Botanical Assessment

Proposed upgrading of the Herold's Bay pump station and sewer pipelines

March 2024

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Mark Berry is an independent botanical specialist with 25 years of experience mainly in the Western Cape, but also in the adjacent provinces, Free State and KwaZulu-Natal. He is also experienced in undertaking/compiling Environmental Impact Assessments (EIA's), Environmental Management Programmes (EMPr's), Environmental Control Officer (ECO) duties, audits, land use surveys and due diligence investigations. CV is available upon request.

Citation of report

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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:	Mark Berry Botanical Consulting
Date:	20 March 2024

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1. Introduction

Proposed development and area assessed

The applicant (George Local Municipality) wishes to upgrade Herold's Bay pump station and sewer pipeline network, south of George (**Figure 1-1**). The proposed upgrading comprises the following (**Figures 1-2** & **1-3**):

- The upgrading of the existing Pump Station No. 1 (PS 1);
- Construction of a new screening and de-gritting pump station;
- Construction of a new 250 mm Ø rising main parallel to the existing rising main from the new screening and de-gritting pump station to the Herold's Bay WWTW; and
- Construction of a new rising main from the Herold's Bay Pump Station (PS 1) to the new screening and de-gritting pump station.

The focus of this study, however, will be the route of the rising main (sewerpipe) from the new pump station (next to Skimmelkrans Lane) to the WWTW, as well as the rising main from the existing pump station (PS 1) to the new one.

Figure 1-1: Location of the site at Herold's Bay, south of George.

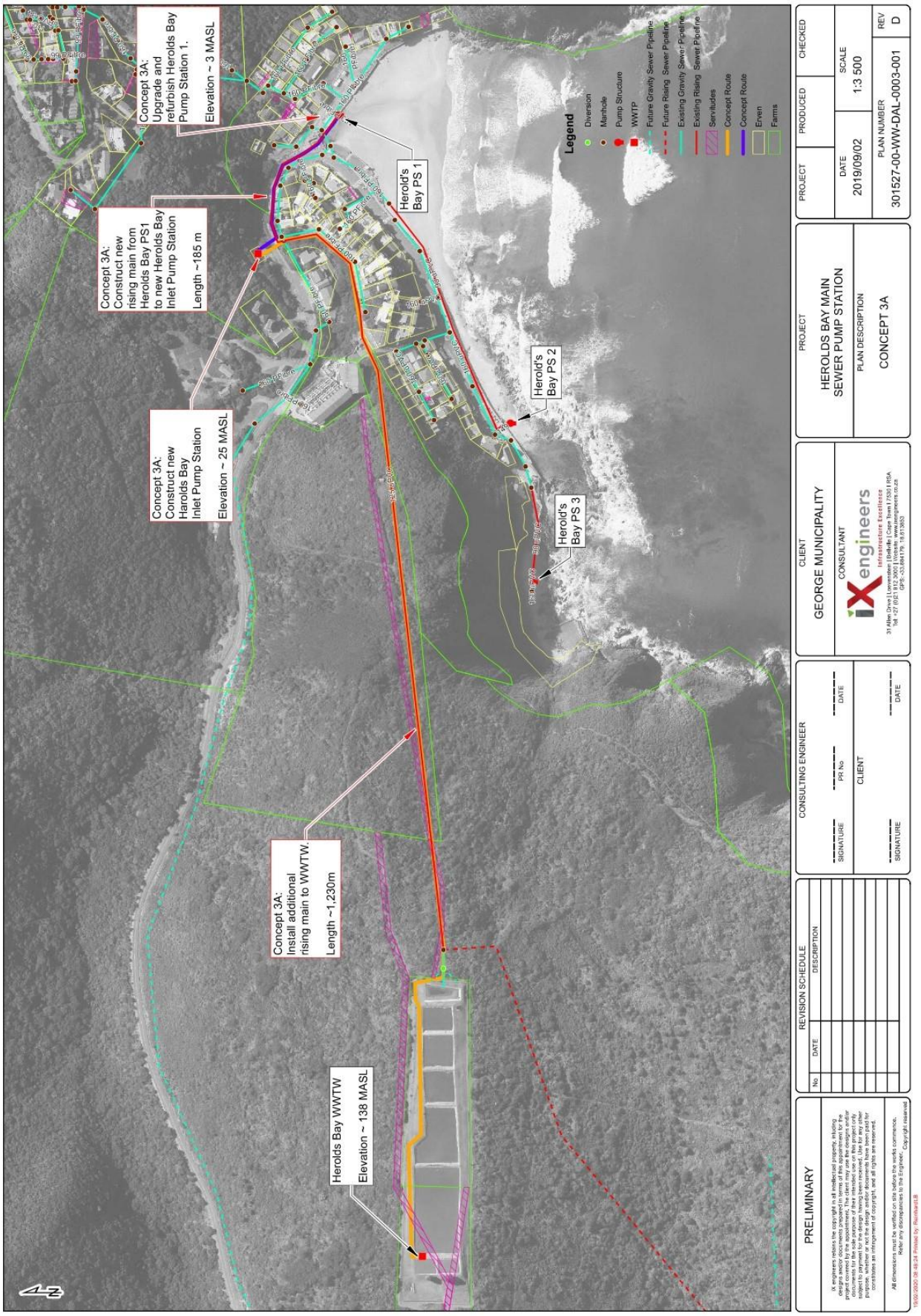

Figure 1-2: Proposed new pump station and sewer pipeline infrastructure.

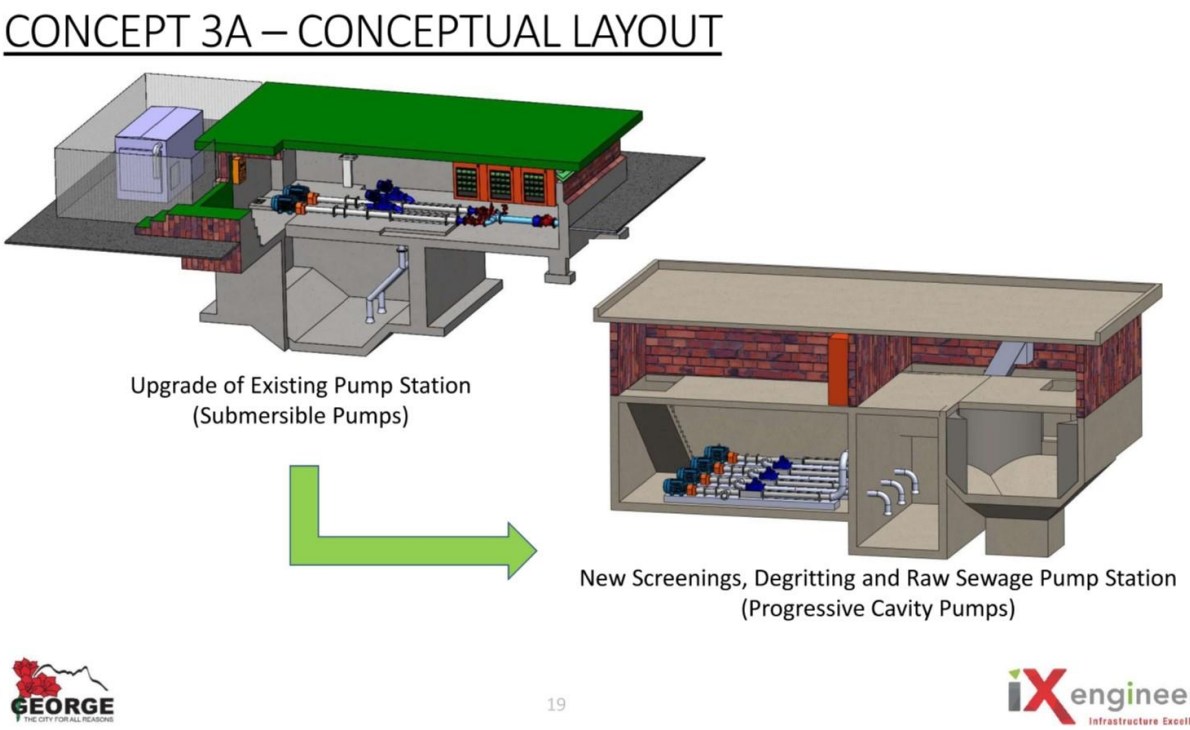

Figure 1-3: Design details of the proposed new pump station and the upgrading of existing pump station.

Details of the preferred alternative are as follows:

- A permanent access road will be constructed for maintenance purposes in the event of failures.
- The pipeline will be buried.
- A 30 m wide corridor will be needed along the pipeline route for the insertion of the pipeline, in the event of rock outcrops, etc. which would require the pipeline to shift slightly.
- Within the 30 m corridor, a 10-12 m wide working footprint is expected to be disturbed. Within the latter footprint, a 3 m wide cleared strip will remain for the maintenance road.

According to the Screening Report, generated by the EAP (Sharples Environmental Services) on 30 November 2022, the site has been mapped as Medium to High sensitive in the plant species theme. With regards to the terrestrial biodiversity theme, it has been mapped as Very High sensitive. The Very High sensitivity is ascribed to the possible presence of threatened ecosystems and the encroachment of the site onto the biodiversity network. As a result, MB Botanical Surveys was contracted to undertake a botanical survey of the site.

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 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 and threatened/vulnerable ecosystems), at species level (Species of Conservation Concern and 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/protocols for biodiversity assessments.

Limitations and Assumptions

The following limitations and assumptions apply to the study:

- Fieldwork was carried out in the winter season, considered to be a suitable time for many flowering species in the Southern Cape. However, plants that only flower at other times of the year (e.g. spring), such as certain bulbs (Iridaceae and Orchidaceae), may have been missed. The overall confidence in the completeness and accuracy of the botanical findings is however considered to be good.
- Sections of the proposed pipeline route was inaccessible due to very dense and impenetrable vegetation. This is ascribed to senescence and the exclusion of fire from the area. However, good views of the route were obtained from the side.

Notwithstanding the above limitations, the specialist is of the opinion that the survey and findings are adequate to aid decision making.

Use of this report

This report reflects the professional judgment of its author(s). The information and recommendations presented in this report 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 Medium to High sensitivity for the site. **Table 2-1** lists the threatened species and their sensitivity from the Screening Report. The Screening Report

further indicates that the terrestrial biodiversity theme is of Very High sensitivity for the site. This rating is ascribed to the possible presence of a critical biodiversity area (CBA), a degraded critical biodiversity area (CBA2), degraded ecological support area (ESA2), National Forestry Inventory, strategic water source areas, and threatened ecosystems (i.e. Garden Route Granite Fynbos and Groot Brak Dune Strandveld).

Table 2-1: Threatened plant species as listed in the Screening Report. The names of sensitive species are not disclosed.

Sensitivity	Feature(s)
Medium	*Lampranthus pauciflorus*
Medium	*Lebeckia gracilis*
Medium	*Freesia fergusoniae*
Medium	*Erica unicolor* ssp. *mutica*
Medium	*Erica glandulosa* ssp. fourcadei
Medium	*Hermannia lavandulifolia*
Medium	Sensitive species 1024
Medium	Sensitive species 1032
Medium	*Euchaetis albertiniana*
Medium	Sensitive species 500
Medium	Sensitive species 516
Medium	Sensitive species 800
Medium	*Diosma passerinoides*

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 (as amended). If the above is confirmed, then a biodiversity assessment will be required.

3. Methodology

The methodology used in this terrestrial biodiversity 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 and CapeFarmMapper) and desktop resources (available literature and 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

A botanical survey of the site was undertaken on 30 June 2023 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 path walked during the survey is 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. A few of the identifications were confirmed on iNaturalist. 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 database[1] 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.

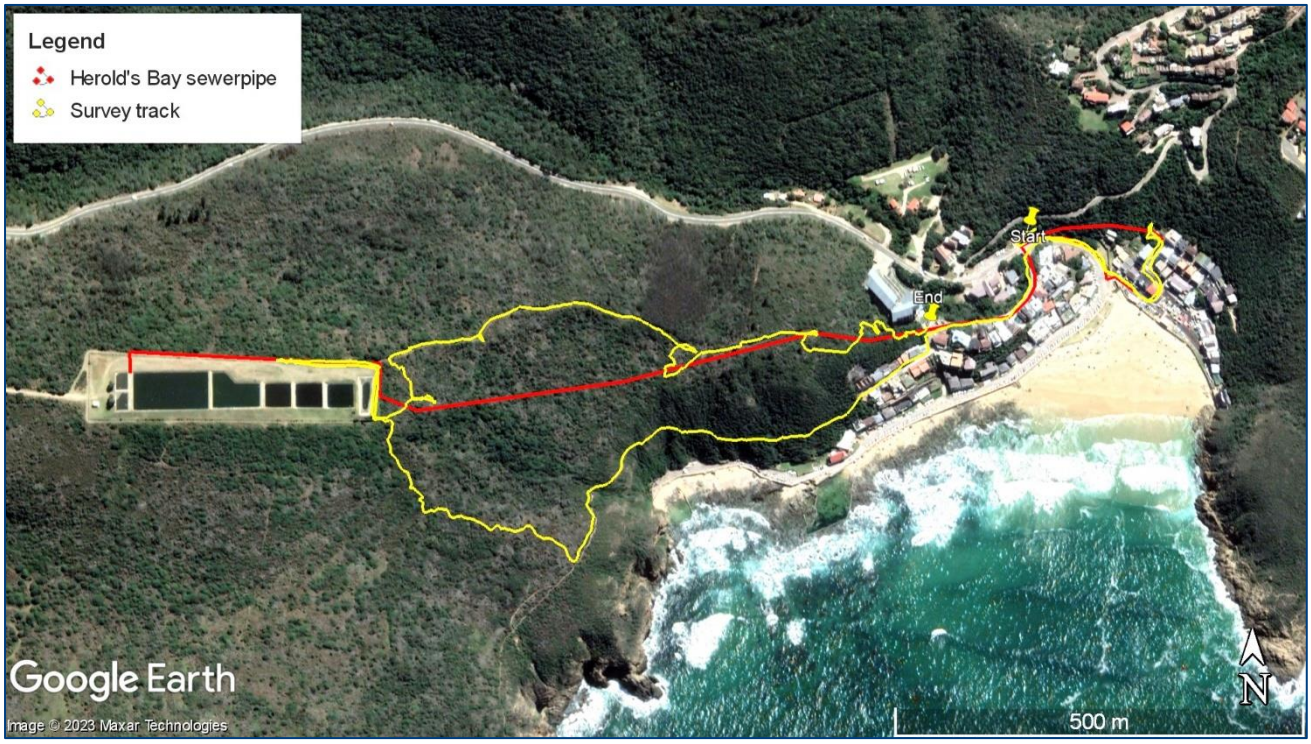

Figure 3-1: Satellite photo showing the survey track on site.

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

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. Indigenous fauna observed was also noted.
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 Easy GPS v2.5 software on an iPhone. Accuracy is given as ±4 m.
4. Identification of the vegetation type(s) and communities (if discernible) on the site. This would include trying to establish the distribution of a vegetation type and whether or not it is vulnerable, endangered or critically endangered.
5. Connectivity with (or isolation from) nearby natural vegetation.

4. Literature Study

A desktop literature review was undertaken during the biodiversity compliance 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 pipeline route between the proposed new pump station and the WWTW is partly located on a vegetated ridge directly west of Herold's Bay. The remainder of the route follows a road through a semi-urban (residential) area towards the proposed pump station. The rising main between the Herold's Bay Pump Station (PS 1) and the new pump station will follow Skimmelkrans Lane, while a third pipeline will run along a steep, vegetated hillslope on the northern side of Skimmelkrans between a residential area and the new pump station. Elevation gain from PS 1 to the WWTW over a distance of 1 km is about 130 m (**Figure 4-1**). The general area can be described as hilly or steeply sloped. Herold's Bay itself is located inside a cove.

Hydrology

According to CapeFarmMapper, the proposed sewerpipes cross two non-perennial watercourses in the eastern part of the site (**Figure 4-1**). Another notable feature is a mapped NFEPA (National Freshwater Ecosystem Priority Area) wetland (unchannelled valley-bottom wetland) next to the pipeline route on the ridge leading up to the WWTW. No evidence of the latter wetland was found on site during the survey. Instead, the area in

question was found to be partly covered by invasive aliens, mainly black wattle (*Acacia mearnsii*). The WWTW itself has been mapped as an artificial wetland. The wetland and watercourses have been included in the biodiversity network.

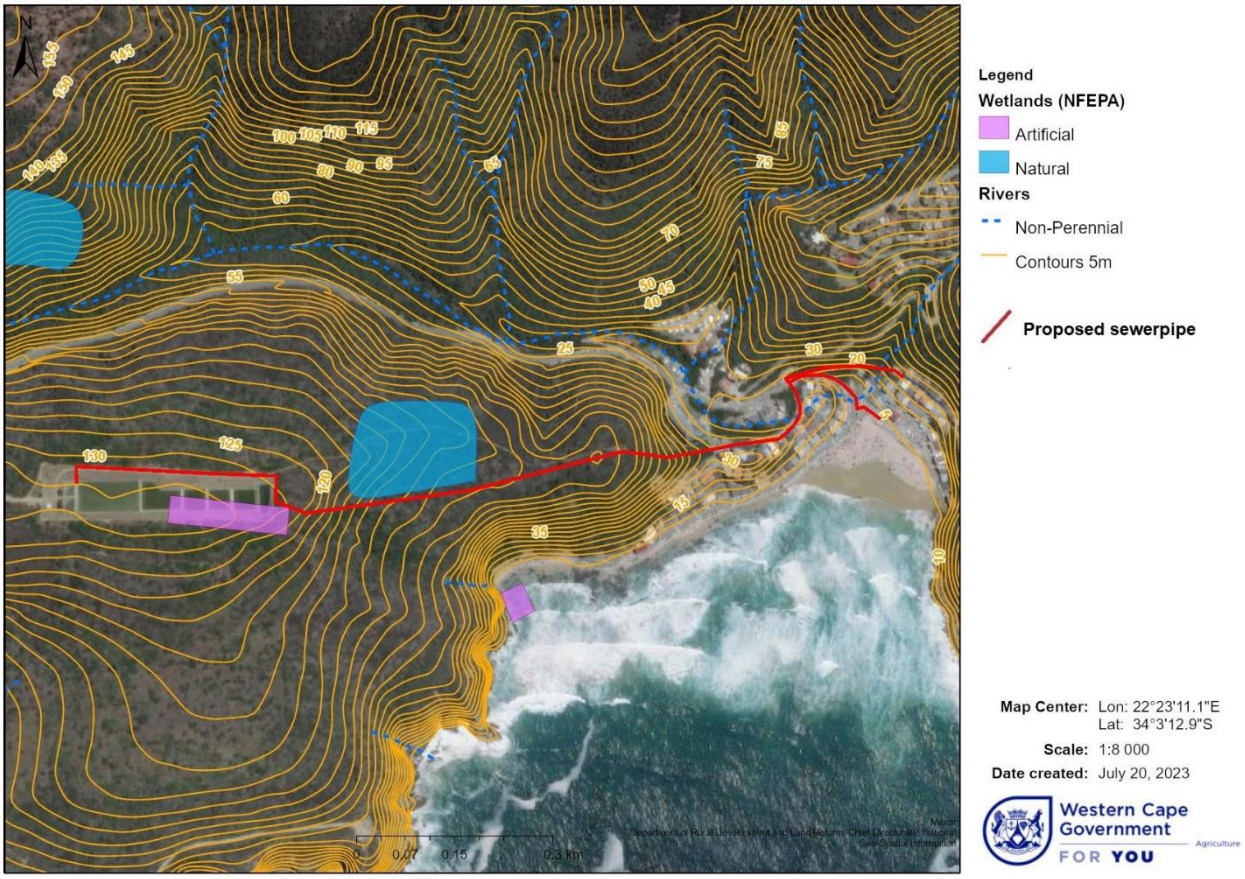

Figure 4-1: Combined topography and hydrology map.

Climate

The mean annual rainfall for the area ranges between 738 mm and 755 mm (as per Cape Farm Mapper climatic data for 1950 to 2000). The peak rainfall periods are the months of March (autumn) and October (spring), while the winter months of June and July are the driest, i.e. bimodal rainfall regime. The study area lies in the transition zone between the winter and summer rainfall regions. Mean monthly maximum and minimum temperatures are 24.2°C and 8.1°C for February and July, respectively (as per Cape Farm Mapper data). The Köppen-Geiger climate classification for the area is Cfb (temperate, no dry season, warm summer).

Geology

According to the 3322 Oudtshoorn 1:250 000 geological map, the high-lying (majority of the pipeline route to the WWTW) parts of the site are underlain by Maalgaten Granite (George pluton), a pre-Cape intrusive rock formation. It comprises gneissic granite,

granodiorite and albitite. Its age is estimated to be between 600 and 650 million years (Toerien, 1979). It produces deep, prismacutanic- and pedocutanic-dominated soils typical of Db land types (Mucina, 2006). It also supports granite fynbos and to a lesser extent Afrotemperate forest. The lower parts of the site in Herold's Bay itself is underlain by Kaaimans Group sediments (Skaapkop Member), comprising gritty quartzite, phyllite and schist. It is of Namibian age and are of the oldest sediments found in the region.

Biodiversity Planning Context

The site lies in a typical coastal fynbos/thicket environment on the Southern Cape coastline. The indigenous species recorded along the proposed pipeline route are typical fynbos and coastal thicket species, such as *Erica peltata, Leucadendron salignum, Sideroxylon inerme, Cassine peragua* and *Thamnochortus glaber*. The 2018 Vegetation Map of South Africa classifies the main vegetation types found here as Garden Route Granite Fynbos and Groot Brak Dune Strandveld (**Figure 4-2**). The latter is a questionable unit as the vegetation (structurally) resembles coastal thicket more, which falls under the Albany Thicket Biome. Groot Brak Dune Strandveld stretches along the coast from Klein Brak in the west to Victoria Bay near Wilderness in the east. It is described as a dense and tall, spiny, sclerophyllous scrub with gaps supporting shrublands with ericoids or succulent-leaved shrubs (Mucina, 2006).

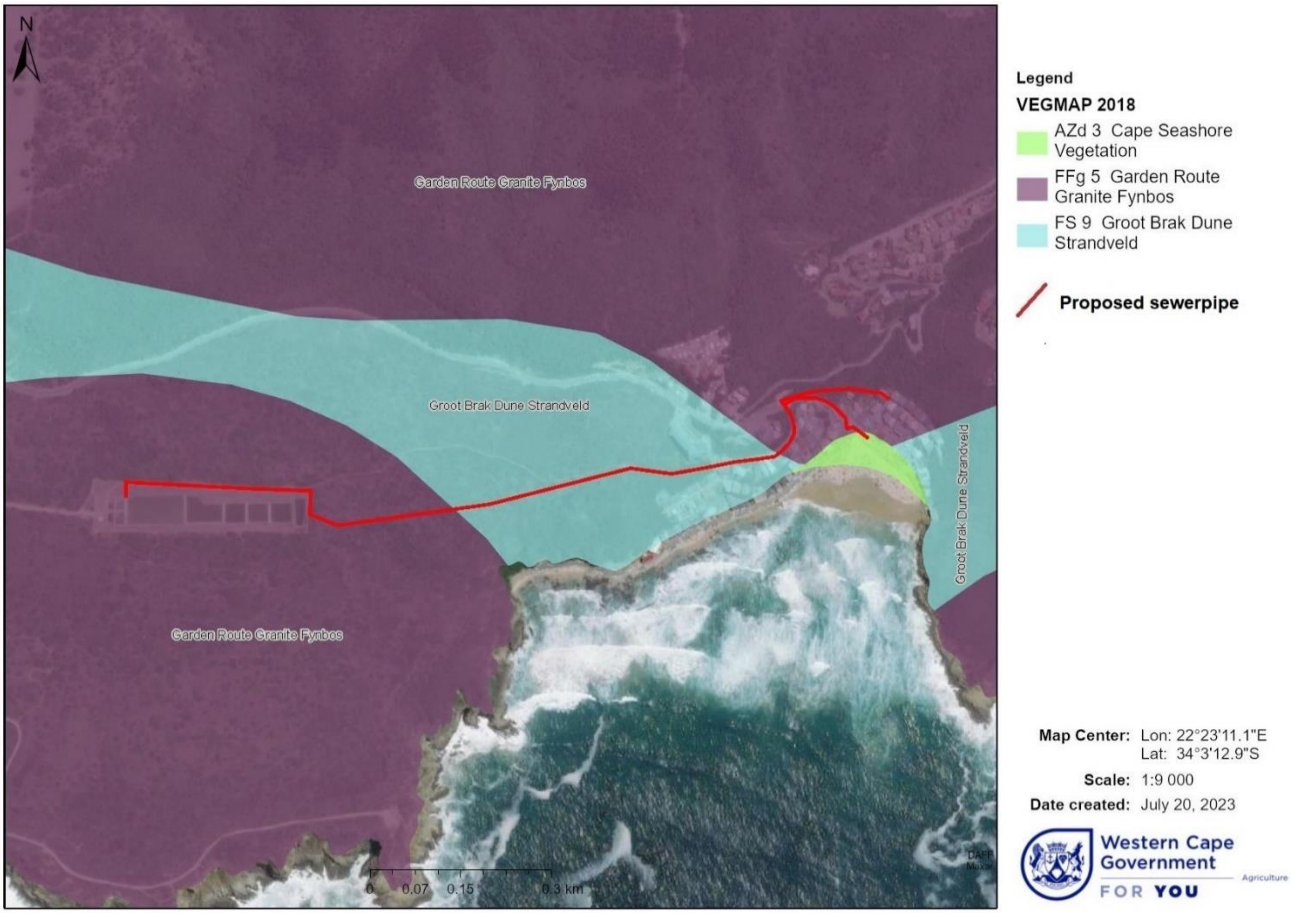

Figure 4-2: Extract of the 2018 SA Vegetation map.

Garden Route Granite Fynbos occurs as three main blocks from Botterberg (south of Robinson Pass) in the west to Hoogekraal Pass (west of Karatara) in the east (Mucina, 2006). The site occurs inside a narrow strip of granite fynbos south of the large middle block. It is described as a dense proteoid and ericoid shrubby grassland (Mucina, 2006). In the west, most of the remnants are dominated by proteas (Mucina, 2006). Eastwards, graminoid and ericaceous fynbos are dominant on the flatter areas (Mucina, 2006).

Due to their transformed state, both Groot Brak Dune Strandveld and Garden Route Granite Fynbos are currently listed as Critically Endangered in the Revised National List of Threatened Ecosystems (DEA, 2022), with only 45% and 37% left, respectively[2]. They have been transformed mainly for agricultural purposes (croplands), pine plantations and to a lesser extent for road building and urban development (Mucina, 2006). Remnants of Garden Route Granite Fynbos largely remain in isolated pockets on steeper slopes (Mucina, 2006). About 2% of Groot Brak Dune Strandveld is conserved, mainly in private nature reserves, such as Kleinbaai, Blydskap and Kwelanga. Less than 1% of Garden Route Granite Fynbos is conserved in the Garden Route National Park (Mucina, 2006). Their protection should therefore remain a priority in the coastal areas.

Like all fynbos types, Garden Route Granite Fynbos 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.). Fire is an important ecological driver in the Fynbos Biome and regular fires are needed for biodiversity maintenance and recruitment purposes. On the other hand, thicket, which is found on steeper, more protected slopes, is not a fire prone type.

The proposed pipelines fall largely inside the Western Cape biodiversity network (**Figure 4-3**). They run through a mixture of terrestrial critical biodiversity areas (CBA's), degraded terrestrial critical biodiversity areas (CBA2's) and a degraded ecological support area (ESA2). The degraded areas are recommended for rehabilitation. In addition, an aquatic CBA has been mapped next to the pipeline route to the WWTW (see notes under the Hydrology section above regarding this CBA). The terrestrial CBA's and CBA2's are aligned with the vegetated slopes above Herold's Bay, while the ESA2 corresponds with the watercourses in Herold's Bay. Reasons for the importance of the CBA's, CBA2's and ESA2 include the presence of ecological processes, threatened vegetation types (Groot Brak Dune Strandveld and Garden Route Granite Fynbos), threatened forest type (Western Cape Milkwood Forest), threatened vertebrate habitat (bontebok), water resource protection (Southern Coastal Belt) and a wetland type (unchannelled valley bottom wetland). The closest protected area is the Kwelanga Private Nature Reserve, which is located 8 km east of Herold's Bay.

[2] Ecosystem Detail - Biodiversity BGIS (sanbi.org)

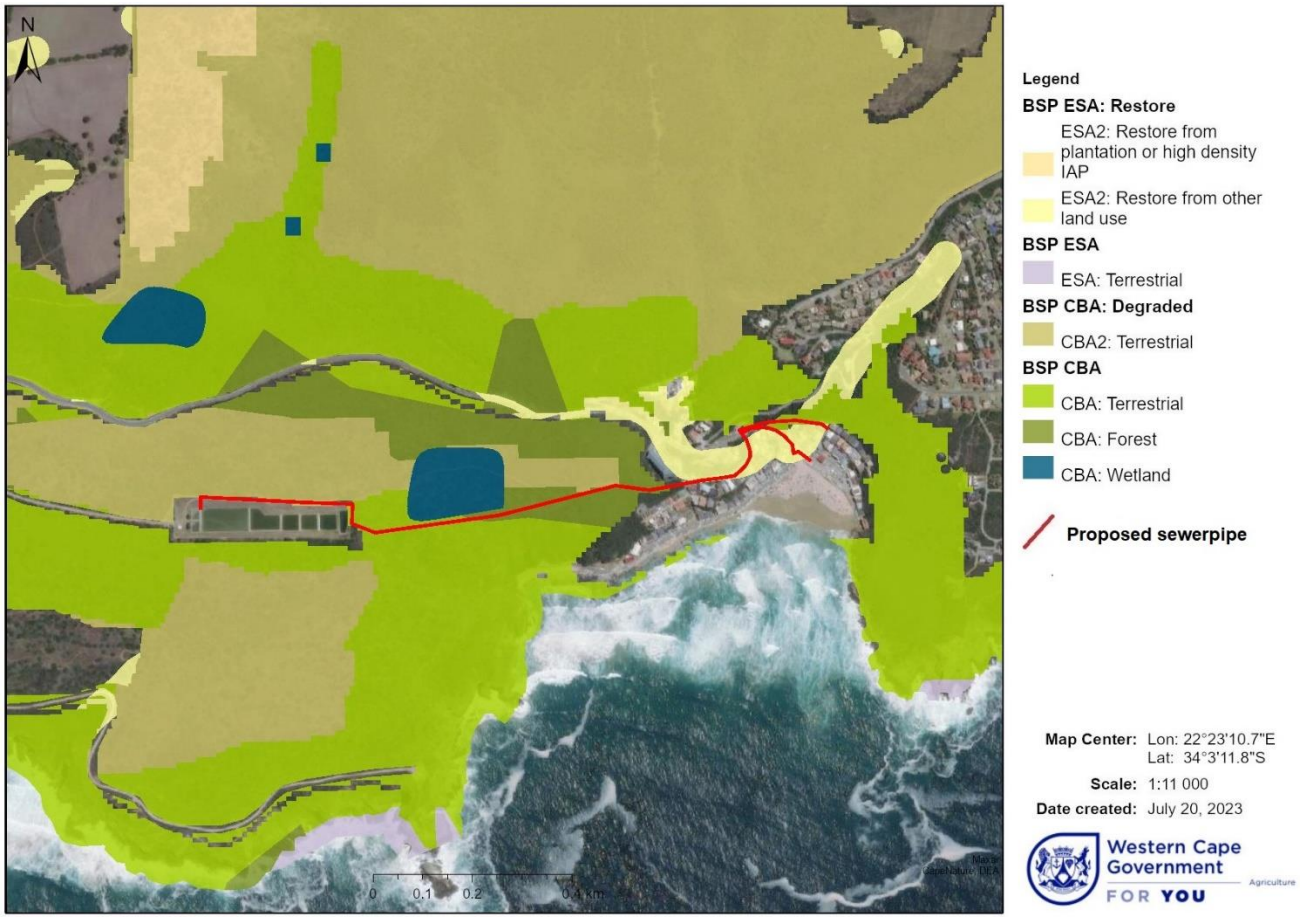

Figure 4-3: Extract of the Western Cape biodiversity network map.

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).

Terrestrial biodiversity (vegetation)

The proposed pipelines through Herold's Bay itself are located mostly inside transformed road verges (**Figures 5-1** & **5-2**). The rising main between Herold's Bay and the WWTW runs through coastal thicket in the lower part, which then transitions into granite fynbos in the upper part (**Figure 5-3** to **5-6**). The pipeline between a residential area and the proposed new pump station also runs through thicket (**Figure 5-7** to **5-9**). However, the specialist was subsequently informed that this pipeline will not be installed. The natural vegetation is of fair quality although considerable alien infestation was noted inside the granite fynbos, especially rooikrans and black wattle. Only the vegetation on the steepest bits can be described as near pristine. The site proposed for the new pump station is devoid of natural vegetation (transformed).

Figure 5-1: Spekie Gericke Crescent, which accommodates a section of the pipeline route between the proposed new pump station and the WWTW.

Figure 5-2: Bottom end of the pipeline route approaching the Herold's Bay PS 1.

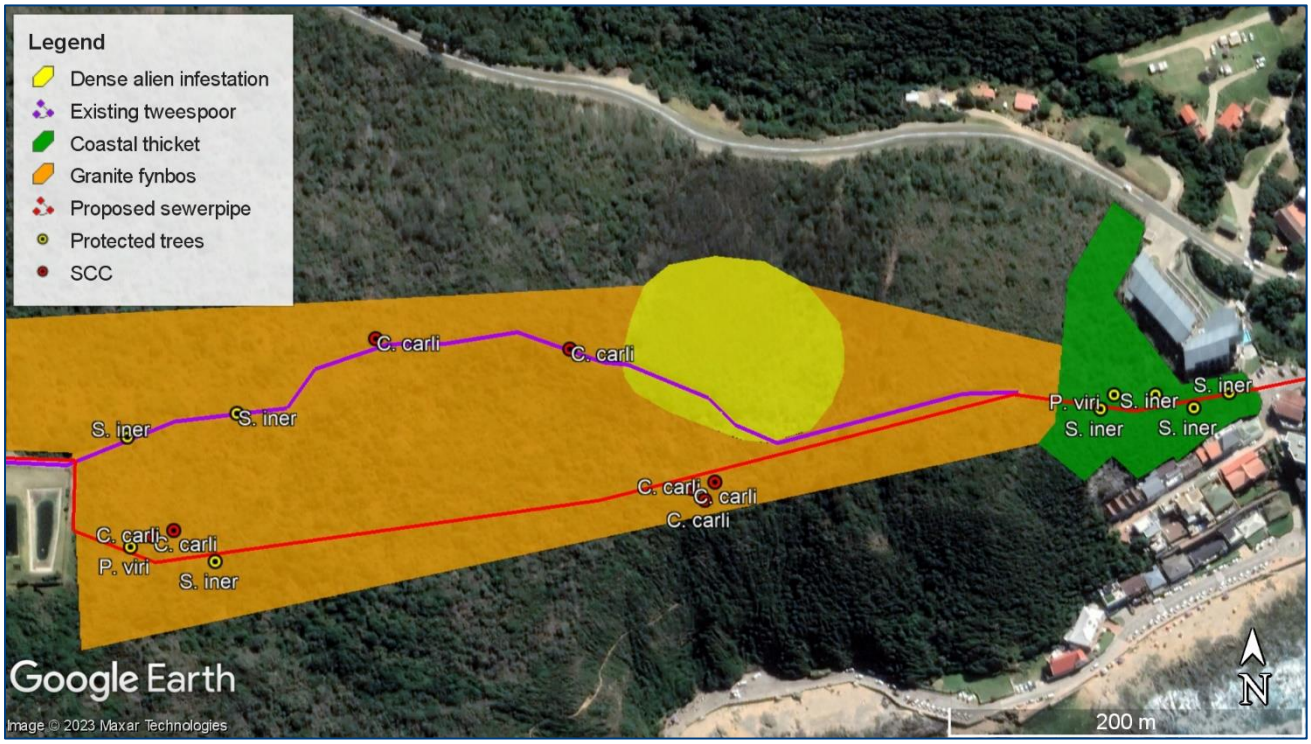

Figure 5-3: Botanical attributes of the western part of site.

Figure 5-4: Approximate route of proposed pipeline (red arrow) through coastal thicket towards the WWTW.

Figure 5-5: Senescent and rooikrans infested fynbos halfway up ridge towards the WWTW.

Figure 5-6: A side view of the upper section of the pipeline route through the fynbos. The arrow indicates the approximate position and direction of the pipeline.

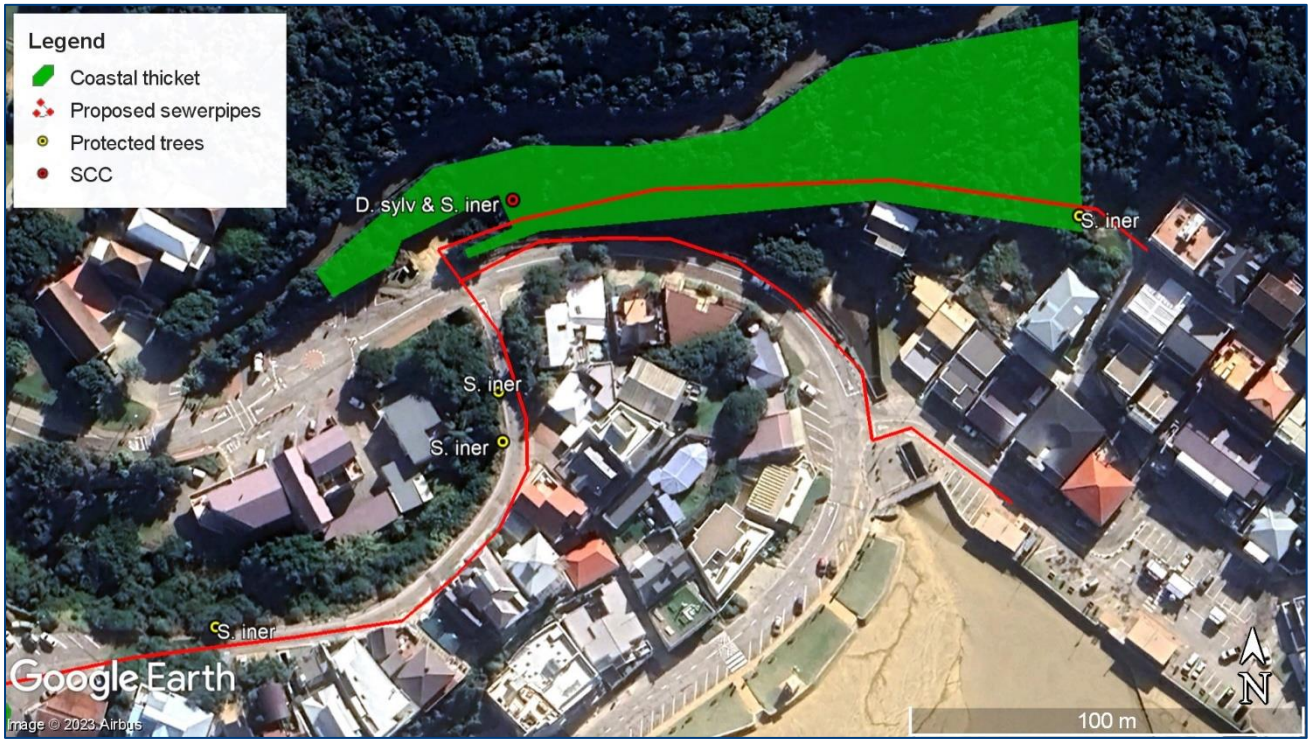

Figure 5-7: Botanical attributes of the eastern part.

Figure 5-8: Site proposed for the new pump station.

Figure 5-9: Thicket covered slope and possible route (arrow) for the pipeline between the residential area and proposed new pump station. This pipeline will not be installed.

A section of pipeline route to the WWTW runs alongside an existing tweespoor to a cellular (radio) mast facility. Structurally, the thicket can be described as a tall (>2 m) closed large-leaved shrubland following Campbell's classification (Campbell, 1981). Typical thicket species recorded include *Sideroxylon inerme, Cassine peragua, Pterocelastrus tricuspidatus, Diospyros dichrophylla, Searsia pterota* and *Bonatea speciosa*. It is uncertain why this has been mapped as a strandveld type as the latter has a lower and more open structure. The fynbos on the slope above the thicket can be described as a mid-high to tall closed small-leaved shrubland following Campbell's classification. It's tall, woody structure can be ascribed to senescence due to the lack (or prevention) of regular fires. As a result, the fynbos has become 'invaded' by thicket species, such as *Sideroxylon inerme, Pittosporum viridiflorum* and *Pterocelastrus tricuspidatus*. Typical fynbos species recorded here include a few *Erica* species, *Leucadendron salignum* and *Thamnochortus glaber*.

Plant species

A fair number of indigenous tree and shrub species were recorded, including *Leucadendron salignum*[F], *Erica peltata*[F] (dominant), *E. discolor* var. *speciosa*[F] (dominant in places), *Metalasia acuta*[F], *Felicia filifolia*[T], *Seriphium plumosum*[F], *Achyranthemum paniculatum*[F], *Osteospermum moniliferum*[F], *Tarchonanthus littoralis*[F], *Cullumia carlinoides*[F], *Eriocephalus africanus*[T], *Senecio ilicifolius*[F], *S. deltoideus*[T], *Helichrysum cymosum, H. patulum*[F], *Nidorella ivifolia*[F], *Aspalathus quinquefolia* ssp. *virgata*[F], *Passerina corymbosa*[F], *Gymnosporia nemorosa*[T], *Cassine peragua*[T], *Lauridia tetragona*[T], *Pterocelastrus tricuspidatus*[T,F], *Olea capensis* ssp. *capensis*[F], *Phylica axillaris*[F] (dominant), *Trichocephalus stipularis*[F], *Searsia glauca*[F], *S. pterota*[T], *S. lucida*[F], *Colpoon compressum*[F], *Canthium inerme*[F], *Pittosporum viridiflorum*[T,F], *Diospyros dichrophylla*[T], *Aloe arborescens*[T], *Aloiampelos ciliaris*[T], *Crassula rubricaulis*[T], *Drosanthemum cf parvifolium*[T,F], *Delosperma inconspicuum*[T], *Carpobrotus edulis*[F], *Agathosma apiculata*[F], *Muraltia cf empleuridioides*[F], *Salvia aurea, Cliffortia falcata*[F], *Carissa bispinosa, Cynanchum viminale*[T], *C. obtusifolium*[T], *Capparis sepiaria, Polygala myrtifolia*[T], *P. fruticosa*[F], *Tecomaria capensis*[T], *Cussonia thyrsiflora*[T], *Zehneria scabra, Rhoicissus digitata*[T], *Pelargonium capitatum*[T,F], *Scutia myrtina*[T], *Allophylus decipiens*[T], *Sideroxylon inerme*[T,F], *Grewia occidentalis*[T], *Asparagus setaceus*[T], *A. aethiopicus*[T], *Buddleja saligna*[T], *Chaenostoma integrifolium*[T] and *Hypoestes forskaolii*[T].

Hemicryptophytes and geophytes recorded include *Thamnochortus glaber*[F], *Stenotaphrum secundatum*[F], *Dioscorea sylvatica*[T], *Oxalis ciliaris*[F], *Trachyandra divaricata*[F], *Albuca bracteata*[T], *Chasmanthe aethiopica*[T,F] and *Bonatea speciosa*[T]. Observed associations with granite fynbos (F) or thicket (T) vegetation are superscripted. *Carpobrotus edulis* is a useful soil binder. **Figure 5-10** shows a few of the recorded indigenous species.

Figure 5-10: A few indigenous species recorded on site, with *Albuca bracteata* (top left), *Dioscorea sylvatica* (top right), *Erica discolor var. speciosa* (middle left), *Cullumia carlinoides* (middle right), *Agathosma apiculata* (bottom left) and *Muraltia cf empleuridioides* (bottom right).

All the recorded species are widespread and fairly common in the region. *Cullumia carlinoides* is the only regional endemic recorded. Floristic association for the fynbos component with Garden Route Granite Fynbos is strong with several important taxa recorded, including *Passerina corymbosa, Leucadendron salignum, Erica peltata, E. discolor* var. *speciosa, Achyranthemum paniculatum, Cliffortia falcata* and *Colpoon*

compressum. For the thicket component several important Groot Brak Dune Strandveld taxa were recorded, including *Tarchonanthus littoralis, Eriocephalus africanus, Lauridia tetragona, Pterocelastrus tricuspidatus, Searsia glauca, Diospyros dichrophylla, Aloe arborescens, Carissa bispinosa, Cynanchum viminale, C. obtusifolium, Cussonia thyrsiflora, Rhoicissus digitata, Sideroxylon inerme, Grewia occidentalis* and *Asparagus aethiopicus*.

Only two SCC were recorded, namely *Cullumia carlinoides* (Near Threatened) and *Dioscorea sylvatica* (Vulnerable). The former is associated with coastal fynbos and is fairly common in the coastal strip between Witsand and George. It is being threatened by coastal developments and alien infestation. *Dioscorea sylvatica* is also frequently encountered in Garden Route area (see iNaturalist records). It has a wide distribution from the George area eastwards and is currently threatened by the "exploitation of tubers for the local medicinal plant trade" according to the online Red List.

Pittosporum viridiflorum (cheesewood) and *Sideroxylon inerme* (milkwood) are protected tree species in terms of the National Forests Act (Act 84 of 1998). Several of these trees were recorded in the immediate vicinity of the proposed pipeline route. The removal of these trees requires a permit from the Department of Forestry.

Invasive species recorded include *Acacia mearnsii* (black wattle, category 2), *A. cyclops* (rooikrans, 1b), *Pinus* sp (pine, probably also 1b) and *Opuntia ficus-indica* (sweet prickly pear, 1b). As indicated above, they are all 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, is prohibited without a permit. The presence of the woody aliens, especially black wattle and rooikrans, also present a fire risk.

6. Potential Impacts

Terrestrial biodiversity (vegetation)

The affected vegetation types have been identified as Groot Brak Dune Strandveld and Garden Route Granite Fynbos, both of which are currently listed as Critically Endangered. The impact will involve considerable earthworks (trenching) to install the pipelines during the construction phase. The EAP initially suggested that steel pipelines supported by concrete plinths can be installed above ground in the steeper areas. This should alleviate the impact caused by earthworks in thicket areas significantly. Care must still be exercised to ensure that adjacent vegetation is not unnecessarily disturbed. However, the applicant has subsequently stated that the plinths are not viable due to financial and engineering constraints.

Given the linear nature of the project and the somewhat degraded state of the granite fynbos, the impact on terrestrial biodiversity is of medium-low concern. Alien (rooikrans and black wattle) infestation along a significant section of the pipeline route to the WWTW has contributed to the degraded state of the fynbos. The exclusion of fire from the area is further contributing to the degradation. Obviously, the situation can be improved by alien clearing, as well as the implementation of a fire management programme. The proposed project presents a far lesser impact than the continued degradation of the fynbos for the reasons mentioned above.

The proposed pipelines also pass through terrestrial CBA's and a degraded ESA, which form part of an extensive coastal biodiversity corridor that runs between Wilderness in the east and Groot Brak in the west. Apart from providing a backbone to the local biodiversity network, the corridor serves as an important passage along which fauna can migrate between the vegetation remnants. Due to the linear nature of the project, one can expect a temporary impact on the functionality of the biodiversity network. Areas disturbed during the construction phase can be rehabilitated and should recover fully. The residual impact will therefore be minimal. **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)	- Disturbance of vegetation, i.e. 570 m long strip of degraded granite fynbos and a 110 m strip of good quality coastal thicket. Earthworks (trenching) will be required. A 10-12 m wide strip will be disturbed during the construction phase, of which a 3 m wide strip will remain for a maintenance road. - Impact on biodiversity network. Impact will be temporary with rehabilitated. - Increased opportunity for alien infestation. - Erosion on the steeper slopes due to poor rehabilitation efforts.	- Increased alien infestation.
Extent of impact	Construction footprint and immediate surroundings	Construction footprint and immediate surroundings
Duration	Short to medium term	Short to medium term
Intensity	Medium	Low
Probability of occurrence	High	High

Degree of reversibility	Medium	High
Irreplaceability of resource	Medium	Medium-low
Mitigatory potential	High	High
Significance before mitigation	Medium-low	Medium-low
Significance after mitigation	Low	Low
Mitigation		
• During the construction phase, demarcate/fence off the construction footprint. Restrict all construction activities, such as stockpiling, parking and cement mixing, to already disturbed areas away from natural vegetation. The contractor(s) must be made aware of the sensitive surroundings and the presence of SCC and protected trees. The thicket and fynbos outside the footprint must be declared a 'no-go' area and not be disturbed in any way. • Pollutant substances brought onto site must be properly contained. Cement/concrete mixing must be contained on impervious and bunded surfaces. No cement mixing is allowed inside vegetated areas. Cement water is highly alkaline and considered toxic. • Remove topsoil and/or seedbearing plant material from the vegetated areas to be disturbed for use in the rehabilitation of disturbed areas after construction. Avoid using seed-bearing alien plant material for rehabilitation purposes. • Avoid trenching in the steeper thicket areas. Install the pipelines above ground by using plinths, etc. The applicant has subsequently stated that plinths will not be viable due to financial and engineering constraints. • Rehabilitate/revegetate all the disturbed surfaces. Erosion prevention measures will be needed on the steep slopes, such as silt fences, logs or netting, to slow down runoff and potential erosion. Mulching and seeding with indigenous grass seed may also be needed. However, due to the linear nature of the project, it is expected that the disturbed areas will recover relatively quickly without the need for much intervention. • Engage in alien clearing, focussing on invasive species such as black wattle and rooikrans. These species are category 1b and 2 invaders that require compulsory control as part of an invasive species control programme. Their control will become a short- to medium-term maintenance requirement. • Allow at least 24 months for the monitoring of rehabilitation success and alien infestation post construction.		

The rehabilitation potential of the disturbed areas should be good. Likely, all the species which originally occurred along the pipeline routes will return, including any alien species present in the area. As an indirect impact, soil disturbance caused by earthworks will provide ideal conditions for the establishment of invasive alien species. The presence of black wattle and rooikrans in the area will exacerbate this impact. Therefore, as an operational phase maintenance concern, keep the pipeline routes and immediate adjacent area clear of invasive aliens during the maintenance period. The aliens also add to the fuel load and increase the risk of wildfires in the long term. As stated earlier, it is a legal requirement for the landowner to clear/control the invasive aliens on their land.

Plant species

The impact on plant species, including SCC and protected tree species, is also expected to be of medium-low significance. Nearly all the recorded species are common and widespread in the region. *Cullumia carlinoides* (Near Threatened) and *Dioscorea sylvatica* (Vulnerable) are the only SCC recorded in the vicinity of the proposed sewer infrastructure. The only gap in the information provided above is the possible presence of spring flowering bulbs, mainly in the Iridaceae and Orchidaceae families. The probability of SCC listed in the Screening Report to occur in the area is indicated in **Table 6-2**. Given their habitat preferences and known (iNaturalist) records of these species within a 1.5 km radius from the site, *Erica glandulosa* ssp. *fourcadei, Hermannia lavandulifolia, Euchaetis albertiniana* and Sensitive species 800 have a medium to medium-high probability to occur on site.

Table 6-2: Threatened plant species as listed in the Screening Report.

Sensitivity	Feature(s)	Habitat & probability of presence
Medium	*Lampranthus pauciflorus* (EN)	Rocky coastal slopes; closest iNat records are from the small headland 0.5 km south of the WWTW; **Low-medium**
Medium	*Lebeckia gracilis* (EN)	Deep coastal sandy flats; **Low**
Medium	*Freesia fergusoniae* (VU)	Renosterveld; closest iNat records are from the hills between Groot Brak and Klein Brak; **Low**
Medium	*Erica unicolor* ssp. *mutica* (EN)	Stony slopes and flats; closest iNat records are from Groot Brak; **Low**
Medium	*Erica glandulosa* ssp. fourcadei (VU)	Coastal fynbos; closest iNat records are from 1.2 km west of the WWTW; **Medium**
Medium	*Hermannia lavandulifolia* (VU)	Renosterveld and valley thicket; closest iNat records are from 400 m south of the WWTW; **Medium-high**
Medium	Sensitive species 1024 (EN)	Dry to moist stony slopes; **Low**
Medium	Sensitive species 1032 (VU)	Fixed dunes close to shoreline; **Low**
Medium	*Euchaetis albertiniana* (EN)	Coastal sands and limestone; iNat records 200 m south of the WWTW; **Medium-high**
Medium	Sensitive species 500 (EN)	Recent sand; **Low**
Medium	Sensitive species 516 (EN)	Valley bushveld and renosterveld; closest historical records are from Groot Brak; **Low**
Medium	Sensitive species 800 (VU)	Calcareous sands and limestone; closest iNat records are from 900 m west of the WWTW; **Medium-high**
Medium	*Diosma passerinoides* (VU)	Silcrete slopes; **Low**

With regards to protected tree species, several *Pittosporum viridiflorum* and *Sideroxylon inerme* trees were recorded in the immediate vicinity of the pipeline routes. They can potentially be avoided, and it is recommended that the trees be marked before the start

of construction activities. A permit will be needed for their removal. **Table 6-3** summarises the impact on flora, SCC and protected tree species.

Table 6-3: Impact of the project on flora, SCC and protected tree species.

Phase	Construction Phase	Operational Phase
Nature of impact(s)	- Loss of indigenous flora, SCC and protected tree species	- Alien infestation and resulting displacement of indigenous flora
Extent of impact	Development footprint	Development footprint and immediate surroundings
Duration	Medium term	Medium term
Intensity	Medium	Low-medium
Probability of occurrence	High	High
Degree of reversibility	Medium-high	High
Irreplaceability of resource	Medium	Medium
Mitigatory potential	High	High
Significance before mitigation	Medium-low	Medium-low
Significance after mitigation	Low	Low
Mitigation		
• During the staking out of the construction footprint take cognisance of the presence of SCC and protected trees (*Pittosporum viridiflorum* & *Sideroxylon inerme*). Try and avoid these as far as practically possible. Removal of the latter requires a permit from the Department of Forestry. It is recommended that the protected trees be marked prior to the start of construction activities. • Search and rescue succulents and bulbs from the construction footprint for replanting in the disturbed areas after construction. Topsoil, cuttings and seedbearing plant material can also be salvaged for this purpose, especially cuttings from *Carpobrotus* and *Pelargonium* species. Geophytes (e.g. *Dioscorea sylvatica, Albuca bracteata, Chasmanthe aethiopica* and *Bonatea speciosa*) 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. Ideally, bulbs should be salvaged during leaf fall, but before or after flowering.		

The **cumulative botanical impact** of the project is expected to be equivalent to the impact on terrestrial biodiversity described above, i.e. the continued erosion of Garden Route Granite Fynbos and the biodiversity network as a result of construction activities. In this instance, the loss of biodiversity and resultant cumulative impact is considered small (acceptable) due to the linear nature of the project and the potential for rehabilitation. There should be no cumulative impact if rehabilitation is successful.

7. Recommended Mitigation Measures

The following mitigation measures are required to ensure that the impact on terrestrial biodiversity and plant species is minimal:

- During the construction phase, demarcate/fence off the construction footprint. Restrict all construction activities, such as stockpiling, parking and cement mixing, to already disturbed areas away from natural vegetation. The contractor(s) must be made aware of the sensitive surroundings and the presence of SCC and protected trees. The thicket and fynbos outside the footprint must be declared a 'no-go' area and not be disturbed in any way.
- Pollutant substances brought onto site must be properly contained. Cement/concrete mixing must be contained on impervious and bunded surfaces. No cement mixing is allowed inside vegetated areas. Cement water is highly alkaline and considered toxic.
- Remove topsoil and/or seedbearing plant material from the vegetated areas to be disturbed for use in the rehabilitation of disturbed areas after construction. Avoid using seed-bearing alien plant material for rehabilitation purposes.
- It was previously recommended that the pipelines be installed above ground in the steeper thicket areas by using plinths in order to avoid trenching. However, the applicant has subsequently stated that plinths are no longer viable due to financial and engineering constraints.
- Rehabilitate/revegetate all the disturbed surfaces. Erosion prevention measures will be needed on the steep slopes, such as silt fences, logs or netting, to slow down runoff and potential erosion. Mulching and seeding with indigenous grass seed may also be needed. However, due to the linear nature of the project, it is expected that the disturbed areas will recover relatively quickly without the need for much intervention.
- Engage in alien clearing, focussing on invasive species such as black wattle and rooikrans. These species are category 1b and 2 invaders that require compulsory control as part of an invasive species control programme. Their control will become a short- to medium-term maintenance requirement.
- During the staking out of the construction footprint take cognisance of the presence of SCC and protected trees (*Pittosporum viridiflorum* & *Sideroxylon inerme*). Try and avoid these as far as practically possible. Removal of the latter requires a permit from the Department of Forestry. It is recommended that the protected trees be marked prior to the start of construction activities.
- Search and rescue succulents and bulbs from the construction footprint for replanting in the disturbed areas after construction. Topsoil, cuttings and seedbearing plant material can also be salvaged for this purpose, especially cuttings from *Carpobrotus* and *Pelargonium* species. Geophytes (e.g. *Dioscorea*

sylvatica, Albuca bracteata, Chasmanthe aethiopica and *Bonatea speciosa*) 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. Ideally, bulbs should be salvaged during leaf fall, but before or after flowering.

- Allow at least 24 months for the monitoring of rehabilitation success and alien infestation post construction.

8. Conclusion & Recommendation

This report presents the results from a desktop study, as well as a field survey conducted on 30 June 2023, to ascertain terrestrial biodiversity and plant species constraints and impacts associated with the proposed upgrading of the Herold's Bay pump station and sewer pipeline network, south of George.

The affected vegetation has been identified as Garden Route Granite Fynbos and Groot Brak Dune Strandveld. Both are currently listed as Critically Endangered. Given the linear nature of the project and the somewhat degraded state of the granite fynbos, the impact on terrestrial biodiversity is of medium-low concern. The proposed pipelines also pass through terrestrial CBA's and a degraded ESA, which form part of an extensive coastal biodiversity corridor. One can expect a temporary impact on the functionality of the biodiversity network. Areas disturbed during the construction phase can be rehabilitated and should recover fully. Nearly all the recorded plant species are common and widespread in the region, with only two SCC recorded. With regards to protected tree species, several *Pittosporum viridiflorum* and *Sideroxylon inerme* trees were recorded in the immediate vicinity of the pipeline routes. They can potentially be avoided.

It is therefore recommended that the project (as currently presented) be approved, but subject to the proposed mitigation measures.

References

Campbell, B.M., Cowling, R.M., Bond, W. & Kruger, F.J. 1981. Structural characterization of vegetation in the Fynbos Biome. *S. Afr. Nat. Sci. Prog. Report* No. 52.

DEA 2022. Revised National List of Ecosystems that are threatened and in need of protection. Government Gazette No. 47526. Government Printer, Pretoria.

Johnson, S. & Bytebier, B. 2015. Orchids of South Africa: A Field Guide. Struik Nature, Cape Town.

Manning, J. & Goldblatt, P. 2012. Plants of the Greater Cape Floristic Region 1: the Core Cape flora, Strelitzia 29. SANBI, Pretoria.

Mucina, L. & Rutherford, M.C. 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

Pool-Stanvliet, R., Duffell-Canham, A., Pence, G. & Smart, R. 2017. The Western Cape Biodiversity Spatial Plan Handbook. CapeNature, Stellenbosch.

Skowno, A.L., Raimondo, D.C., Poole, C.J., Fizzotti, B. & Slingsby, J.A. (eds) 2019. South African National Biodiversity Assessment 2018 Technical Report Volume 1: Terrestrial Realm. South African National Biodiversity Institute, Pretoria.

Toerien, D.K. 1979. The geology of the Oudtshoorn area. Geological Survey, Department of Mines, Pretoria.

Annexure 1: 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 projectwill 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.