

Botanical Impact Assessment

Proposed upgrading of Moordkuil Pump Station, Mossel Bay

18 June 2026



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Declaration of Independence

I Mark Gerald Berry, as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- in terms of the general requirement to be independent:
 - **other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the development proposal or application and that there are no circumstances that may compromise my objectivity;** or
 - ~~am not independent, but another specialist (the “Review Specialist”) that meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);~~
- in terms of the remainder of the general requirements for a specialist, have throughout this EIA process met all of the requirements;
- have disclosed to the applicant, the EAP, the Review EAP (if applicable), the Department and I&APs all material information that has or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application; and
- am aware that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations, 2014 (as amended).

Signature of the Specialist:



Name of Company:

MB Botanical Surveys

Date:

18 June 2026

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1. Introduction

Proposed development and area assessed

This report investigates the botanical impacts of the proposed upgrading of the Moordkuil Pump Station near Mossel Bay. The raw water pump station is situated on the left bank of the Moordkuil River, 3 km north of Klein Brak River (**Figure 1-1**). Stretches of degraded thicket and renosterveld were encountered on the site. The aim of the study, which was requested by SES (EAP) on behalf of applicant (Mossel Bay Municipality), is to determine the botanical value of the affected area, the anticipated impact imposed by the project, and to recommend mitigation measures.

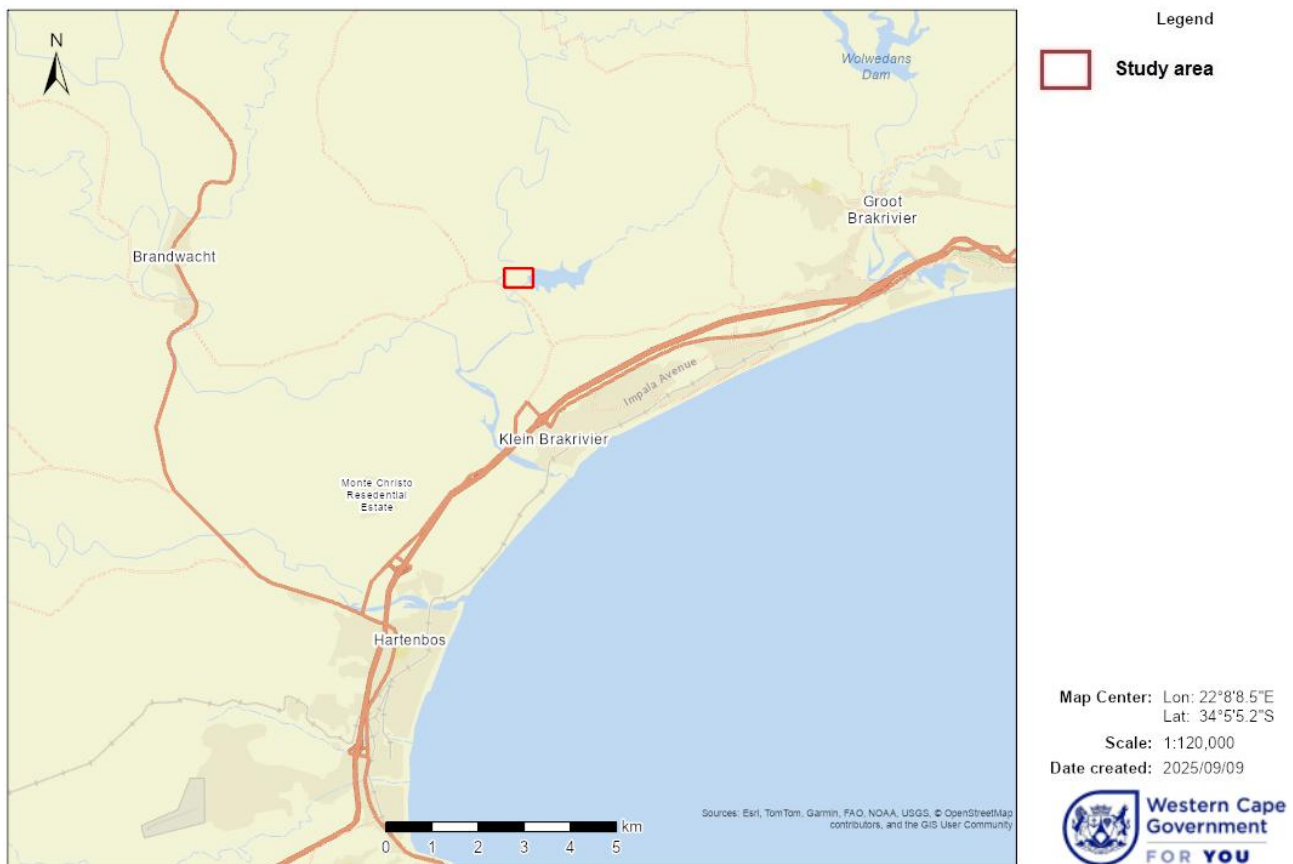


Figure 1-1: Satellite photo showing the location of the site (outlined in red) north of Klein Brak River in the Mossel Bay area.

The applicant wishes to upgrade the raw water abstraction works and pump station on Portions 15, 24 and 25 of Farm Klipheuvel 143, Mossel Bay. The current preferred design alternative has changed from the previous alternative (Alternative B) in that the area previously allocated for the temporary pumps will now accommodate the permanent pumps. Additional infrastructure includes the resurfacing of the access road to the pump station and the installation of a rising main towards the Klipheuvel Dam east of the site. See **Figure 1-2** for further details. Three possible sites are also investigated for the placement of a site camp for the duration of the construction phase.

According to the two Screening Reports, generated by the EAP (SES) on 9 June 2026 for the project, the site has been mapped as Medium sensitive in the plant species theme, and Very High sensitive in the terrestrial biodiversity theme. The Very High sensitivity is ascribed to the possible presence of threatened vegetation types and the encroachment of the site on the biodiversity network. As a result, MB Botanical Surveys was contracted to undertake a botanical assessment of the project area.

Terms of Reference

The terms of reference agreed upon for this botanical study include:

- Adhere to the EAP's terms of reference for the study, including a *status quo* assessment, followed by either a Compliance Statement or a Botanical Impact Assessment Report, depending on the outcome of the *status quo* assessment;
- Identify and describe biodiversity patterns at a community and ecosystem level (main vegetation type, plant communities & threatened/vulnerable ecosystems), at species level (Species of Conservation Concern & protected species) and in terms of significant landscape features;
- Describe the sensitivity of the site and its immediate surroundings;
- Map or describe the presence of invasive alien plants;
- Review the relevant biodiversity plans compiled in terms of the National Environmental Management Biodiversity Act (Act 10 of 2004);
- Make recommendations with regards to the protection/management of biodiversity; and
- Adhere to the NEMA and CapeNature guidelines for biodiversity assessments.

Limitations and Assumptions

The following limitations and assumptions apply to the study:

- Since fieldwork was carried out in autumn and late winter, flowering plants that only flower at other times of the year (e.g. late spring to summer), such as certain bulb species (notably from the Iridaceae and Orchidaceae families), may have been missed. The overall confidence in the completeness and accuracy of the botanical findings is however considered to be good.

Notwithstanding the above limitation and the fact that the affected vegetation is degraded where most of the work will take place, the specialist is of the opinion that the survey and findings are adequate to aid decision making. However, a follow-up botanical survey later in spring should contribute towards the current species list.

Disclaimer & Use of this report

Any person using or referring to this report, do so at their own risk. The author will not accept liability for any loss or damage arising from this report or its content. This report reflects the professional judgment of its author. The information and recommendations

presented are specific to the project and site at hand and do not extend to future developments or neighbouring sites. Use of this report is therefore restricted.

2. Site Sensitivity Verification

The Department of Environmental Affairs online Environmental Screening Tool indicates that the plant species theme is of High sensitivity for the project area (see the Screening Reports, generated by the EAP on 9 June 2026). **Annexure 1** lists the threatened species and their sensitivity from the Screening Reports. The Screening Reports further indicate that the terrestrial biodiversity theme is of Very High sensitivity. This rating is ascribed to the possible presence of a terrestrial critical biodiversity area (CBA1), a degraded terrestrial critical biodiversity area (CBA2) and two threatened vegetation types (Garden Route Granite Fynbos & Groot Brak Dune Strandveld).

In circumstances where the *status quo* assessment proves the contrary to the above (i.e. where the site is deemed to be of Low sensitivity in respect of both themes, the GN320 of 2020 requires that a Terrestrial Biodiversity Compliance Statement is submitted as set out by the National Environmental Management Act (NEMA) (Act No. 107 of 1998) Regulations of 2020. If the above is confirmed, then a biodiversity assessment will be required. The latter seems to be more appropriate in this instance.

3. Methodology

The methodology used in this terrestrial biodiversity compliance assessment, including a desktop background assessment and one site visit, is outlined in the subsections below.

Desktop assessment

A brief review of online (e.g. Google Earth, iNaturalist.org & CapeFarmMapper) and desktop resources (available literature & reports) was undertaken to determine the nature of the site, the expected vegetation type(s), the presence of natural vegetation remnants and species of conservation concern (SCC), hydrological features, and the significance of the site in terms of biodiversity planning.

Site survey

Botanical surveys of the site were undertaken on 26 March and 28 August 2025 by the author. A qualitative assessment of the type and condition of affected vegetation on site, disturbances and presence of alien species, SCC and protected tree species was carried out. The paths walked during the survey are shown in **Figure 3-1**. Plant species not identified in the field, were collected and/or photographed and identified at the office and Compton (Kirstenbosch) Herbarium. The 2018 South African Vegetation Map and the latest floristic taxonomic literature and reference books were used for the purpose of this specialist study. Any plants classified as rare or endangered in the Red List of South African

Plants online database¹ are highlighted. The assessment follows the relevant national guidelines/protocols for biodiversity assessments as listed in the Government Gazette No. 43110 on 20 March 2020.

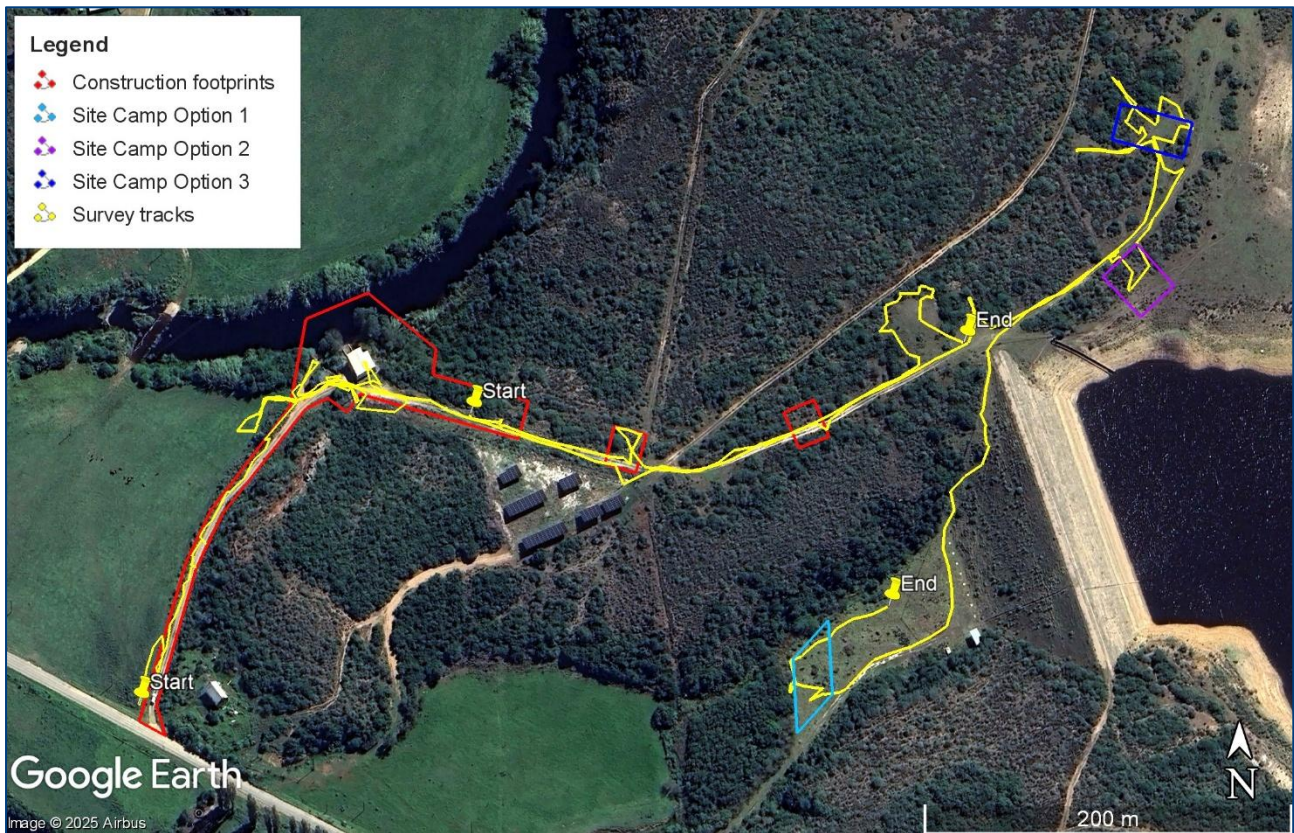


Figure 3-1: Satellite photo showing the survey tracks on site.

The following information was recorded during the site visit:

1. The condition of the vegetation. Is the vegetation either disturbed or degraded? A disturbed or degraded area could range from agricultural fields (fallow land), or areas previously disturbed by mining activities, to an area that has been severely eroded or degraded as a result of bad land management or alien infestation.
2. Species diversity (alpha diversity). This refers to the numbers of different indigenous plant species occurring on site.
3. Species of Conservation Concern (SCC), endemics, as well as protected tree species occurring on site. This would include near threatened, rare, vulnerable, endangered or critically endangered species. SCC and protected tree species were mapped using GPS Tracks Pro v4.9.5 software on an iPhone 16 Pro. Accuracy is given as ± 5 m.
4. Identification of the vegetation type(s) and communities (if discernible) on the site. This would include trying to establish the known range of a vegetation type and

¹ [Threatened Species Programme | SANBI Red List of South African Plants](#)

whether or not it is vulnerable, endangered or critically endangered.

5. Connectivity with (or isolation from) nearby natural vegetation.

Data analysis

Site ecological importance (SEI) of the affected (receptor) area has been determined by applying the criteria described in the Species Environmental Assessment Guideline (SANBI, 2020). See **Annexure 2** for a description of the SEI methodology. The impact assessment methodology is described in **Annexure 3**.

4. Literature Study

A desktop literature review was undertaken during the biodiversity assessment using both online resources and existing maps and reports. A summary of the most relevant information to this assessment is presented below. Some of the information was ground-truthed during the site survey.

Location, topography & land use

The study site is located on the edge of the Moordkuil River floodplain, 3 km north of Klein Brak River (**Figure 4-1**). The surrounding landscape to the north and east is hilly. The hillslopes north of the Klipheuwel Dam rise to 168 m above sea level, while the landscape flattens out downstream towards the south and the confluence with the Brandwag River. The site is covered by tracts of degraded thicket and also renosterveld on the slopes above the site. Two of the proposed site camp options are located inside pastures on the floodplain. Dairy farms have transformed much of the surrounding landscape north of the N2, with only the hilly areas and steeper slopes remaining untransformed. Botlierskop Private Game Reserve is located just over a kilometre away to the north.

Hydrology

According to CapeFarmMapper, the pump station is located on the edge of a NFEPA estuarine wetland associated with the Moordkuil River (**Figures 4-1 & 4-2**). The National Freshwater Ecosystem Priority Areas (NFEPA) project provides strategic spatial priorities for conserving South Africa's freshwater ecosystems and supports sustainable use of water resources. These priority areas are commonly referred to as NFEPA's. One of the site camp options is also located next to a non-perennial watercourse coming from the Klipheuwel Dam. The above wetland and watercourse have been included in the Western Cape biodiversity network.



Figure 4-1: Combined topography and hydrology map.



Figure 4-2: Moordkuil River with one of the water abstraction pipes.

Climate

The mean annual rainfall for the site, which is located on the Garden Route coastal plain, is 444 mm (as per CapeFarmMapper climatic data for 1950 to 2000). The peak rainfall periods are the months of March and October–November (i.e. bimodal rainfall regime), while the driest periods are the summer and winter months. The study area lies in a transitional area between the winter and summer rainfall regions. Mean daily maximum and minimum temperatures are 23.4°C and 10.2°C for February and July, respectively (as per CapeFarmMapper climatic data).

Geology

According to the 3422 AA Mossel Bay 1:50 000 geological map, the site lies on the boundary between alluvium and Enon Formation (conglomerate, breccia & sandstone) (**Figure 4-3**). The latter belongs to the Uitenhage Group (Jurassic to Cretaceous age) of sediments. The cobblestones found in the Enon conglomerate originate from the Table Mountain Group sandstones (Viljoen, 1993). Enon conglomerate is an important source of stone aggregate, which is mined at several quarries found in the area (Viljoen, 1993). The latter typically supports Albany thicket and renosterveld in the Mossel Bay area.



Figure 4-3: Exposed Enon conglomerate on a 'koppie' north of the site.

Biodiversity Planning Context

The study site is located in a renosterveld–thicket environment on the Southern Cape

coastal plain. The indigenous species recorded on site are typical renosterveld and thicket species, such as *Elytropappus rhinocerotis*, *Eriocephalus africanus*, *Sideroxylon inerme*, *Mystroxydon aethiopicum* and *Azima tetraacantha*. The 2018 SA Vegetation Map has incorrectly mapped the main vegetation type on site as Garden Route Granite Fynbos, with the pump station area encroaching on Groot Brak Dune Strandveld (**Figure 4-4**). Vlok has mapped it as Brandwag Fynbos-Renoster-Thicket (see CapeFarmMapper online data). The main vegetation type here should rather be mapped as Mossel Bay Shale Renosterveld, with strong elements (patches) of Albany thicket. This error is repeated in the 2024 beta version of the SA Vegetation Map. Mossel Bay Shale Renosterveld occurs on the undulating hills and valleys from the Kruisrivier near Riversdale to Botterberg, west of the Robinson Pass, centred on the Gouritz River (Mucina, 2006). The renosterveld is described as a medium dense, medium tall cupressoid-leaved shrubland dominated by renosterbos (Mucina, 2006). Thicket patches are common within the unit.

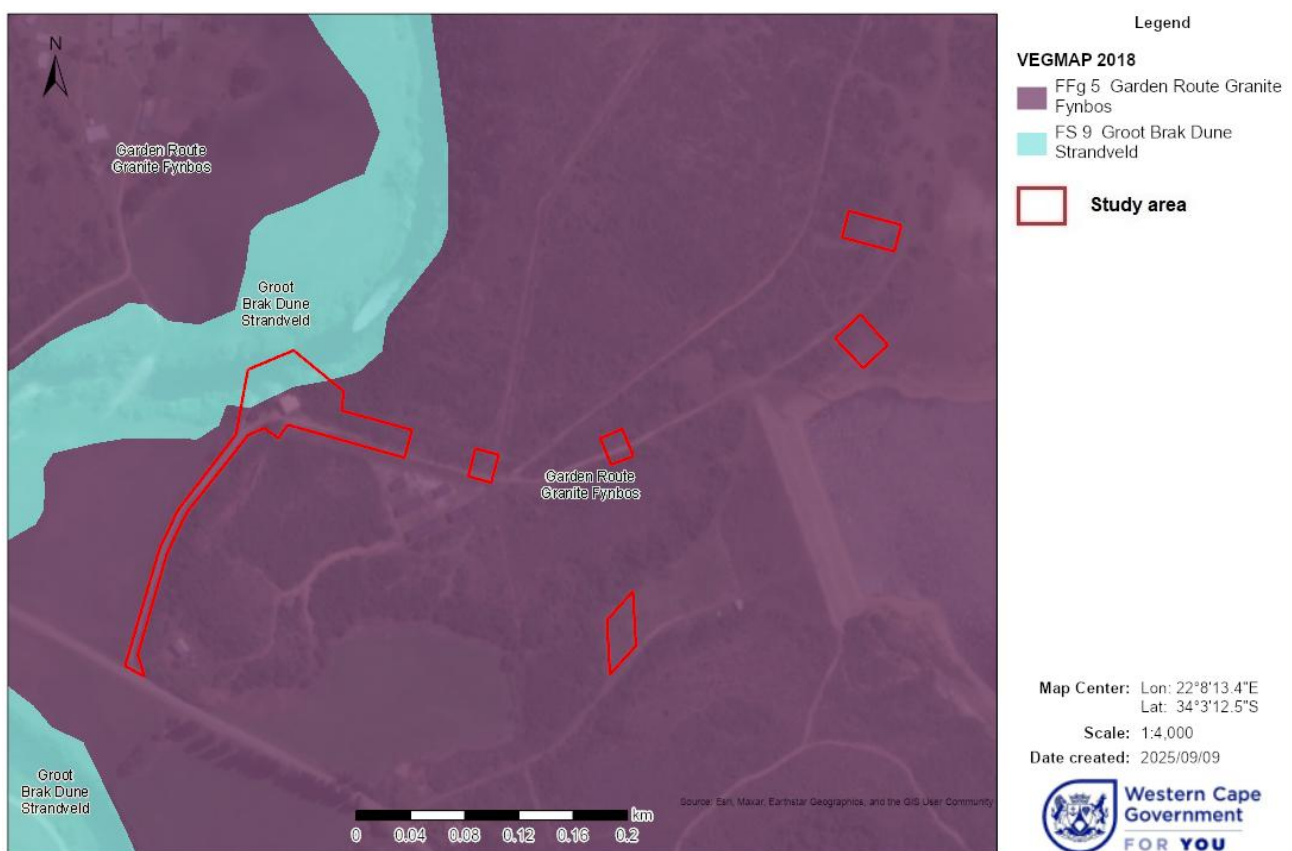


Figure 4-4: Extract of the 2018 SA Vegetation map.

Being part of the Fynbos Biome, Mossel Bay Shale Renosterveld is maintained by a regular fire regime. Unfortunately, landscape fragmentation is disrupting this 'maintenance' requirement, often leading to localised species loss and bush encroachment or alien infestation (pers. obs.). Due to its transformed state, Mossel Bay Shale Renosterveld is currently listed as Critically Endangered in the Revised National List of Threatened Ecosystems (DEA, 2022). A large percentage of it has been transformed in the past for pastures and croplands (Mucina, 2006). Only 38% of Mossel Bay Shale Renosterveld is still

left, while 0.2% is currently protected². The ecosystem is also degraded by erosion and overgrazing (Mucina, 2006). The unit is narrowly distributed with high rates of habitat loss in the past 30 years, placing it at risk of collapse³.



Figure 4-5: Extract of the Western Cape biodiversity network map.

A large part of the project area falls inside the Western Cape biodiversity network. The pipeline route and two of the camp site options fall inside a terrestrial critical biodiversity area (CBA) and degraded critical biodiversity areas (CBA2) (**Figure 4-5**). The pumpstation itself and camp site option below the dam wall encroach on aquatic (river) CBA's and degraded aquatic CBA's. Reasons for the mapped units include the presence of a climate adaption corridor, ecological processes (FEPA river corridor), threatened vegetation type (albeit the wrong type), threatened vertebrate habitat (bontebok), estuary (Klein Brak Estuary), river types (ephemeral upper foothill river & permanent lower foothill river), wetland types (channelled & unchannelled valley bottom wetlands) and water resource protection (Southern Coastal Belt). It was previously noted that most of the intact vegetation in the Mossel Bay interior is found on the steeper hill slopes. These areas are thus considered of great value in the biodiversity network. The CBA2's correspond with transformed areas, such as pastures and roads. The Moordkuil River has

² [Ecosystem Detail - Biodiversity BGIS](#)

³ [Ecosystem Detail - Biodiversity BGIS](#)

been mapped as an aquatic CBA. The closest protected area to the site is the Doring River Wilderness Area, located 15 km away to the north.

CBA's are defined as areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure (Pool-Stanvliet, 2017). These sites are selected for meeting national targets for species, habitats and ecological processes (Pool-Stanvliet, 2017). Many of these areas support known occurrences of threatened plant species, and/or may be essential elements of designated ecological corridors. Loss of designated CBA's is therefore not recommended. ESA's, on the other hand, are supporting zones required to prevent the degradation of CBA's and Protected Areas.

5. Results

In order to fulfil in the requirements of the terrestrial biodiversity and plant species protocols, this section describes the vegetation (terrestrial biodiversity) and plant species encountered in two subsections. In the plant species subsection specific reference is made to species of conservation concern (SCC) and protected tree species.

Terrestrial biodiversity (vegetation)

The site (Moordkuil Pump Station & access road) lies inside transformed or degraded thicket (**Figures 5-1 to 5-5**). The vegetation changes into senescent renosterveld further up the hill slope along the route for the rising main. A large patch of good quality Albany thicket was noted on the southern side of the bypassing farm road (**Figure 5-6**). The vegetation directly adjacent to the existing infrastructure and access road is quite degraded with a notable presence of weeds and aliens, such as *Acacia mearnsii*, *Nicotiana glauca*, *Solanum mauritianum* and *Verbena bonariensis*. Patches of thicket on the edges of the project footprint are populated by typical thicket species, such as *Sideroxylon inerme*, *Grewia occidentalis*, *Searsia pallens*, *Euclea undulata* and *Azima tetracantha*. Disturbances noted include the presence of farm roads, water pump infrastructure, pastures, fence lines, remains of demolished buildings and alien species. There is also a small solar plant located next to the rising main route.

Transformed or disturbed areas were selected for the site camp options (**Figures 5-7 to 5-9**). Site camp option 1 (below dam wall) is mainly covered by grasses, weeds and pioneer shrubs, such as *Cenchrus clandestinus*, *Stenotaphrum secundatum*, *Juncus acutus*, *Cyperus textilis*, *Nidorella ivifolia*, *Senecio rosmarinifolius* and *Vachellia karroo*. It also lies in close to a watercourse with *Cyperus textilis* and *Typha capensis*. Site camp options 2 and 3, which contain scattered thicket/renosterveld elements or regrowth, are more diverse. Indigenous species recorded here include *Dicerotheramnus rhinocerotis*, *Oedera genistifolia*, *Scolopia zeyheri*, *Searsia pallens*, *Ruschia tenella* and *Cotyledon orbiculata*. Site camp option 3 also contains the remains of demolished farm buildings. The botanical attributes of the study area are presented in **Figure 5-10**.



Figure 5-1: Access road to the pump station, fringed by a pasture and degraded thicket/thicket regrowth.



Figure 5-2: Embankment on western side of pump station, covered by pioneer shrubs and reeds.



Figure 5-3: Thicket on eastern side of pump station and position of temporary access to construction site.



Figure 5-4: Degraded vegetation on eastern side of pump station.



Figure 5-5: Route for rising main, fringed by *Vachellia karroo*, *Searsia pallens*, *S. rehmanniana*, *Euclea undulata* and *Athanasia trifurcata*.



Figure 5-6: Good quality thicket with *Aloe arborescens* on the southern side of pump station site.



Figure 5-7: Site camp option 1, below the Klipheuvel Dam wall (34° 03' 17" S; 22° 08' 17" E).



Figure 5-8: Site camp option 2, above Klipheuvel Dam (34° 03' 10" S; 22° 08' 23.5" E).



Figure 5-9: Site camp option 3 (34° 03' 07.5" S; 22° 08' 24" E).

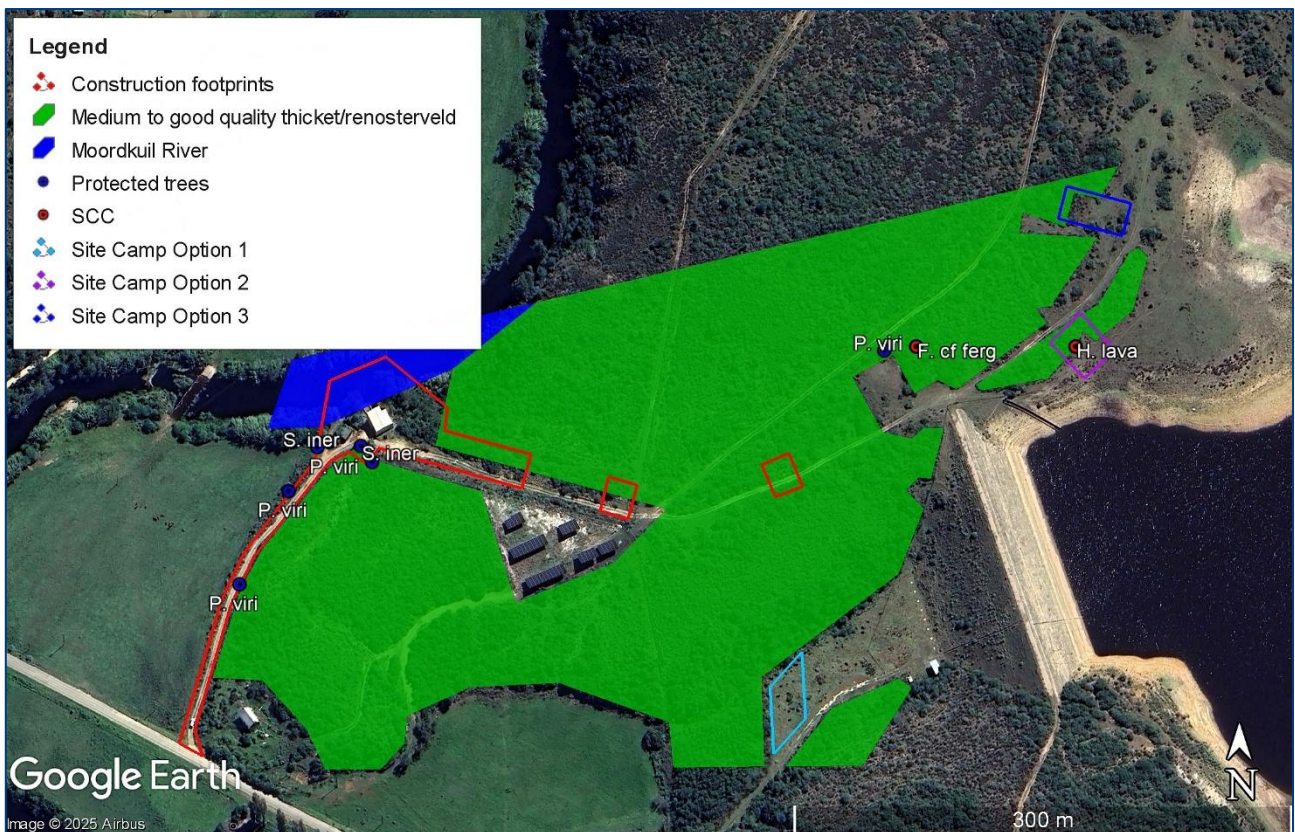


Figure 5-10: Botanical attributes of the project area. The untuned areas inside the project footprint are transformed or highly degraded.

Plant species

The following indigenous tree and shrub species were recorded on site, namely *Athanasia trifurcata*, *Dicerotheramnus rhinocerotis*, *Senecio rosmarinifolius*, *Helichrysum rosum*, *Metalasia pungens*, *Eriocephalus africanus*, *Oedera genistifolia*, *Chrysocoma ciliata*, *Nidorella ivifolia*, *Berkheya heterophylla*, *Vachellia karroo*, *Indigofera nigromontana*, *Rhynchosia caribaea*, *Searsia pallens*, *S. rehmanniana* var. *glabrata*, *S. lucida*, *Lauridia tetragona*, *Gymnosporia buxifolia*, *Putterlickia pyracantha*, *Mystroxyton aethiopicum*, *Scolopia zeyheri*, *Buddleja saligna*, *Euclea undulata*, *Pittosporum viridiflorum*, *Olea europaea*, *Azima tetracantha*, *Ruschia tenella*, *Lampranthus emarginatoides*, *Delosperma neethlingiae*, *Drosanthemum parvifolium*, *D. floribundum*, *Carpobrotus deliciosus*, *Cotyledon orbiculata*, *Crassula perforata*, *C. nudicaulis*, *C. subulata*, *C. muscosa*, *Sideroxyton inerme*, *Gnidia squarrosa*, *Grewia occidentalis*, *Carissa bispinosa*, *Diospyros dichrophylla*, *Abutilon sonneratianum*, *Hermannia holosericea*, *H. lavandulifolia*, *Rubus rigidus*, *Asparagus suaveolens*, *A. aethiopicus*, *A. multiflorus*, *A. mariae*, *Leonotis ocymifolia*, *L. leonurus*, *Lycium cinereum*, *Solanum africanum*, *S. linnaeanum*, *Polygala myrtifolia*, *P. ericifolia*, *Myrsine africana*, *Phyllica cf axillaris*, *Cynanchum ellipticum*, *C. viminale*, *Gomphocarpus physocarpus*, *Rhoicissus digitata*, *Acalypha capensis*, *Pavonia columella*, *Hypoestes forskalii* and *H. aristata*.

Hemicryptophytes and geophytes recorded include *Cyperus textilis*, *C. polystachyos*, *Juncus acutus*, *Typha capensis*, *Stenotaphrum secundatum*, *Chloris gayana*, *Setaria megaphylla*, *Cynodon dactylon*, *Phragmites australis*, *Oxalis caprina*, *Cyanella lutea*, *Freesia cf fergusoniae*, *Watsonia laccata* and *Bobartia robusta*. *Freesia cf fergusoniae* and *Bobartia robusta* are regional endemics recorded in the upper (renosterveld) parts of the site. **Figure 5-11** shows a few of the indigenous species recorded.

Floristic affinity with both Albany thicket and Mossel Bay Shale Renosterveld is strong with several important taxa recorded, including *Dicerotheramnus rhinocerotis*, *Eriocephalus africanus*, *Putterlickia pyracantha*, *Euclea undulata*, *Olea europaea*, *Cotyledon orbiculata*, *Crassula perforata*, *Grewia occidentalis*, *Carissa bispinosa* and *Diospyros dichrophylla*. Two Species of Conservation Concern (SCC) were recorded, namely *Hermannia lavandulifolia* (VU) and *Freesia cf fergusoniae* (VU). According to the online Red List of South African Plants, they are under threat from crop cultivation, overgrazing, urban developments and alien infestation. Fortunately, both species are still frequently encountered in the Mossel Bay area, with a high number of iNat records. All the other recorded species are widespread and common. Two protected tree species (in terms of the National Forests Act 84 of 1998) were recorded, namely *Sideroxyton inerme* (milkwood) and *Pittosporum viridiflorum* (kasuur). Both these tree species are common in the region, but their removal requires a permit from the Department of Forestry.



Figure 5-11: A few indigenous species recorded on site, with *Delosperma neethlingiae* (top left), *Pittosporum viridiflorum* (top right), *Leonotis leonurus* (middle left), *Searsia rehmanniana* (middle right), *Watsonia laccata* (bottom left) and *Oedera genistifolia* (bottom right).

Invasive aliens were recorded throughout the site especially along the access road and around the pump station, including *Acacia mearnsii* (black wattle, category 2), *A. cyclops* (rooikrans, 1b), *Datura stramonium* (common thorn apple, 1b), *Opuntia ficus-indica* (prickly pear, 1b), *O. monacantha* (prickly pear, 1b), *Persicaria lapathifolia* (spotted knotweed), *Cestrum laevigatum* (inkberry, 1b), *Anredera cordifolia* (Madeira vine, 1b), *Erigeron bonariensis* (flax-leaf fleabane), *Nicotiana glauca* (wild tobacco, 1b), *Ricinus communis* (castor-oil plant, 2), *Solanum mauritianum* (bugweed, 1b), *Cirsium vulgare*

(spear thistle, 1b), *Verbena bonariensis* (purple top, 1b), *Physalis peruviana* (gooseberry), *Xanthium spinosum* (spiny cocklebur, 1b), *Tagetes minuta* (khaki weed), *Cenchrus clandestinus* (kikuyu, 1b in protected areas), *Paspalum urvillei* (giant paspalum) and *Saccharum officinarum* (sugarcane). **Figure 5-12** shows a few of the alien species. As indicated above, over half are Category 1b and 2 invaders. In terms of the National Environmental Management: Biodiversity Act (NEMBA) (Act 10 of 2004) Alien and Invasive Species List (2016), category 1b invasive species require compulsory control as part of an invasive species control programme. Also, the harbouring of category 2 species, such as black wattle and castor-oil plant, is prohibited without a permit. Black wattle, which is indicative of past disturbances, is considered a serious threat to the environment and very difficult to control. The presence of the woody aliens also presents a fire risk.



Figure 5-12: Alien species recorded on site, with *Xanthium spinosum* (top left), *Ricinus communis* (top right), *Opuntia monacantha* (bottom left) and *Solanum mauritianum* (bottom right).

Site Ecological Importance

In order to demonstrate the biodiversity sensitivity of the project area, a site ecological importance (SEI) map was prepared (**Figure 5-13**). This map considers the biodiversity importance of the receptor area and its resilience to impacts. The receptor area is described as the affected habitats (i.e. transformed/degraded areas, Moordkuil River & thicket/renosterveld). Most of the project footprint scored a Very Low value, while the

thicket/renosterveld and riverine areas scored High and Medium values, respectively. These values were influenced by the size of areas in question, threat status and condition of the vegetation, potential presence of SCC, and connectivity with the biodiversity network. The results of the SEI analysis are presented in **Table 5-1**.

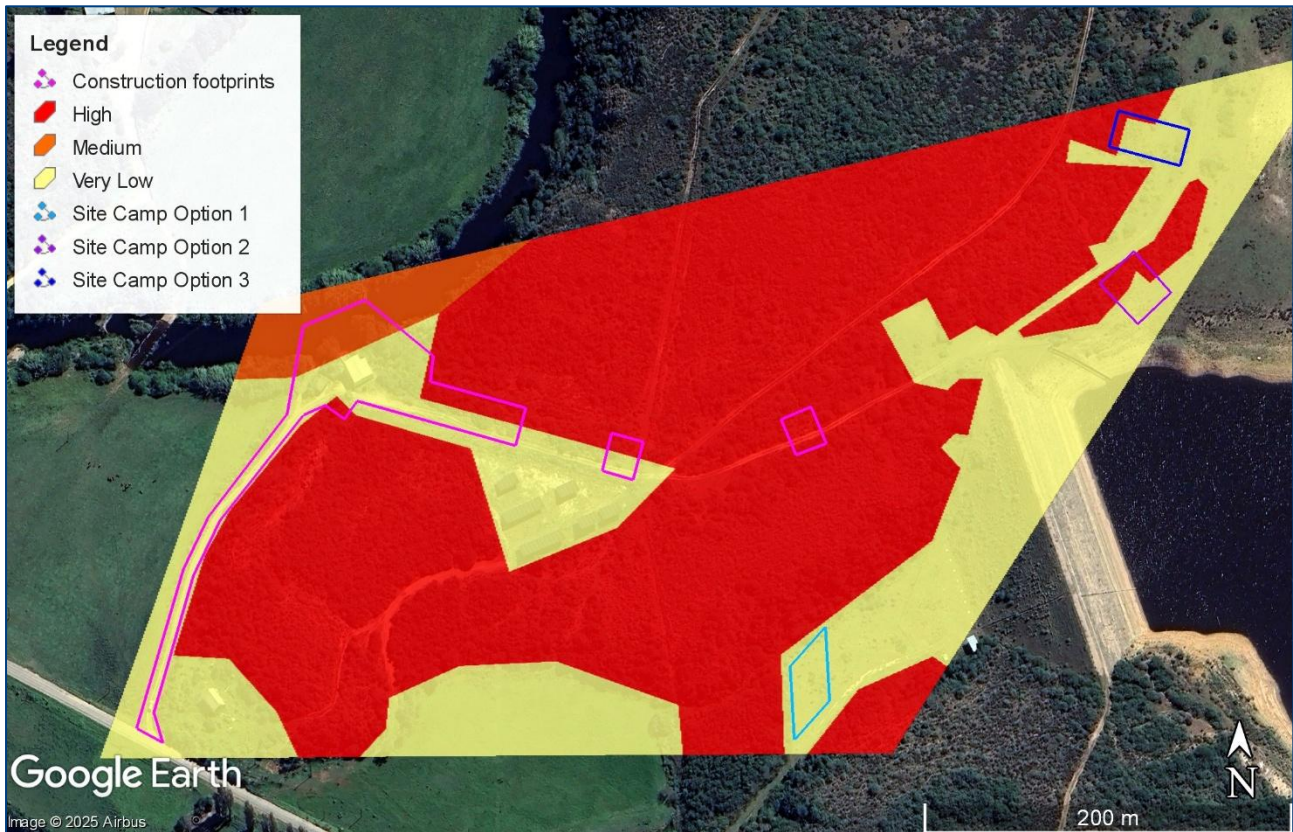


Figure 5-13: Site ecological importance (SEI) map of the project area.

Table 5-1: SEI analysis.

| | CI | FI | BI | RR | SEI |
|--|------|------|------|-----------|----------|
| Medium to good quality thicket/renosterveld | High | High | High | Medium | High |
| Moordkuil River corridor | High | High | High | High | Medium |
| Transformed or highly degraded areas | Low | Low | Low | Very High | Very Low |

6. Potential Impacts

Terrestrial biodiversity (vegetation)

With the information in hand, it is impossible to determine how much natural vegetation will be affected by the project. However, encroachments of thicket/renosterveld and riverine vegetation is expected. Fortunately, most of these encroachments will occur in degraded or regrowth vegetation next to existing infrastructure and farm roads. Post

construction recovery is also expected to be quick if allowance is made for rehabilitation and alien control. Pioneer tree and shrub species, such as *Vachellia karroo*, *Searsia* spp, *Dicerotheramnus rhinocerotis*, *Eriocephalus africanus* and *Athanasia trifurcata*, will populate the disturbed areas again within a couple of years. The affected vegetation is also well represented on the surrounding hills. With regards to the design alternatives for the pump station, the current preferred alternative will not result in a significantly greater impact than the previous alternative (Alternative B).

With regards to the site camp options, options 1 and 3 are more degraded or disturbed, and mainly covered by grasses and scattered pioneer shrubs/trees. Site option 2 contains considerably more vegetation and plant species. It is therefore recommended that site options 1 and/or 3 be considered for the site camp. Proper fencing will be needed around the site camp to prevent damage to the adjacent vegetation. In the case of option 1 below the dam wall, consideration must be given to an adjacent watercourse/wetland. During the construction phase care must be exercised to avoid the unnecessary disturbance of the adjacent vegetation. Proper fencing will be needed in this regard. As an indirect impact, earthworks will provide ideal conditions for the establishment of invasive alien species. The presence of aliens, such as black wattle, wild tobacco and a plethora of herbaceous species, will exacerbate this impact. **Table 6-1** summarises the impact on terrestrial biodiversity.

Table 6-1: Impact on terrestrial biodiversity.

| Phase | Construction Phase | Operational Phase |
|---------------------------------------|--|---|
| Nature of impact(s) | <ul style="list-style-type: none"> - Clearing of mostly degraded thicket/renosterveld. - Temporary impact on the functionality of biodiversity network. - Increased opportunity for alien infestation. - Pollution of aquatic systems. | <ul style="list-style-type: none"> - Increased alien infestation. - Erosion due to poor rehabilitation efforts. |
| Extent of impact | Project footprint & immediate surroundings | Project footprint & immediate surroundings |
| Duration | Medium | Long term |
| Intensity | Medium | Low |
| Probability of occurrence | High | Medium |
| Degree of reversibility | Medium | High |
| Irreplaceability of resource | Medium | Medium-low |
| Mitigatory potential | High | High |
| Significance before mitigation | Medium-low | Low |
| Significance after mitigation | Low | Low |

The project area is located partly inside a CBA corridor that runs along the foothills of the

Mossel Bay interior and connects with Outeniquas (Doringrivier Wilderness Area & Ruitersbos Nature Reserve) to the north. Apart from providing a backbone to the local biodiversity network, the corridor serves as an important passage along which fauna can migrate between the mountain and the foothills and along the foothills itself. With the project located close to the southern edge of the corridor one can expect a temporary impact on its functionality. The only mitigation measures would be to rehabilitate the disturbed areas post construction, encourage the re-establishment of indigenous vegetation on the disturbed surfaces (where practical), and implement alien control.

Plant species

The impact on plant species, including potential SCC and protected tree species, is also expected to be of low significance, with mitigation. This is due to the presence of mostly widespread and common thicket/renosterveld species. Two SCC were recorded on site, namely *Hermannia lavandulifolia* (VU) and *Freesia cf fergusoniae* (VU). Both observed occurrences can be avoided. *Polygala pubiflora* (VU) and *Trichodiadema burgeri* (VU) were also recorded by the author on an adjacent farm. Fortunately, all of them are still frequently encountered in suitable habitats in the Mossel Bay area. **Table 6-2** summarises the impact on plant species.

Table 6-2: Impact of the project on flora, SCC & protected tree species.

| Phase | Construction Phase | Operational Phase |
|---------------------------------------|--|--|
| Nature of impact(s) | - Loss of indigenous flora, potential SCC & protected tree species | - Alien infestation & resulting displacement of indigenous flora |
| Extent of impact | Project footprint & immediate surroundings | Project footprint & immediate surroundings |
| Duration | Medium | Long term |
| Intensity | Medium | Low |
| Probability of occurrence | High | Medium |
| Degree of reversibility | Medium | High |
| Irreplaceability of resource | Medium | Medium-low |
| Mitigatory potential | High | High |
| Significance before mitigation | Medium-low | Low |
| Significance after mitigation | Low | Low |

Given their habitat preferences and known iNaturalist records, the probability of SCC listed in the Screening Report to occur on site is indicated in **Annexure 1**. Three species, including two sensitive species which names are withheld, have a medium to high probability to occur on the site or surrounding area. To mitigate the impact, topsoil from the construction areas should be protected and replaced after construction as part of the rehabilitation process. As a duty of care measure, consideration could also be given to

search and rescue (S&R) of suitable species (e.g. bulbs & succulents). Of course, any replanting of rescued plant material must be done in matching habitats from which the plants originate. Two protected tree species will probably be affected, namely *Sideroxylon inerme* and *Pittosporum viridiflorum*. A permit will be needed for their removal.

The **cumulative botanical impact** of the project is expected to be equivalent to the impact on terrestrial biodiversity and plant species described above, i.e. the continued erosion of Albany thicket and/or Mossel Bay Shale Renosterveld, the biodiversity network, as well as the loss of plant species. In this instance, the slight loss of biodiversity and resultant cumulative impact will be acceptable (with mitigation), due to the transformed or degraded state of the affected vegetation and the nature of the project. A large part of the site can be rehabilitated and some of the vegetation restored.

7. Recommended Mitigation Measures

The following mitigation measures are recommended to ensure that the impact on terrestrial biodiversity and plant species is minimised during the **construction phase**:

- Fence off the construction areas. The thicket/renosterveld outside the construction areas must not be disturbed in any way.
- With regards to the site camp options, preference should be given to options 1 and 3. Site option 2, which contains considerably more vegetation and plant species, should not be selected. In the case of site camp option 1 (below the dam wall), a buffer of sufficient width must be maintained between the camp and nearby watercourse.
- To mitigate the impact of vegetation clearing, topsoil and seedbearing plant material from the construction areas must be protected and replaced after construction as part of the rehabilitation process. As a duty of care measure, consideration should also be given to S&R of suitable species (e.g. bulbs & succulents). Of course, any replanting of rescued plant material must be done in matching habitats from which the plants originate. Bulbs should be removed along with some soil, placed in gel, bagged and then taken to a nursery for temporary storage or transplanted directly in the receiving area. S&R should be done at an appropriate time of the year, preferably when the soil is wet during the raining season. Ideally, bulbs should be salvaged during leaf fall, but before or after flowering. Please note that a CapeNature permit is needed for the relocation of indigenous plant species.
- Allow at least 24 months for the monitoring of rehabilitation success and alien infestation post construction. Keep the project footprint as well as an additional strip of 10–15 m wide clear of invasive aliens.

Mitigation measures recommended for the **operational phase**:

- Monitor the construction footprint and all areas disturbed during construction for rehabilitation success and erosion. Where needed, rehabilitate/revegetate

disturbed surfaces expediently. Erosion prevention measures may be needed on steep slopes, such as silt fences, logs or netting, to slow down runoff and potential erosion. Mulching and seeding with indigenous thicket/renosterveld seed may also be needed.

- As a long-term maintenance requirement, continue with alien clearing on and around the project footprint, focussing on invasive species such as black wattle, rooikrans, common thorn apple, prickly pear, wild tobacco, castor-oil plant, bugweed and spear thistle. These species are category 1b and 2 invaders that require compulsory control as part of an invasive species control programme. Please note that it is a legal requirement for landowners to clear alien vegetation on their land.

8. Conclusion & Recommendations

This report sets out the results from a desktop study, as well as two field surveys undertaken on 26 March and 28 August 2025, to ascertain terrestrial biodiversity and plant species constraints and possible impacts associated with the proposed upgrading of the Moordkuil Pump Station on Portions 15, 24 and 25 of Farm Klipheuveld 143, north of Klein Brak River.

The site proposed for the project lies inside transformed or degraded Albany thicket and Mossel Bay Shale Renosterveld. The latter is currently listed as Critically Endangered. The site is also partly located inside the Western Cape biodiversity network, with most of it mapped as terrestrial and aquatic critical biodiversity areas (CBA) or degraded critical biodiversity areas (CBA2). Two SCC were recorded on site, namely *Hermannia lavandulifolia* (VU) and *Freesia cf fergusoniae* (VU). Both observed occurrences can be avoided. Two protected tree species (*Sideroxylon inerme* & *Pittosporum viridiflorum*) are also present on the site.

With regards to the Screening Reports, I do not disagree with the general ratings of High for plant species and Very High for terrestrial biodiversity. However, these ratings do not always take localised disturbances (transformations) on the ground into account, such as farm roads, cleared/degraded areas or incorrectly mapped vegetation types. For example, Garden Route Granite Fynbos and Groot Brak Dune Strandveld do not occur here. One can therefore argue that the ratings should be lower for certain areas of the site. Given the transformed or degraded state of the vegetation, the impact on terrestrial biodiversity and plant species is of medium-low significance, prior to mitigation. With mitigation, this impact can be lowered further.

It is therefore recommended that the proposed project be considered for approval, but subject to the proposed mitigation measures listed above.

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Annexure 1: Threatened plant species as listed in Screening Reports (species in bold were recorded on site)

| Sensitivity | Feature(s) | Probability of presence on site or surrounding area |
|--------------------|---------------------------|--|
| Medium | <i>Polygala pubiflora</i> | High |
| Medium | Sensitive species 642 | Medium |
| Medium | Sensitive species 18 | Medium |
| Medium | Sensitive species 85 | Low |

Annexure 2: Site Ecological Importance

Site Ecological Importance (SEI) is considered to be a function of the biodiversity importance (BI) of the receptor (e.g. SCC, the vegetation community or habitat type present on site) and its resilience to impacts (receptor resilience or RR) as follows:

$$SEI = BI + RR$$

BI in turn is a function of conservation importance (CI) and the functional integrity (FI) of the receptor as follows:

$$BI = CI + FI$$

Conservation importance (CI) is evaluated in accordance with recognised established internationally principles and criteria for the determination of biodiversity-related value, including the IUCN Red List of Species, Red List of Ecosystems and key biodiversity areas. CI is defined here as: “The importance of a site for supporting biodiversity features of conservation concern present, e.g. populations of SCC (CR, EN, VU & NT), Rare species, range-restricted species, and areas of threatened ecosystem types, through mainly natural processes”. Fulfilling criteria to evaluate CI do not rely on a single specific threshold for each of the above defining characteristics but can act in combination or in isolation, providing a more robust evaluation of CI (Table 1).

Table 1: Conservation importance (CI) criteria.

| CI | Criteria |
|-----------|--|
| Very high | Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of <10 km ² . Any area of natural habitat of a CR ecosystem type or large area (>0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type. |
| High | Confirmed or highly likely occurrence of CR, EN and VU species that have a global EOO of >10 km ² . IUCN threatened species (CR, EN & VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or <10 000 mature individuals remaining. Small area (>0.01% but <0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (>0.1%) of natural habitat of VU ecosystem type. Presence of Rare species. |
| Medium | Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN & VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. >50% of receptor contains natural habitat with potential to support SCC. |
| Low | No confirmed or highly likely populations of SCC. No confirmed or highly likely populations of range-restricted species. |

| CI | Criteria |
|----------|---|
| | <50% of receptor contains natural habitat with limited potential to support SCC. |
| Very low | No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining. |

Functional integrity (FI) of the receptor (e.g. the vegetation community or habitat type) is defined here as the receptors' current ability to maintain the structure and functions that define it, compared to its known or predicted state under ideal conditions. Ecological processes can be considered to be mostly intact and functional if the receptor area has low levels of current ecological disruptors, has good connectivity to other areas and is a relatively large area. As for CI, the fulfilling criteria to evaluate FI do not rely on a single specific threshold for each of the above defining characteristics but can act in combination or in isolation (Table 2).

Table 2: Functional integrity (FI) criteria.

| FI | Criteria |
|-----------|--|
| Very high | Very large (>100 ha) intact area for any conservation status of ecosystem type or >5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts with no signs of major past disturbance (e.g. ploughing). |
| High | Large (>20 ha but <100 ha) intact area for any conservation status of ecosystem type or >10 ha for EN ecosystem types. Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential. |
| Medium | Medium (>5 ha but <20 ha) semi-intact area for any conservation status of ecosystem type or >20 ha for VU ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential. |
| Low | Small (>1 ha but <5 ha) area. Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts. |
| Very low | Very small (<1 ha) area. No habitat connectivity except for flora with wind-dispersed seeds. Several major current negative ecological impacts |

Recalling that biodiversity importance (BI) is a function of conservation importance (CI) and the functional integrity (FI) of a receptor, BI can be derived from a simple matrix of CI and FI as follows:

| | | Conservation importance | | | | |
|----------------------|-----------|-------------------------|-----------|----------|----------|----------|
| | | Very high | High | Medium | Low | Very low |
| Functional integrity | Very high | Very high | Very high | High | Medium | Low |
| | High | Very high | High | Medium | Medium | Low |
| | Medium | High | Medium | Medium | Low | Very low |
| | Low | Medium | Medium | Low | Low | Very low |
| | Very low | Medium | Low | Very low | Very low | Very low |

Receptor resilience (RR) is defined here as: “The intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention.” The fulfilling criteria to evaluate RR are based on the estimated recovery time required to restore an appreciable portion of functionality to the receptor (Table 3) and will require justification by the specialist.

Table 3: Receptor resilience (RR) criteria.

| RR | Criteria |
|-----------|--|
| Very high | Habitat that can recover rapidly (<5 years) to restore >75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed. |
| High | Habitat that can recover relatively quickly (5–10 years) to restore >75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed. |
| Medium | Will recover slowly (>10 years) to restore >75% of the original species composition and functionality of the receptor 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. |
| 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. |
| Very low | Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed. |

Finally, after the successful evaluation of both BI and RR as described above, it is possible to evaluate the **site ecological importance (SEI)** from the final matrix as follows:

| Site ecological importance | | Biodiversity importance | | | | |
|----------------------------|-----------|-------------------------|-----------|----------|----------|----------|
| | | Very high | High | Medium | Low | Very low |
| Receptor resilience | Very low | Very high | Very high | High | Medium | Low |
| | Low | Very high | Very high | High | Medium | Very low |
| | Medium | Very high | High | Medium | Low | Very low |
| | High | High | Medium | Low | Very low | Very low |
| | Very high | Medium | Low | Very low | Very low | Very low |

Table 4: Guidelines for interpreting SEI in the context of the proposed development activities.

| SEI | 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. |

Annexure 3: Impact Assessment Methodology

Each issue that is identified consists of components that on their own or in combination with each other give rise to potential impacts, either positive or negative, from the project onto the environment or from the environment onto the project. In the EIA the significance of the potential impacts is considered before and after identified mitigation is implemented, for direct, indirect, and cumulative impacts, in the short and long term.

A description of the nature of the impact, any specific legal requirements and the stage (construction/decommissioning or operation) were given. The following criteria will be used to evaluate the significance of each issue that was identified:

Nature: This is an appraisal of the type of effect the activity is likely to have on the affected environment. The description includes what is being affected and how. The nature of the impact will be classified as positive or negative, and direct or indirect.

❖ **Extent and location:** This indicates the spatial area that may be affected (**Table 1**).

Table 1: Geographical extent of impact

| Rating | Extent | Description |
|--------|------------|---|
| 1 | Site | Impacted area is only at the site – the actual extent of the activity. |
| 2 | Local | Impacted area is limited to the site and its immediate surrounding area |
| 3 | Regional | Impacted area extends to the surrounding area, the immediate and the neighbouring properties. |
| 4 | Provincial | Impact considered of provincial importance |
| 5 | National | Impact considered of national importance – will affect entire country. |

❖ **Duration:** This measures the lifetime of the impact (**Table 2**).

Table 2: Duration of Impact

| Rating | Duration | Description |
|--------|---------------------------|---|
| 1 | Short term | 0–3 years, or length of construction period |
| 2 | Medium term | 3–10 years |
| 3 | Long term | >10 years, or entire operational life of project. |
| 4 | Permanent – mitigated | Mitigation measures of natural process will reduce impact – impact will remain after operational life of project. |
| 5 | Permanent – No mitigation | No mitigation measures of natural process will reduce the impact after implementation – impact will remain after operational life of project. |

❖ **Intensity/severity:** This is the degree to which the project affects or changes the environment; it includes a measure of the reversibility of impacts (**Table 3**).

Table 3: Intensity of Impact

| Rating | Intensity | Description |
|--------|------------|---|
| 1 | Negligible | Change is slight, often not noticeable, natural functioning of environment not affected. |
| 2 | Low | Natural functioning of environment is minimally affected. Natural processes can be reversed to their original state. |
| 3 | Medium | Environment remarkably altered, still functions, if in modified way. Negative impacts cannot be fully reversed. |
| 4 | High | Natural functions and processes disturbed – potentially ceasing to function temporarily. |
| 5 | Very high | Natural functions and processes permanently cease, and valued, important, sensitive or vulnerable systems or communities are substantially affected. Negative impacts cannot be reversed. |

- ❖ **Potential for irreplaceable loss of resources:** This is the degree to which the project will cause loss of resources that are irreplaceable (**Table 4**).

Table 4: Potential for irreplaceable loss of resources.

| Rating | Potential for irreplaceable loss | Description |
|--------|----------------------------------|---|
| 1 | Low | No irreplaceable natural resources will be impacted. |
| 3 | Medium | Natural resources can be replaced, with effort. |
| 5 | High | There is no potential for replacing a particular vulnerable resource that will be impacted. |

- ❖ **Probability:** This is the likelihood or the chances that the impact will occur (**Table 5**).

Table 5: Probability of Impact

| Rating | Probability | Description |
|--------|-------------|---|
| 1 | Improbable | Under normal conditions, no impacts expected. |
| 2 | Low | The probability of the impact to occur is low due to its design or historic experience. |
| 3 | Medium | There is a distinct probability of the impact occurring. |
| 4 | High | It is most likely that the impact will occur. |
| 5 | Definite | The impact will occur regardless of any prevention measures. |

- ❖ **Confidence:** This is the level of knowledge or information available, the specialist had in his/her judgement (**Table 6**).

Table 6: Confidence in level of knowledge or information

| Rating | Confidence | Description |
|--------|------------|--|
| | Low | Judgement based on intuition, not knowledge/information. |
| | Medium | Common sense and general knowledge inform decision. |
| | High | Scientific/proven information informs decision. |

- ❖ **Consequence:** This is calculated as extent + duration + intensity + potential impact on irreplaceable resources.
- ❖ **Significance:** The significance will be rated by combining the consequence of the impact and the probability of occurrence (i.e. consequence x probability = significance). The maximum value which can be obtained is 100 significance points (**Table 7**).

Table 7: Significance of issues (based on parameters)

| Rating | Significance | Description |
|--------|--------------|--|
| 1-14 | Very low | No action required. |
| 15-29 | Low | Impacts are within the acceptable range. |
| 30-44 | Medium-low | Impacts are within the acceptable range but should be mitigated to lower significance levels wherever possible. |
| 45-59 | Medium-high | Impacts are important and require attention; mitigation is required to reduce the negative impacts to acceptable levels. |
| 60-80 | High | Impacts are of great importance, mitigation is crucial. |
| 81-100 | Very high | Impacts are unacceptable. |

- ❖ **Cumulative Impacts:** This refers to the combined, incremental effects of the impact. The possible cumulative impacts will also be considered.