Botanical assessment for ESKOM's proposed Robberg – Bitou 66kV Powerline & Bitou Substation, Bitou Municipality

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Prepared for SiVEST

November 2013

National Legislation and Regulations governing this report

This is a 'specialist report' and is compiled in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment Regulations, 2010.

Appointment of Specialist

Bergwind Botanical Surveys & Tours CC was appointed by SiVEST to provide specialist botanical consulting services for the proposed Robber – Bitou 66kV Powerline and Substation.

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Expertise

Dr David J. McDonald:

- Qualifications: BSc. Hons. (Botany), MSc (Botany) and PhD (Botany)
- Botanical ecologist with over 30 years' experience in the field of Vegetation Science.
- Founded Bergwind Botanical Surveys & Tours CC in 2006
- Has conducted over 300 specialist botanical / ecological studies.

- Has published numerous scientific papers and attended numerous conferences both nationally and internationally (details available on request)

Mr Paul I. Emms

- Qualifications: ND Horticulture, BSc. (Biodiversity & Conservation Biology), Hons (Botany)

Independence

The views expressed in the document are the objective, independent views of Dr McDonald and Mr Emms and the survey was carried out under the aegis of Bergwind Botanical Surveys and Tours CC. Neither Dr McDonald, Mr Emms nor Bergwind Botanical Surveys and Tours CC have any business, personal, financial or other interest in the proposed development apart from fair remuneration for the work performed.

Conditions relating to this report

The content of this report is based on the authors' best scientific and professional knowledge as well as available information. Bergwind Botanical Surveys & Tours CC, its staff and appointed associates, reserve the right to modify the report in any way deemed fit should new, relevant or previously unavailable or undisclosed information become known to the author from on-going research or further work in this field, or pertaining to this investigation

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THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

We, David Jury McDonald and Paul Ivor Emms, as the appointed independent specialists hereby declare that we:

- act/ed as the independent specialists in this application;
- regard the information contained in this report as it relates to our specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- are fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R. 543) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- are aware that a false declaration is an offence in terms of regulation 71 of GN No. R. 543.

Note: The terms of reference must be attached.

Signature of the specialists:

Bergwind Botanical Surveys & Tours CC

Name of company:

Date: 9 December 2013

Date:

ACRONYMNS

PSP – powerline support pole

PBSS – Plettenberg Bay Substation

RSS - Roberg Substation

WWTW – Waste Water Treatment Works

CONTENTS

1. Introduction 6

2. Terms of Reference 6

3. Description of the study area 7

4. Evaluation method 10

5. Limitations and assumptions 10

6. Vegetation 11

6.1 General overview and conservation context 11

6.2 Vegetation of the study area 15

7.Impact Assessment 20

7.1. 'No Go' Alternative 21

7 2. Direct impacts 22

7.3 Indirect impacts 24

7.4. Cumulative impacts 24

8. Conclusions and recommendations 27

9. References 28

1. Introduction

ESKOM plans to construct a network of 66kV powerlines between the Robberg Substation and the Bitou Valley, which would include a new substation in the Bitou Valley. The proposed project has been through several iterations, which dates back to 2005. Between 2005 and 2013 several botanical assessments have been carried out for the proposed substation and powerline routes, namely Route 1, 2, 3 & 4. The surveys were carried out as follows:

- 2007: Routes 1, 2 & 3 and substation sites A & B surveyed by Bergwind Botanical Surveys & Tours CC (McDonald) for SHE Cape Environmental CC.
- 2008: Route 4 and substation and substation site C surveyed by Ross C. Turner Botanical Surveys for SHE Cape Environmental CC.
- 2013: section of Route 4 from pylon site B15 to B16 surveyed by ANCHOR Environmental (Porter & Clark) for SiVEST.

SHECape managed the Basic Assessment (BA) from 2007 to 2010. Route 4 and Substation C were granted environmental authorisation in 2010 but this was appealed in the same year. The project was since taken over and is being managed by SiVEST Environmental. A second BA was carried out for Route 4 and Sub-station C form 2012 to 2013. Since the specialist reports are now six to seven years old, the Department of Environmental Affairs & Development Planning (DEA&DP) has requested that Routes 1, 2 & 3 and Substation sites A and B are re-assessed. Part of the assessment would therefore entail verification of previously sampled sections of the proposed routes. Bergwind Botanical Surveys was commissioned to carry out the re-assessment of the various routes and sub-station sites.

2. Terms of Reference

The following terms of reference were followed:

- Provide a description of the vegetation of the site and areas of sensitivity.
- Identify and describe biodiversity patterns at community and ecosystem level (main vegetation type, plant communities in vicinity and threatened/ vulnerable ecosystems species), at species level (species of conservation concern as listed in the Red List of South African Plants – redlist.sanbi.org; presence of alien species) and in terms of significant landscape features.
- Assess the potential direct, indirect impacts and cumulative impacts of the proposed project.
- Provide mitigation options with respect to the proposed project layout and alternatives impacting on sensitive areas.

- Provide mitigation options with respect to the long-term management of vegetation affected.
- Comment on whether or not biodiversity processes would be affected by the proposed project, and if so, how these would be affected.

Guidelines and recommendations for environmental assessment from Cape Nature and the Botanical Society were also followed, along with those published by the Department of Environmental Affairs and Development Planning (Brownlie, 2005, De Villiers *et al*. 2005).

3. Description of the study area

3.1 Locality and disturbance regime

The planned powerline routes are between New Horizons on the north side of the N2 National Highway, which is on the Robberg side of Plettenberg Bay, to the Bitou Valley to the north and the N2 National Highway to the east (Figures 1 & 2). The three substation alternatives are situated along the R340, which runs from the N2 to Wittedrift.

The area comprises farmland and natural vegetation. Although many patches of vegetation are considered intact, it is thought that a number of these areas underwent disturbance in the past. Those areas that have a low incidence of invasive alien vegetation are most likely areas that have not been disturbed for a long time and have thus reverted back to natural, ecologically intact habitat. There are, however, also areas that have never been disturbed but have become infested with weeds. Examples are the river courses, where black wattle (*Acacia mearnsii*) has invaded, and hill-slopes where pines (*Pinus radiata*) either dot or cover the landscape.

3.2 Geology and topography

Most of the area comprises gentle to moderately undulating hills undulating hills. These are mostly comprised of shale, described by Rebelo *et al.* (in Mucina & Rutherford, 2006) as *" Acidic, moist clay-loam, prismacutanic and pedocutanic soils derived from Caimans Group and Ecca (in the east) shales."*

The characteristic hill-slopes of the region form valleys of varying steepness. Valleys with river courses are generally steeper whereas the smaller valleys have smaller catchment areas. The valley are generally fire-protected.

A major geological feature at the north end of the study area is the Bitou Valley. The Bitou River and floodplain forms an estuary and salt marsh due to the low altitude and flatness of the floodplain. The floodplain and flat riparian and seasonally inundated areas are characterized by alluvial, fine sandy, silty and clay-rich soils derived from sandstones and shales.

3.3 Climate

Mean Annual Precipitation (MAP) for the region is 230-780 mm (mean: 420 mm), with rainfall spread more or less evenly throughout the year (i.e. temperate climate). Summer and winter peak temperatures are 29.9˚C and 2.6˚C in January and July respectively (Rebelo *et al.* in Mucina & Rutherford, 2006).

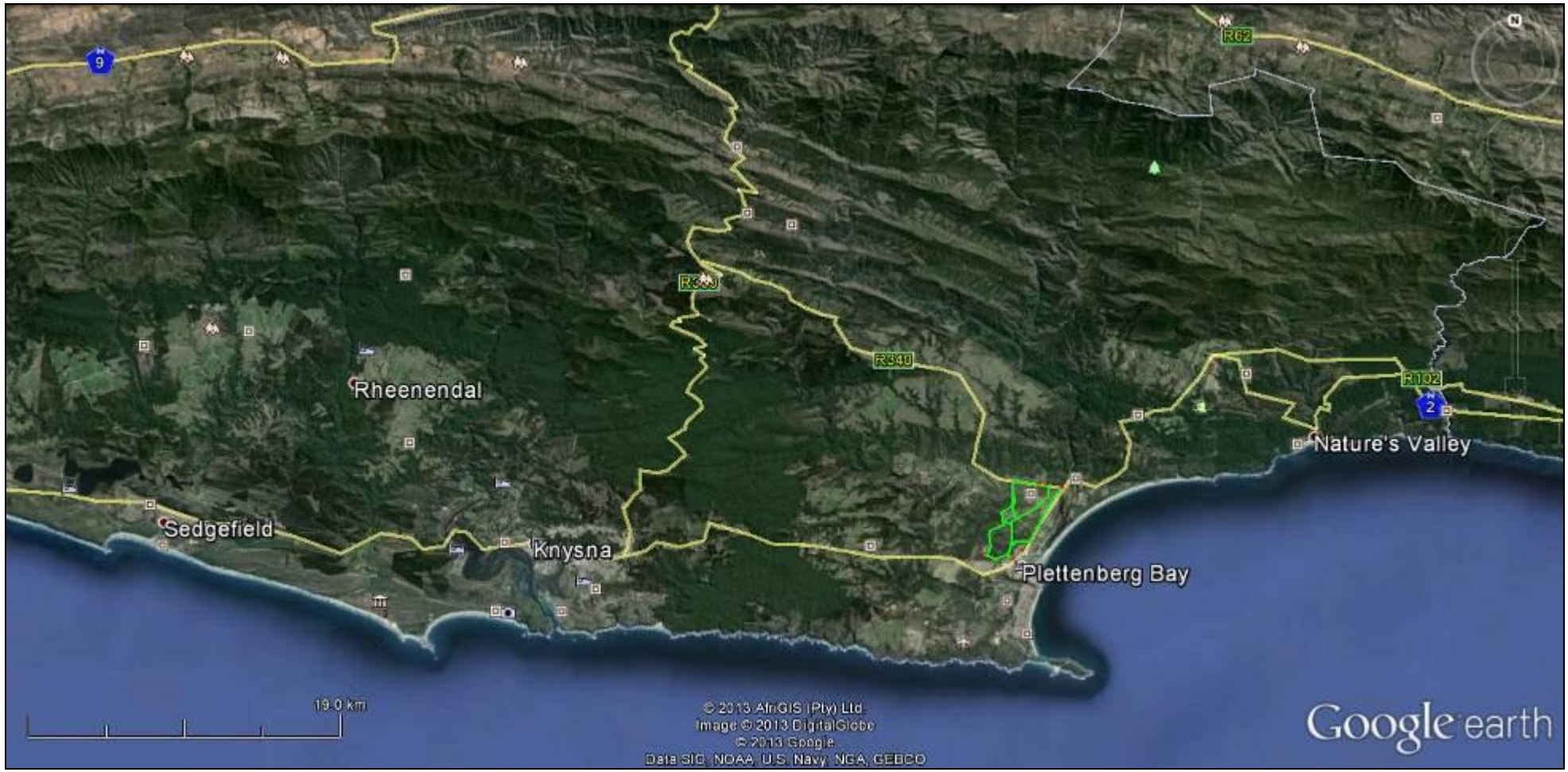

Figure 1. Google Earth™ aerial image showing the study area (green lines) located along the Garden Route.

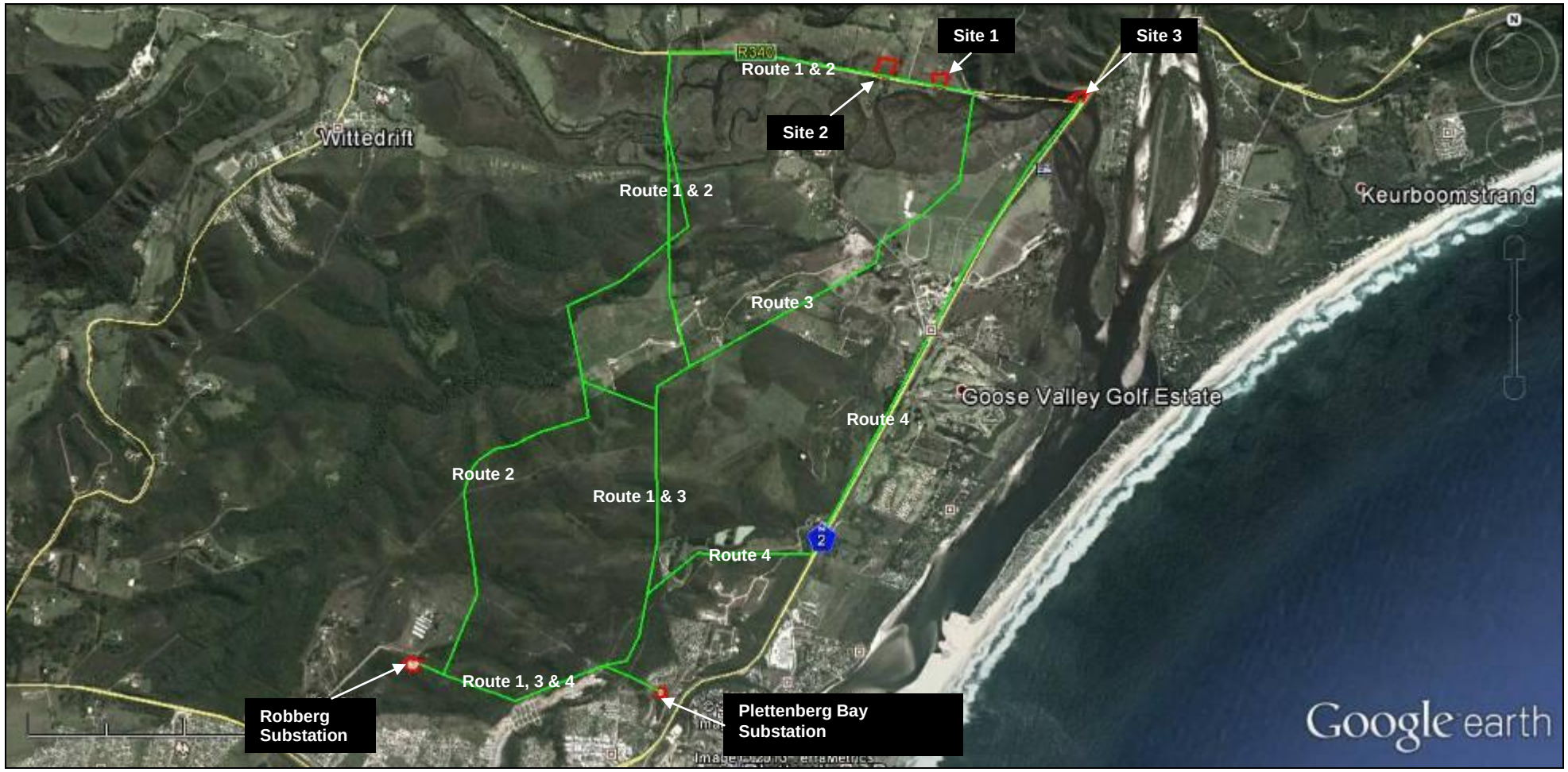

Figure 2. Google Earth™ aerial image showing the proposed 66kV powerline routes 1, 2, 3 & 4 (green lines) and substation sites 1, 2 & 3 (red boundary lines).

4. Evaluation method

The site study area was visited and surveyed on foot on 29, 30, 31 and 4 October 2013. The habitat condition was sampled and described with the aid of photographic records, sample waypoints and desktop analysis (Google Earth ™ imagery and Quantum GIS software). A number of standard assessment criteria were used to determine the potential impacts as follows:

- *Ecosystem status*: ecosystem status of the vegetation type was obtained using the List of Threatened Terrestrial Ecosystems (Government Gazette, 2011). The gazetted list is important for commenting on the level of sensitivity in relation to natural vegetation quantity and quality.
- *Conservation planning:* The Critical Biodiversity Areas of the Garden Route (Holness, Bradshaw & Brown, 2010) was used to contextualize the area in terms of biodiversity importance and conservation planning.
- *Species of conservation concern:* the presence of rare or threatened species as listed in the Red List of South African Plants (redlist.sanbi.org).
- *Special habitats:* the presence of rare or sensitive habitats such as wetlands and dune systems.
- *Species, communities and populations:* the presence or absence of any species provides insight into the ecological state of the area. Pioneer species, for example, are important to mention, since these usually indicate past disturbance, whereas mature or old individuals indicates areas that have not undergone physical disturbance and may be sensitive or support important biodiversity. Populations and communities hold the same value in terms of interpretation of the ecological status of an area.
- *Restoration potential and biodiversity corridors:* degraded areas or alien-infested areas have the potential to be restored depending on the level of disturbance or transformation. Degraded and transformed areas may also be of importance if, for example, these areas link portions or remnants of good quality or threatened vegetation types.

5. Limitations and assumptions

The survey was carried out during the peak spring flowering period (early October), which makes this an acceptable study in terms of finding and identifying most species in the area surveyed. The land on Erf 444/1 could not be accessed during the site visit since the owner would not grant permission to his land. Erf 305/4 could not be accessed for the same reason. Although these areas could not be visited, they were viewed from a distance and could be assessed based on continuation of adjacent

habitat types. This is nevertheless seen as a limitation since there may have been important ecological features and species on these properties which were not seen.

6. Vegetation

6.1. General overview and conservation context

According the *Vegetation map of South Africa, Lesotho, and Swaziland* (VEGMAP) (Mucina, Rutherford and Powrie, 2005) the proposed powerline routes traverses three vegetation types and two azonal types (Figure 3). The zonal types are Outeniqua Sandstone Fynbos, Garden Route Shale Fynbos and Cape Lowland Alluvial Vegetation. An obvious error in the map is the ommission of Southern Coastal Forest and Southern Afrotemperate Forest, which is most likely due to the small scale of the map and lack of ground-truthing. The azonal types are Cape Lowland Freshwater Wetlands and Cape Estuarine Salt Marshes.

Two of the abovementioned vegetation types are threatened (Table 1). The first and most dominant of the vegetation types in the study area, is Garden Route Shale Fynbos, which is listed as **VULNERABLE** (Government Gazette, 2011). The second unit, Cape Lowland Alluvial Vegetation, covers a small portion of the study area and is listed as **CRITICALLY ENDANGERED** (Government Gazette, 2011). At this point it is important to recognize that the VEGMAP represents both historical and present vegetation cover, which means large areas may have been altered to varying degrees, depending on the past disturbance regime. The implication is that any remnant threatened vegetation is liklely to have high conservation importance. Secondly, the remaining types which are not threatened may also have high conservation importance since these represent well-consolidated areas of unaltered and therefore ecologically intact habitat.

When viewed in relation to the Critical Biodiversity Areas of the Garden Route (Holness, Bradshaw & Brown, 2010) the majority of the study area falls within Critical Biodiversity Areas; with a small proportion being Ecological Support Areas (ESA) and the remainder comprising undesignated areas (i.e. low conservation importance) (Figure 4). The ground-truthing of these areas is important since fine-scale biodiversity plans are often only consulted in a desktop analysis. The spatial planning aspects of biodiversity are important to consider in terms of conservations of priority areas and ecological corridor for maintaining important biodiversity processes.

Table 1. Ecosystem status of listed threatened vegetation types with regard to transformation of habitat; level of protection and related taxa of special concern (Government Gazette (2011).

Vegetation type	**Ecosystem status**	**Criterion**	**Original extent of Ecosystem**	**Remaining natural area of ecosystem**	**Proportion of ecosystem protected**	**Known number of species of special concern**
Garden Route Shale Fynbos	VULNERABLE	A1	57 000 ha	44%	4% of original area	8 Red Data plant species (EX, EW, CR, EN & VU excl VU D2) and 3 endemic plant species
Cape Lowland Alluvial Vegetation	CRITICALLY ENDANGERED	A1	36 000 ha	33%	1% of original area	10 Red Data plant species (EX, FNV, CR, EN & VU excl VU D2)

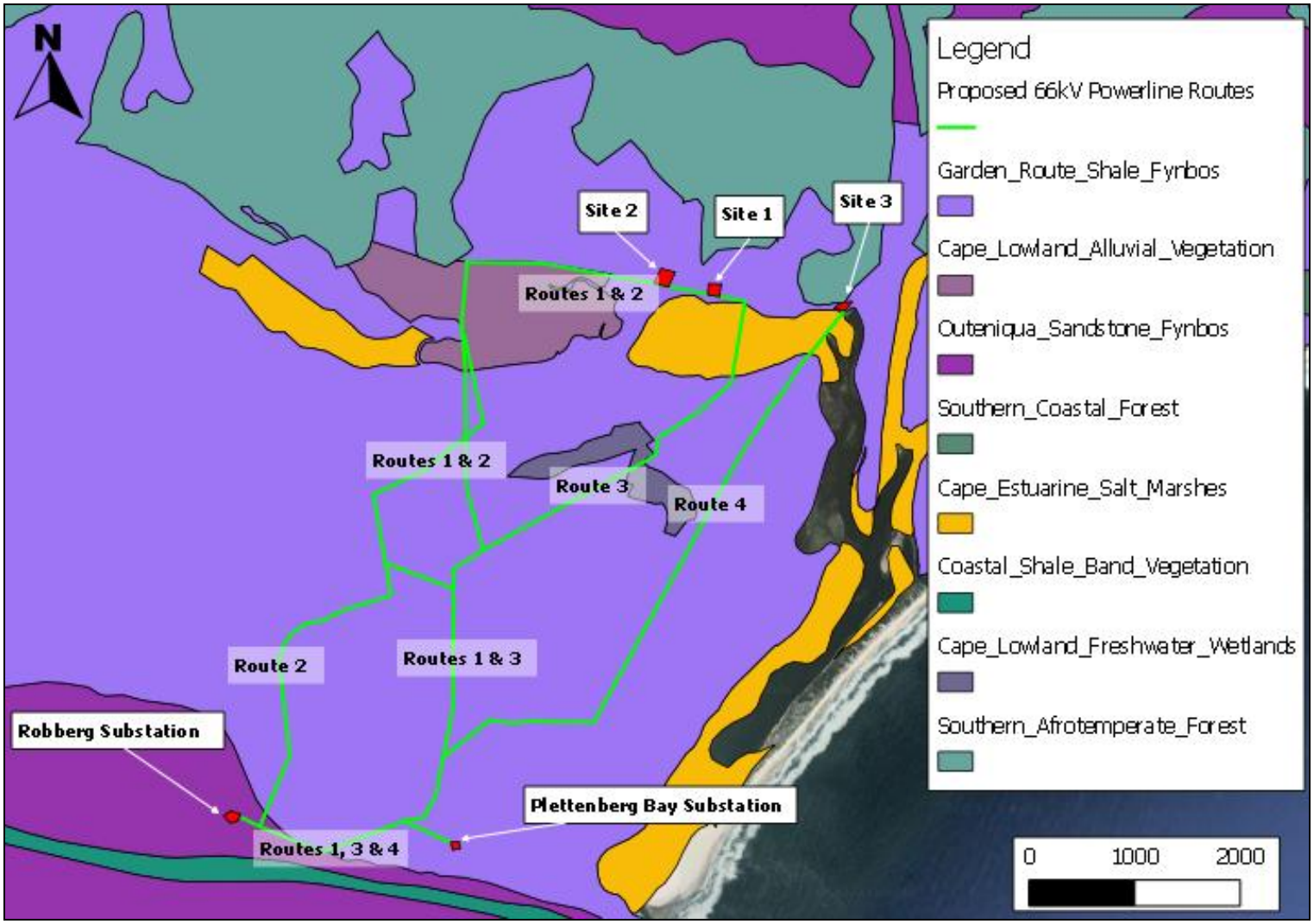

Figure 3. The study area showing the proposed 66kV powerline alternatives and substation sites represented on a map portion of *The Vegetation of South African, Lesotho and Swaziland* (Mucina, Rutherford and Powrie, 2005).

Figure 4. The study area showing the proposed 66kV powerline alternatives (green lines) and substation sites in relation to the Critical Biodiversity Areas of the Garden Route (Holness, Bradshaw & Brown, 2010).

6.2. Vegetation of the study area

The vegetation along Routes 1 – 4 and at Substation Sites 1 - 3 varies from intact good quality habitat to highly transformed habitat. The vegetation is described along each route according to the various habitat condition classes, which can be divided into sections. The sections are based on field waypoints or from Google Earth™ imagery print outs that were marked up in the field and subsequently cross referenced in Google Earth, or a combination or the two information sources. These are presented in Table 2. Where sample points overlap with areas surveyed by previous botanical studies, the points are used to verify the state of the habitat condition. The Substation Sites are also described in Table 2.

Route 1 & 3 & 4

The vegetation is described along the routes from the southern end (Robberg and Plettenberg Substations side) to the northern end (Bitou Valley and newly proposed substation Sites 1, 2 & 3 side).

Waypoint section	General description and list of species	Images of sample points
074 34° 2.579'S 23° 20.510'E to **080** 34° 2.707'S 23° 20.868'E (Figure 5)	This section, which runs from the Robberg Substation towards the Plettenberg Bay Substation beneath the ESKOM servitude, includes the sample points of McDonald (2007) Rb10 and Rb11. The fynbos habitat has not changed since his assessment and consists of 'Mid-High Dense Ericoid Shrubland with a Dense Herbaceous Understorey'. Dominant shrubs recorded by McDonald (2007) and during 2013 include *Metalasia densa, Phylica* sp.*, Anthospermum aethiopicum, Erica canaliculata* and *Erica* sp. The sedge *Tetraria* cf. *involucrata* is still dominant in the herbaceous stratum. Additional species from both sampling periods include *Aspalathus* sp., *Bobartia* sp., *Passerina falcifolia, Lobelia coronopifolia, Leucadendron salignum, Peucedanum* sp.*, Helichrysum felinum, Osteospermum moniliferum, Oedera capensis, Gazania krebsiana, Restio* sp.*, Cassytha ciliolata, Eragrostis capensis, Themedra triandra, Montinia caryophyllacea, Muraltia alopecuroides, Restio* sp.*, Tetraria* cf. *ustulata, Satyrium* sp.*, Hermannia* sp.*, Gnidia oppositifolia, Gerbera* cf. *crocea, Seriphium cinereum. Agathosma* sp. and *Chironia baccifera.* **Vegetation type:** Outeniqua Sandstone Fynbos **Mitigation:** The intact vegetation needs to be managed properly, which means that ESKOM must (1) remove invasive species, (2) ensure that burn cycles are maintained and (3) refrain from bossie cutting. Additional service roads are not necessary.	 View from Robberg Substation towards New Horizons. Waypoint 074.  Waypoint 077.

Figure 5. Google Earth™ aerial image showing the proposed 66kV powerline Routes 1, 3 & 4 & Route 2 (green lines) between waypoints 074 to 128. The numbered yellow circle icons are the waypoints from the 2013 survey whereas the numbered purple triangle icons are from McDonald's 2007 survey.

Routes 1 & 3 & 4

Waypoint section	General description and list of species	Images of sample points
128 34° 2.737'S 23° 20.991'E **to** **130** 34° 2.611'S 23° 21.363'E (Figures 6a & 6b)	At waypoint 080 (34° 2.707'S; 23° 20.868'E) the existing powerline crosses a kloof with natural forest, which is infested with black wattle (*Acacia mearnsii*) along the watercourse. The forest would not be impacted since no pylons would need to be placed here. On the opposite side of the kloof, at New Horizons, the natural fynbos continues in the vicinity of waypoint 128 but the area has been disturbed, presumably through brush cutting and/or frequent fires and disturbance from the recent construction of houses and roads adjacent to the servitude. Dominant shrubs include *Oedera capensis, Passerina falcifolia* and *Ursinia* sp. Additional species include *Elytropappus rhinocerotis, Erica canaliculata, Erica* sp., *Lobelia coronopifolia, Tarchonanthus camphoratus, Selago corymbosa, Bobartia* sp., *Metalasia densa, Eragrostis capensis* and *Leucadendron salignum*. The vegetation changes to heavy infestations of *Eucalyptus* sp. and black wattle (*Acacia mearnsii*) at waypoint 130. **Vegetation type:** Outeniqua Sandstone Fynbos transitional with Garden Route Shale Fynbos **Mitigation:** Disturbance should be minimized to prevent further degradation of the habitat.	 View toward Robberg Substation form New Horizons. Waypoint 128.  View form New Horizons toward the Bitou Valley. Waypoint 128.

Route 1 & 3 & 4

Waypoint section	General description and list of species	Images of sample points
130 34° 2.611'S 23° 21.363'E **to** **97** 34° 2.422'S 23° 21.532'E (Figures 6a & 6b)	At waypoint 130 the route takes a diversion to the Plettenberg Bay Substation (PBS). The powerline is supported by a pylon in degraded fynbos on the west side of a small valley and within transformed grassy patches just outside the PBS. The vegetation on the slope leading to the PBS is of a similar quality to the section described between waypoints 128 and130 and is unlikely to be affected. The vegetation immediately to the north of the existing 66kV powerline is infested with *Eucalyptus* sp., *Pinus radiata* and black wattle. From waypoint 130 to 097 the area is heavily infested with black wattle and *Eucalyptus* sp. and is highly degraded. The wattle has completely out-competed the natural vegetation. The river course at waypoint 097 is also heavily invaded but there were a number of remnant forest and other species noted between the Waste Water Treatment Works (WWTW) at this point, such as *Sideroxylon inerme, Olinia ventosa, Scolopia mundii* and *Olea europaea subsp. africana.* **Vegetation type:** Garden Route Shale Fynbos **Mitigation:** The invasive alien vegetation should be eradicated by the land-owner. If this is removed the natural seed bank would probably regenerate successfully, however, this would require continual removal of germinating wattle, gum and possibly other additional invasive *Acacia* species. Removing the black wattle and other invasive species would allow the natural vegetation to restore naturally.	 View from New Horizons towards the Plettenberg Bay Substation. Waypoint 131.  Black wattle infestations at waypoint 097.

Figure 6a. Google Earth™ aerial image showing the proposed 66kV powerline Routes 1 & 3 & (green lines) between waypoints 128 to 0130. The numbered yellow circle icons are the waypoints from the 2013 survey.

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Figure 6b. Google Earth™ aerial image showing the proposed 66kV powerline Routes 1 & 3 & 4 and Route 4 diversion towards the N2 National Highway (green lines) between waypoints 131 to 097. The numbered yellow circle icons are the waypoints from the 2013 survey.

Route 1 & 3

Waypoint section	General description and list of species	Images of sample points
97 34° 2.422'S 23° 21.532'E to **025** 34° 1.894'S 23° 21.590'E (Figure 7)	After waypoint 097 and the alien infested river course the route traverses two undulating hills over a distance of ±950 m, which supports intact heathland on the slopes and thicket in the valleys. The heathland vegetation comprises the same '*Passerina falcifolia*-dominated ericoid shrubland' described by McDonald (2007). The herbaceous understorey layer is dominated by *Helichrysum cymosum*. Additional species include *Euryops virgineus* (along the disturbed edge of the servitude), *Crassula* sp., *Selago corymbosa, Peucedanum* sp., *Erica* sp., *Anthospermum aethiopicum* and *Tarchonanthus camphoratus.* The good quality thicket habitat in the valley described by McDonald (2007) as 'bush-clump' is impenetrable and has not changed since his survey. Species include *Cassine peragua, Dovyalis caffra, Grewia occidentalis, Myrsine africana, Diospyros dichrophylla, Osyris compressa, Searsia lucida, Tarchonanthus camphoratus, Ochna serrulata, Carissa bispinosa, Euclea undulata and Osteospermum moniliferum.* The thicket extends from waypoint 025 to placemark 25a (34° 2.002'S; 23° 21.604'E). Note the disturbed grassy area and artificial pond between waypoint 024 (34° 1.870'S; 23° 21.602'E) and 026 (34° 1.840'S; 23° 21.605'E) has not changed since McDonald's (2007) survey is a preferred location for a powerline support pole (PSP) used as A pylon position. **Vegetation type:** Garden Route Shale Fynbos **Mitigation:** The habitat is intact; despite possibly being disturbed in the past by farming and should nonetheless be protected. The thicket in the valley should not be disturbed unnecessarily since this may be an important shelter for herbivores. Clearing of vegetation should be by cutting only and should be a 'once-off'. After construction the vegetation should be left to recover.	 View towards the Robberg Substation from waypoint 025.  View towards the Robberg Substation from waypoint 024

Figure 7. Google Earth™ aerial image showing the proposed 66kV powerline routes 1, 3 & 4 (green lines) between waypoints 097 to 025. The numbered yellow circle icons are the waypoints from the 2013 survey whereas the numbered purple triangle icons are form McDonalds 2007 survey.

Routes 1 & 3

Waypoint section	General description and list of species	Images of sample points
026 34° 1.840'S 23° 21.605'E to **33a** 34° 1.435'S 23° 21.818'E (Figure 8)	The *Passerina falcifolia*-dominated ericoid shrubland continues after the open grassy area and pond (waypoint 024 & Rb8), which continues to waypoint 033. The vegetation changes slightly in terms of species composition but essentially comprises the same habitat type along this section. From waypoint 026 the species makeup is more or less the same as for waypoint 024; however, at waypoint 028 (34° 1.756'S; 23° 21.605'E) there is higher species richness, presumably due to slightly higher moisture levels graduating to direr soils. This sample also matches McDonald's (2007) Rb13 sample and this author's samples from this point to waypoint 030 (34° 1.645'S; 23° 21.603'E). The vegetation can by described according to McDonald's (2007) description as 'Low to Mid-high (1-1.5 m) Dense Ericoid Fynbos with either Dense or Sparse Herbaceous Understorey'. Dominant species include *Passerina falcifolia* and *Erica* sp. Additional species include *Bobartia* sp., *Aspalathus* sp., *Satyrium membranaceum, Satyrium longicolle, Disa cornuta*, *Anthospermum aethiopicum, Arctopus echinatus*, *Haemanthus* sp., *Elytropappus rhinocerotis*, *Osteospermum moniliferum, Clutia ericoides, Ehrharta* sp., *Gnidia oppositifolia, Restio* sp., *Peucedanum* sp., *Selago corymbosa, Hermannia* sp., *Tarchonanthus camphoratus, Themeda triandra*, *Wahlenbergia* sp., *Lampranthus* sp., *Ornithogalum dubium, Searsia lucida*, *Ursinia* sp. and *Scabiosa columbaria.* The small succulent *Crassula orbicularis* occurs on the slopes at waypoint 033. **Vegetation type:** Garden Route Shale Fynbos **Mitigation:** The access track would minimize the need to disturb the habitat. No brush cutting would be needed since this is a relatively low (<1.5 m) vegetation type.	 View towards the Bitou Valley from waypoint 028  View towards the Bitou Valley from waypoint 030

Figure 8. Google Earth™ aerial image showing the proposed 66kV powerline Routes 1 & 3, Route 2 and Route Diversion 1c to Route 2 (green lines) between waypoints 026 to 033 (yellow shading). The numbered yellow circle icons are the waypoints from the 2013 survey whereas the numbered purple triangle icons are form McDonalds (2007) survey.

Route 3

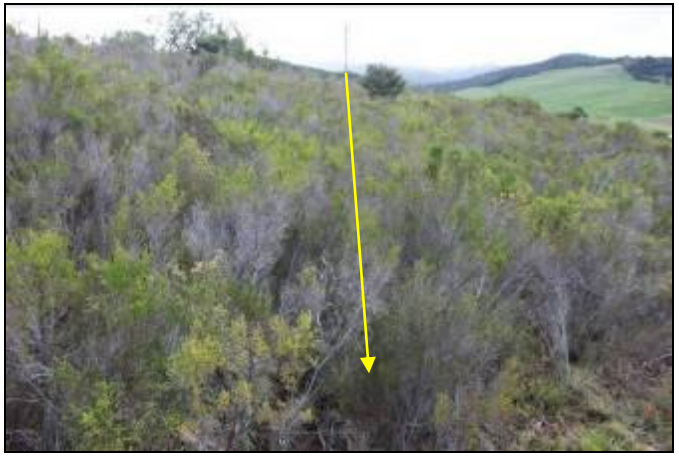
Waypoint section	General description and list of species	Images of sample points
Placemark 33a 34° 1.435'S 23° 21.818'E To Placemark **069a** 34° 1.195'S 23° 22.342'E (Figure 9)	From placemark 33a to waypoint 069 the vegetation routes passes through transformed farmland. Thereafter, from placemark 33b (34° 1.341'S; 23° 22.023'E) to waypoint 069, the same *Passerina falcifolia*-dominated ericoid shrubland continues. After waypoint 069 the habitat comprises transformed land up to placemark 069a. **Vegetation type:** Garden Route Shale Fynbos **Mitigation:** At placemark 33c (34° 1.365'S; 23° 21.974'E) there is a line of thicket vegetation that should be avoided. The access track should be done as a 'once-off'.	 View towards the Bitou Valley from waypoint 033.  View towards the Robberg Substation from waypoint 069.

Figure 9. Google Earth™ aerial image showing the proposed 66kV powerline route 3 (green lines) between waypoints 033 to 067. The numbered yellow circle icons are the waypoints from the 2013 survey. The numbered icons 33a and 33b are placemark points, i.e. not field samples but used to designate key features in the landscape.

Routes 3

Waypoint section	General description and list of species	Images of sample points
Placemark 69a 34° 1.195'S 23° 22.342'E to Waypoint **065** 34° 0.989'S 23° 22.653'E (Figure 10)	Between placemark 69a and waypoint 067 (34° 1.169'S; 23° 22.391'E) there is a patch of vegetation in an area that was previously ploughed. The area is used for stock grazing and is therefore highly degraded. Natural species include *Conyza scabrida, Passerina falcifolia, Erica* sp*., Selago corymbosa, Helichrysum cymosum, Euryops virgineus* and *Searsia lucida.* The land abuts the Diepriver Vlei, with the habitat transitional at waypoint 067 (34° 1.169'S; 23° 22.391'E) to the water's edge into riverine thicket. At this point the vegetation is dominated by *Diospyros dichrophylla, Searsia lucida, Grewia occidentalis, Carissa bispinosa, Dovyalis caffra, Crassula orbicularis, Cotyledon orbiculata* and *Sideroxylon inerme* (milkwood) along the water's edge. The route then crosses the Diepriver Vlei where there is the same riverine thicket vegetation described at waypoint 067a (34° 1.089'S; 23° 22.572'E). The route passes over the vlei again and continues through a disturbed grassy patch next to the road at waypoint 065. **Vegetation type:** Garden Route Shale Fynbos and Cape Lowland Freshwater Wetlands **Mitigation:** The riverine thicket, should not be disturbed since this habitat is regarded as sensitive in addition to harbouring protected milkwood trees.	 View towards Robberg Substation at waypoint 068.  View towards Bitou Valley over Diepriver Vlei from waypoint 067.

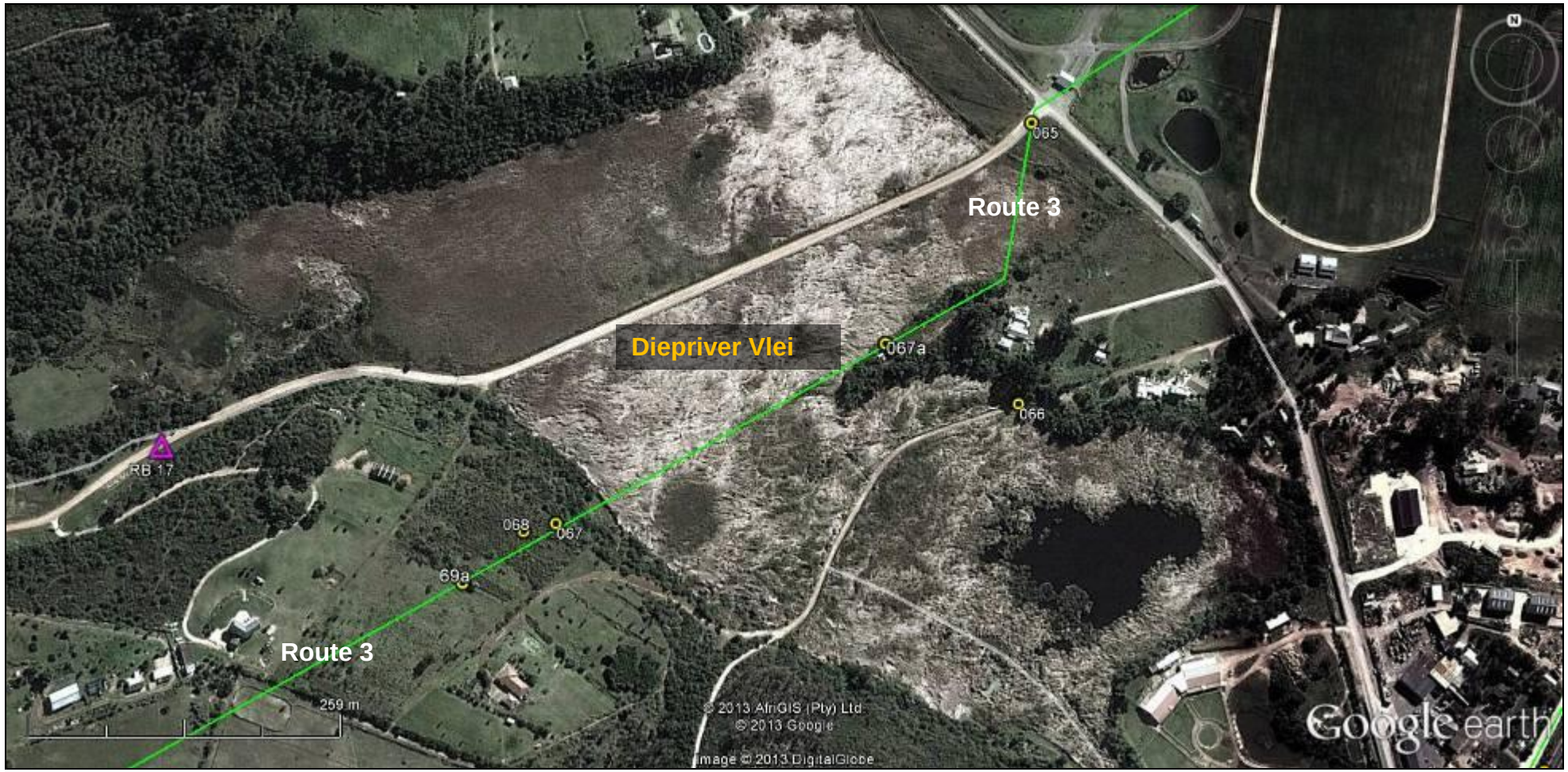


Figure 10. Google Earth™ aerial image showing the proposed 66kV powerline Route 3 (green lines) between placemark 69a to waypoint 065. The numbered yellow circle icons are the waypoints from the 2013 survey whereas the numbered purple triangle icons are form McDonald's (2007) survey. The numbered icons 69a and 67b are placemark points, i.e. not field samples but used to designate key features in the landscape.

Routes 3

Waypoint section	General description and list of species	Images of sample points
Waypoint 065 34° 0.989'S 23° 22.653'E to Waypoint **040** 34° 0.395'S ; 23° 23.066'E (Figure 11)	After waypoint 065 the route traverses transformed farmland. At placemark 65a (34° 0.872'S; 23° 22.871'E) there is an old milkwood tree (*Sideroxylon inerme*) in the farmland/polo fields. The transformed land continues to placemark 65b (34° 0.724'S; 23° 23.033'E). After this point the habitat changes to estuarine salt marsh. The salt marsh continues across the Bitou River to waypoint 040. The salts marsh has not been altered since McDonalds's (2007) survey, and is dominated by typical salt marsh vegetation, namely *Sarcocornia* spp. and *Bassia diffusa*. The edges and flats are dominated by sedge-beds of *Juncus krausii* and further upstream by common reed (*Phragmites australis*). **Vegetation type:** Garden Route Shale Fynbos (transformed) and Cape Estuarine Salt Marshes. **Mitigation:** The old milkwood tree at placemark 65a must be avoided. The salt marsh must be avoided since the area is regarded as sensitive.	 View towards the Bitou Valley showing transformed farmland/polo fields between waypoint 065 and placemark 65b.  Waypoint 040

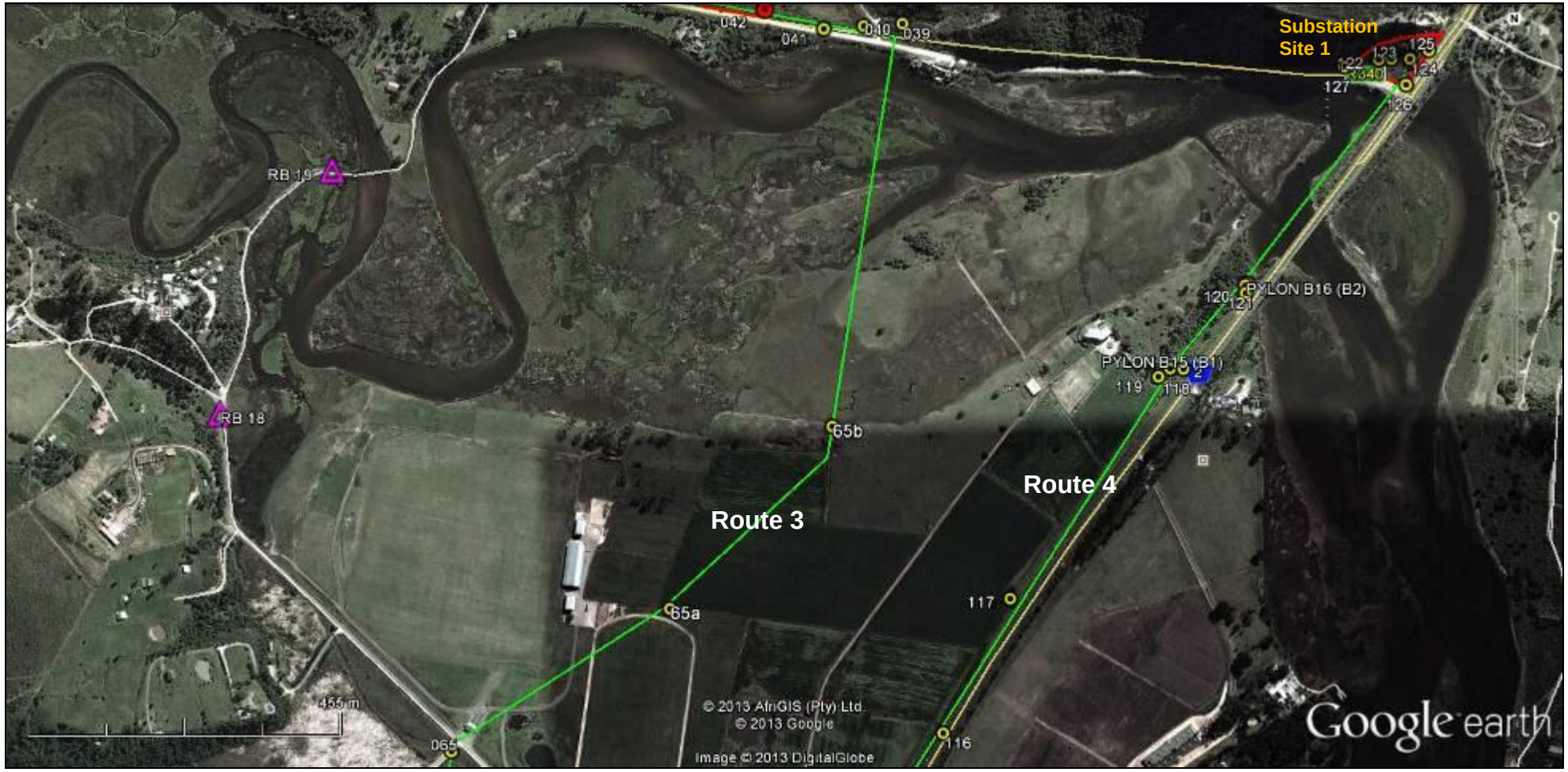


Figure 11. Google Earth™ aerial image showing the proposed 66kV powerline Route 3 and Route 4 (green lines) and Substation Sites 3 (red lines) between placemark 69a to waypoint 065. The numbered yellow circle icons are the waypoints from the 2013 survey whereas the numbered purple triangle icons are form McDonald's (2007) survey. The numbered icons 69a and 67b are placemark points, i.e. not field samples but used to designate key features in the landscape.

Route 1 Diversion 1b to Route2

Waypoint section	General description and list of species	Images of sample points
Waypoint 035 34° 1.610'S 23° 21.579'E to Waypoint **062** 34° 1.547'S 23° 21.366'E (Figure 8)	The route diverts from Routes 1 & 3 in the vicinity of waypoint 035 (Figure 8). Two vegetation types occur here; the first is a continuation of the *Passerina falcifolia*-dominated ericoid shrubland that occurs between waypoints 026 and 030, and the second is what McDonald (2007) described as dense bush-clump or low thicket-like forest. The latter occurs between McDonald's (2007) waypoint RB14 (34° 1.578'S; 23° 21.495'E) and waypoint 063 (34° 1.555'S; 23° 21.435'E). The low thicket-like forest overstorey is dominated by *Schotia afra, Searsia lucida, Diospyros dichrophylla, Buddleja saligna, Sideroxylon inerme, Dovyalis caffra, Osteospermum moniliferum* and *Grewia occidentalis*. The shrubby and herbaceous understorey comprises *Asparagus* sp., *Plectranthus* sp., *Carissa bispinosa, Chironia baccifera, Passerina falcifolia, Crassula* sp., *Euryops virgineus, Metalasia acuta, Ursinia* sp., *Euphorbia* sp., *Euclea crispa* and *Knowltonia vesicatoria.* The next stretch of land between waypoint 062 and Route 2 comprises transformed fields. **Vegetation type:** Garden Route Shale Fynbos and insipient Southern Afrotemperate Forest **Mitigation:** Avoid the thicket-like forest and minimized damage to fynbos habitat. Remove all invasive pines.	 View towards the west at waypoint 035.  View towards the N2 at waypoint 062.

Route 1 Diversion 1c to Route2

Waypoint section	General description and list of species	Images of sample points
Waypoint 033 34° 1.449'S 23° 21.765'E to Waypoint **002** 34° 0.991'S 23° 21.670'E (Figure 12)	From waypoint 033 the vegetation comprises *Passerina falcifolia*-dominated ericoid shrubland, which, like the Route 1 Diversion 1b to Route 2, changes to thicket vegetation. In this instance the thicket is lower than at waypoints RB14 and 063. The vegetation includes *Aloe ferox*. After waypoint 011 the route passes through transformed farmland and passes through the large milkwood tree and thicket clumps described at waypoint 002. Additional species at this point includes *Searsia lucida, Buddleja saligna, Diospyros dichrophylla, Searsia lucida* and *Apodytes dimidiata.* **Vegetation type:** Garden Route Shale Fynbos **Mitigation:** The invasive rooikrans (*Acacia cyclops*) should be eradicated soon before the area becomes heavily infested. The thicket should not be disturbed.	 View towards the Bitou Valley at waypoint 033  View towards the N2 at waypoint 011

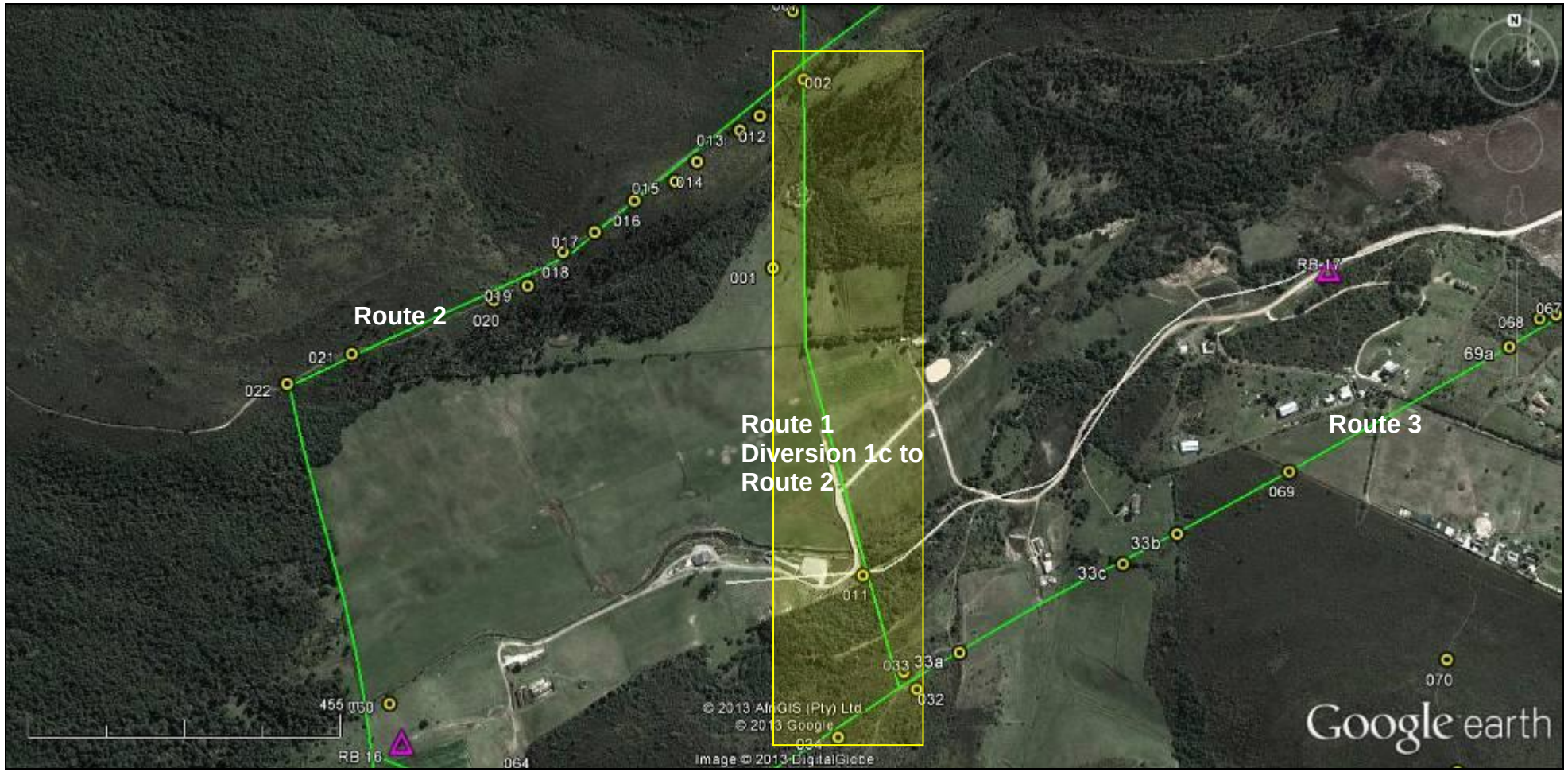


Figure 12. Google Earth™ aerial image showing the proposed 66kV powerline Route 1 Diversion 1c to Route 2 (green lines in shaded yellow) and Route 3 between waypoint 033 and 002. The numbered yellow circle icons are the waypoints from the 2013 survey. The numbered purple numbered icons with the 'RB' prefix are McDonald's (2007) sample waypoints.

Route 2

Waypoint section	General description and list of species	Images of sample points
Waypoint 077 34° 2.633'S 23° 20.615'E to Waypoint **083** 34° 2.347'S 23° 20.760'E (Figure 13)	Route 2 starts in the vicinity of the Robberg Substation and branches off Route 1 & 3 & 4 in a northerly direction. The vegetation is the same as the sample points Rb 10 and R11 and 074 to 080 (including 077), which was described by McDonald (2007) as 'Mid-High Dense Ericoid Shrubland with a Dense Herbaceous Understorey'. The dense fynbos on the E- to NE-facing slopes were noted by McDonald (2007) as being 'invaded' by *Osteospermum moniliferum* due to the old age of the vegetation. It was also noted that *Pinus radiata* has heavily invaded the slopes of Erf 437/24 and further along the ridge at 437/25 and 437/2. The infestations are still vigorous in 2013. Erf 437/44 is also invaded. The invasive *Hakea sericea,* which is 'colonizing' beneath the servitude along with *Pinus radiata*, needs to be eradicated. The pine-infested area ends at waypoint 081 (34° 2.502'S; 23° 20.689'E) and continues through transformed farmland up to waypoint 083. The route runs along on a fence-line, with partially pine-infested fynbos on the east side and farmland on the west side. It is thought that the farmland has been used as grazing pasture previously and not ploughed for crops since there is a variety of geophytes and herbaceous species emerging in the meadows. **Vegetation type:** Outeniqua Sandstone Fynbos and Garden Route Shale Fynbos **Mitigation:** The riparian forest must not be damaged.	 View towards Bitou Valley at waypoint 077.  View to the northeast at waypoint 082.

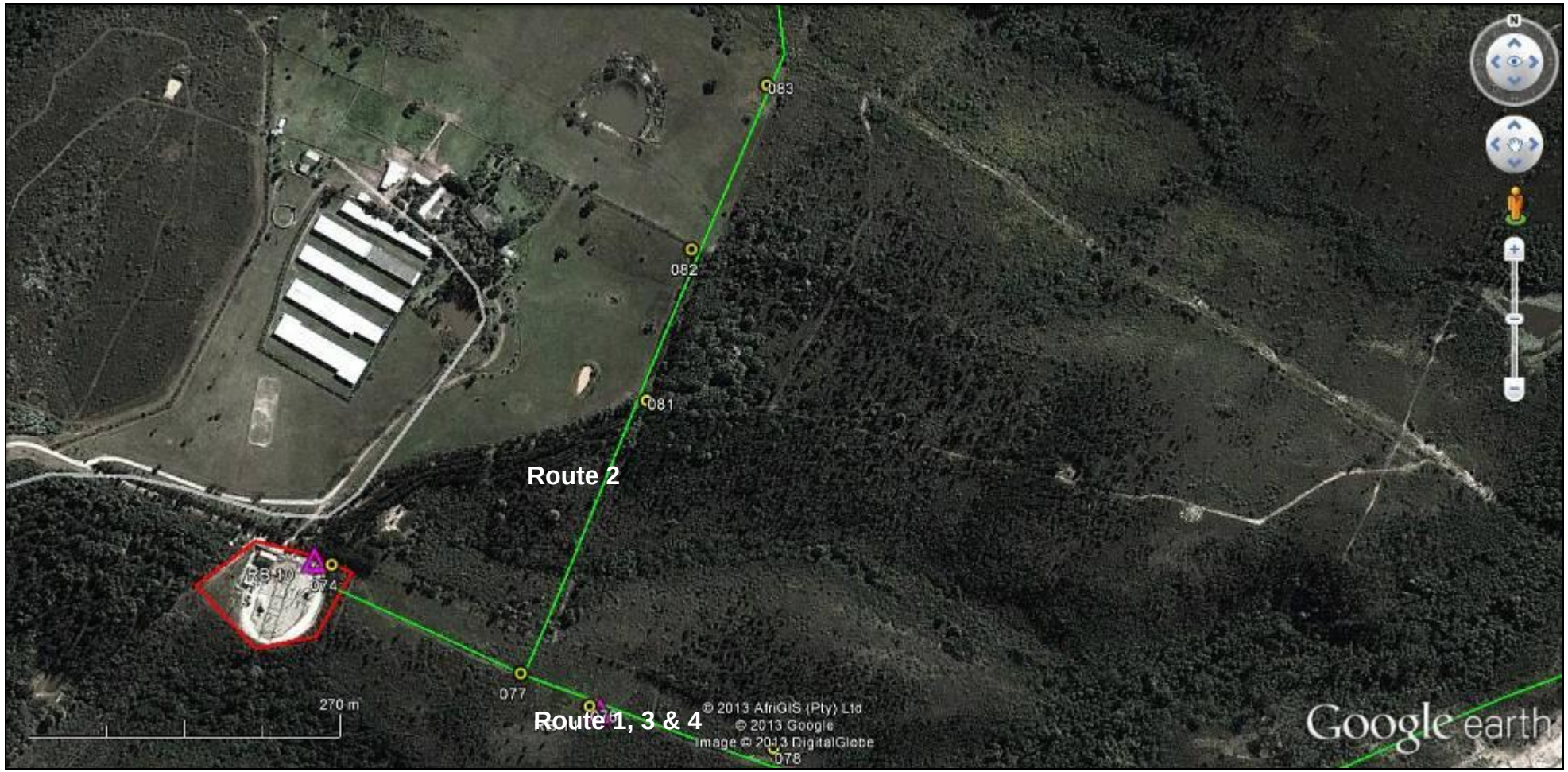


Figure 13. Google Earth™ aerial image showing the proposed 66kV powerline Route 2 (green lines) between waypoint 077 and 083. The numbered yellow circle icons are the waypoints from the 2013 survey. The numbered purple numbered icons with the 'RB' prefix are McDonald's (2007) sample waypoints.

Route 2

Waypoint section	General description and list of species	Images of sample points
Waypoint 083 34° 2.347'S 23° 20.760'E To **061** 34° 1.578'S 23° 21.275'E (Figure 14)	From waypoint 083 the farmland changes to natural vegetation with patches of *Pinus radiata* (most dominant) and *Acacia cylops* (least dominant). The route traverses a small valley before continuing over a series of moderately undulating slopes. The slope on the south side just after waypoint 083 comprises fynbos that is converting to forest since the valley forest is nearby and has not been burnt for many years. The dominant species include *Passerina falcifolia, Searsia lucida and Osteospermum moniliferum*, with moderate infestations of rooikrans (*Acacia cyclops*). The valley has black wattle (*Acacia mearnsii*) infested forest. Forest and forest margin species observed include *Rapanea melanophloeos, Burchellia bubalina* and *Diospyros dichrophylla*, however the bush is impenetrable so a comprehensive survey was not possible. The slopes on the north side of the valley comprise *Passerina falcifolia*-dominated ericoid shrubland with large patches of *Osteospermum moniliferum* and moderate infestations of *Pinus radiata*. This habitat continues until placemark 37a (34° 1.676'S; 23° 21.203'E). The route passes through McDonald's (2007) waypoint RB7 and waypoint 038. Between these, and waypoint 061, are two small thicket-dominated valleys. The slopes close to the 'valley' comprise heathland mixed with thicket-associated species such as *Osteospermum moniliferum and Searsia lucida.* **Vegetation type:** Garden Route Shale Fynbos and insipient Southern Afrotemperate Forest (riparian forest in the river valley). **Mitigation:** The infestations of black wattle in the valley forest are a concern and should be eradicated along with the infestations of rooikrans. All invasive pine species adjacent to the route must be eradicated. Disturbance would have to be a once-off activity since a large tract of intact habitat would be disturbed.	 View to the northeast from waypoint 083.  View towards the Plettenberg Bay Substation from waypoint 061.

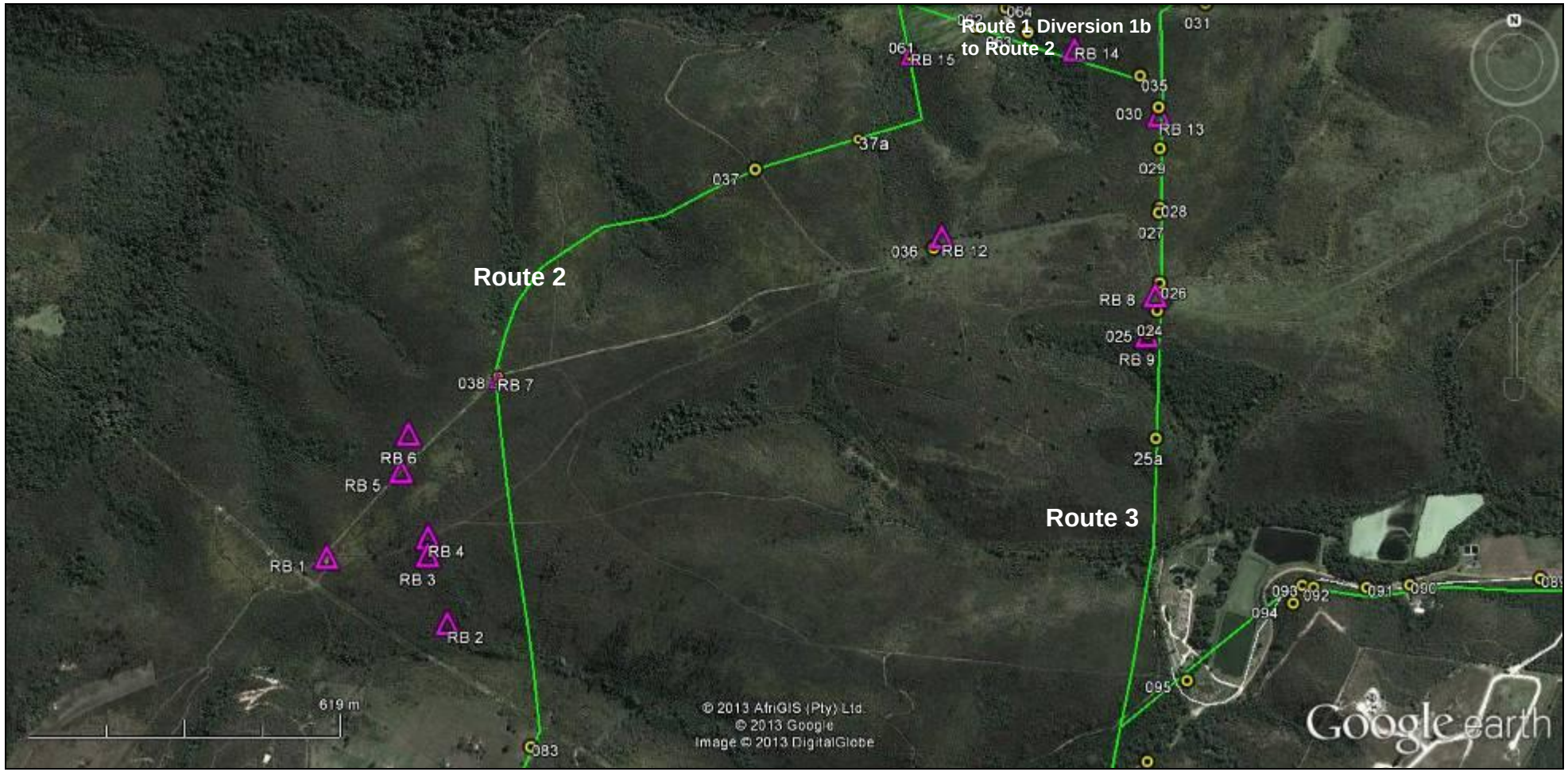


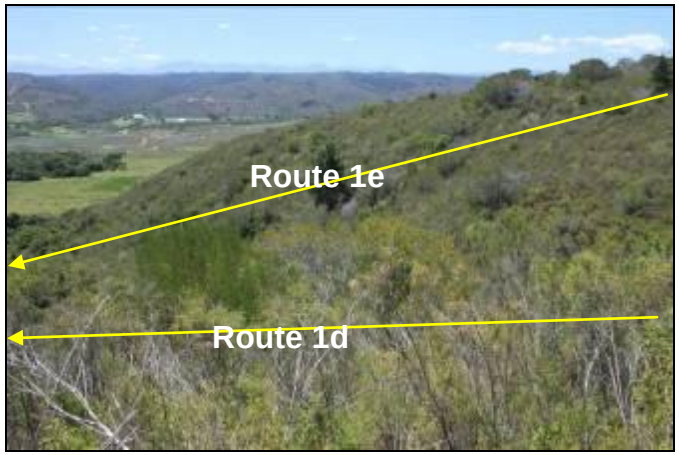
Figure 14. Google Earth™ aerial image showing the proposed 66kV powerline Route 2 and Route 3 (green lines) between waypoint 083 and 061. The numbered yellow circle icons are the waypoints from the 2013 survey. The numbered purple numbered icons with the 'RB' prefix are McDonald's (2007) sample waypoints.

Route 1 & 2

Waypoint section	General description and list of species	Images of sample points
Waypoint 061 34° 1.578'S 23° 21.275'E to **waypoint 022** 34° 1.224'S 23° 21.196'E (Figure 15)	After waypoint 061 the route continues along the edge of the fence-line with transformed farmland on the north side and a large portion of intact natural forest on the south side. The forest edge is partially invaded with black wattle, however, the forest further upslope, between placemark 61a (34° 1.372'S; 23° 21.228'E) and waypoint 022 (34° 1.224'S; 23° 21.196'E) is of good quality. At waypoint 022 the forest is transitional to impenetrable dense thicket. **Vegetation type:** Garden Route Shale Fynbos and Southern Afrotemperate Forest. **Mitigation:** The forest must not be disturbed. The back wattle must be eradicated form the forest before the area becomes more heavily infested. The transformed farmland should be used to place the powerline and should be aligned over the top of the forest between placemark 61a and waypoint 022.	 View towards the Bitou Valley showing farmland and natural forest between waypoint 060 and 022.  View towards the Plettenberg Bay Substation at waypoint 022.

Figure 15. Google Earth™ aerial image showing the proposed 66kV powerline Route 1 & 2, Route Divesrion1b and 1c to Route 2 and Route 3 (green lines) between waypoint 061 and 022 and. The numbered yellow circle icons are the waypoints from the 2013 survey. The numbered purple numbered icons with the 'RB' prefix are McDonald's (2007) sample waypoints.

Route 1 & 2

Waypoint section	General description and list of species	Images of sample points
waypoint 022 34° 1.224'S 23° 21.196'E to **placemark 9b** 34° 0.730'S 23° 21.668'E and **9c** 34° 0.729'S 23° 21.709'E (Figures 16 & 17)	After the dense thicket at waypoint 022, the route continues along a ridge next to an overgrown road. The vegetation soon reverts back to *Passerina falcifolia*-dominated ericoid shrubland, which continues to placemarks 9b and 9c. There are several patches of thicket and remnant forest, between waypoint 022 and 002 (34° 0.991'S; 23° 21.670'E). Two patches of thicket-forest occur along this section. The first occurs between waypoint 020 (34° 1.160'S; 23° 21.384'E), which comprises thicket and forest clumps with *Apodytes dimidiata, Osyris compressa, Ficus burtt-davyi, Diospyros dichrophylla, Sideroxylon inerme, Searsia longispina, Cassine peragua, Euclea undulata* and *Gymnosporia buxifolia.* The second thicket-forest patch occurs between waypoint 014 (34° 1.054'S; 23° 21.572'E) and 002 and includes several milkwood trees (*Sideroxylon inerme*). A large and very old milkwood tree occurs at waypoint 002. Additional species occurring in the second patch include *Searsia lucida, Buddleja saligna, Diospyros dichrophylla, Searsia lucida* and *Apodytes dimidiata.* The fynbos habitat is dominated by *Passerina falcifolia*, *Erica* sp., *Euryops virgineus, Helichrysum cymosum, Ursinia* sp., *Anthospermum aethiopicum* and *Conyza scabrida.* Additional species include *Selago corymbosa, Ornithogalum dubium, Searsia lucida, Tarchonanthus camphoratus, Disa cornuta, Scabiosa columbaria, Metalasia densa*, Cullumia sp. and an unidentified asteraceaous species. This habitat is more disturbed between waypoint 002 and waypoints 009 (34° 0.877'S; 23° 21.659'E), 010 (34° 0.921'S; 23° 21.765'E) and placemark 9c than between waypoints 022 and 002. The route splits after waypoint 002 into Route 1e to the north and Route 1d to the south. The two routes are in close proximity and slope downwards to the Bitou River Valley. At placemark 9a the vegetation changes from fynbos to dense thicket, which extends to the end point of the section at placemark 9b and 9c. **Vegetation type:** Garden Route Shale Fynbos **Mitigation:** A sensitive area which is transitional to the threatened habitat in the Bitou River floodplain and should ideally be avoided. No access road to be built. Area to be rehabilitated.	 View towards the Robberg Substation at waypoint 017 (blue circle = thicket-forest patch)  View towards the Bitou Valley at waypoint 022.

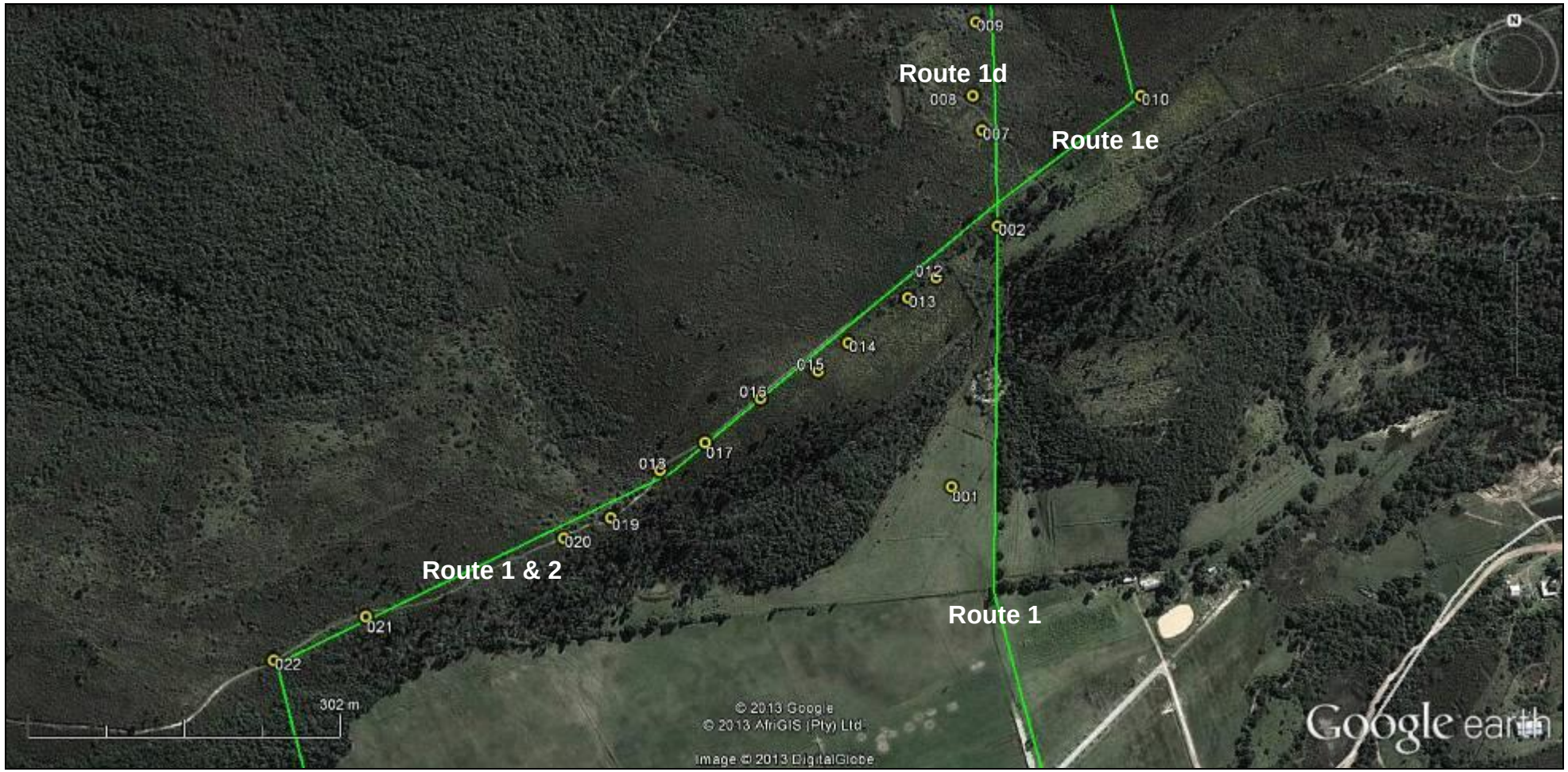


Figure 16. Google Earth™ aerial image showing the proposed 66kV powerline Routes 1 & 2, Route 1, Route 1d and 1d (green lines) between waypoint 022 and 009. The numbered yellow circle icons are the waypoints from the 2013 survey.

Figure 17. Google Earth™ aerial image showing the proposed 66kV powerline Route 1 & 2 and Route 1d & 1e (green lines) between waypoint 013 and placemarks 9b & 9c. The numbered yellow circle icons are the waypoints from the 2013 survey.

Route 1& 2

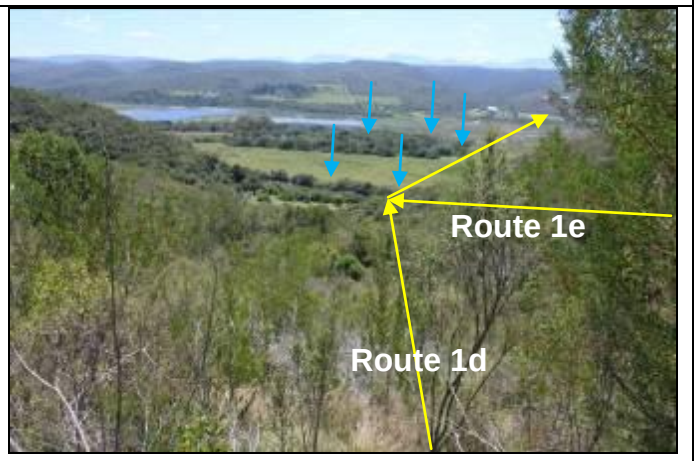
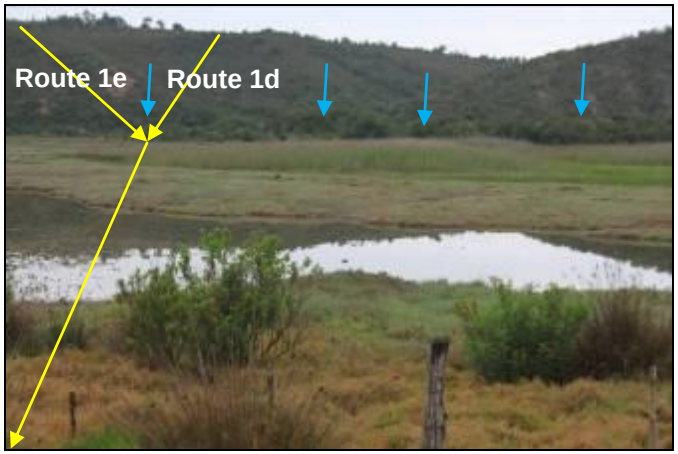
Waypoint section	General description and list of species	Images of sample points
placemark 9b 34° 0.730'S 23° 21.668'E and **9c** 34° 0.729'S 23° 21.709'E to **Waypoint 057** 34° 0.245'S 23° 21.667'E (Figure 18)	Route 1d and 1e are within 60 m of each other at the point where they meet the Bitou River riparian zone at placemarks 9b and 9c respectively. The landowner was not willing to allow access to this area from the north side (R340) whereas access from the south side, from the hill slopes, was not possible due to dense vegetation cover. Thus a comprehensive species checklist was not possible. However, the riparian habitat was noted by McDonald (2007) previously for having high numbers of milkwood trees (*Sideroxylon inerme*). The species was confirmed by using binoculars from the R304 side, however there is likely to be a number of additional species present, which are expected to be typical thicket and low forest associated species. McDonald's checkpoint B23 corresponds to waypoint 057. The floodplain, which is known as Cape Estuarine Salt Marsh, is dominated by typical salt marsh vegetation, namely *Sarcocornia* spp. and *Bassia diffusa*. The edges and flats are dominated by sedge-beds of *Juncus krausii, Stenotaphrum secundatum* and *Conyza scabrida.* **Vegetation type:** Cape Lowland Alluvial Vegetation, Southern Afrotemperate Forest (riparian forest) and Cape Estuarine Salt Marshes. **Mitigation:** The salt marsh and Riparian zone (including the protected milkwood trees) is a sensitive system, and as McDonald (2007) noted, is sensitive to changes in water regime and pollution as well as effects of compaction from sources such as livestock trampling and vehicles. Thus any placement of pylons on the floodplain would be damaging to the ecosystem.	 The Bitou River and floodplain. Blue arrows show the riparian, milkwood-dominated vegetation.  The Bitou River and floodplain. Blue arrows show the riparian, milkwood-dominated vegetation. Photographed from waypoint 057.

Figure 18. Google Earth™ aerial image showing the proposed 66kV powerline Route 1 & 2 and Routes 1d & 1e (green lines) between waypoint 013 and placemarks 9b & 9c. The numbered yellow circle icons are the waypoints from the 2013 survey.

Route 1& 2 (surveyed from east to west)

Waypoint section	General description and list of species	Images of sample points
Waypoint 040 34° 0.395'S 23° 23.066'E to **Waypoint 058** 34° 0.237'S 23° 21.666'E (Figure 19)	The routes traverses farmland and the roadside between waypoints 040 to 058. The habitat is degraded along most of the route due to disturbance from the road and farming. This has resulted in a high cover of grasses and natural pioneer species. In some places there is dense 'pioneer' thicket comprising *Searsia* spp. and *Grewia occidentalis*. Since the road is built in the Bitou River floodplain and along the edge of the salt marsh, there are numerous areas where the roadside habitat comprises marshland. These areas are dominated by the sedge *Juncus krausii* towards the eastern side, with *Phragmites australis* becoming dominant at the western end. Additional species occurring in the marshes include *Cyperus thunbergii* whereas dryland species include *Searsia laevigata, Searsia lucida, Euryops virgineus, Hyparrhenia hirta, Hermannia* sp.*, Selago corymbosa, Conyza scabrida, Seriphium cinereum, Osteospermum moniliferum, *Rubus* cf. *cuneifolius, Arctotheca calendula, *Acacia cyclops, Stenotaphrum secundatum, Tarchonanthus camphoratus,* and *Eucalyptus* sp. Marshland habitat occur between the following waypoints: • Waypoint 040 (include *Sarcocornia* sp. and *Bassia diffusa* associated with the salt marsh). • Waypoint 044 (adjacent to Substation site 1): *Phragmites australis*-dominated marsh. • 047 (34° 0.311'S; 23° 22.508'E) to 050 (34° 0.281'S; 23° 22.287'E): marsh dominated by *Juncus krausii* and *Cyperus thunbergii*. • 051 (34° 0.269'S; 23° 22.237'E) to 053 (34° 0.240'S; 23° 21.987'E) includes the same habitat as above but with stands of *Typha capensis*. • 054 (34° 0.233'S; 23° 21.834'E) to 055 (34° 0.240'S; 23° 21.781'E) the same habitat as above. • 056 (34° 0.239'S; 23° 21.723'E) to 058 (34° 0.237'S; 23° 21.666'E). **Vegetation type:** Cape Lowland Alluvial Vegetation and Garden Route Shale Fynbos **Mitigation:** The marshland should be avoided and transformed dryland 'island' and used for	 View towards Wittedrift along the R340 at waypoint 042.  CRITICALLY ENDANGERED Cape Lowland Alluvial Vegetation at waypoint 051.

the placement of pylons.

- Other noteworthy features/habitats are as follows: 042 (34° 0.381'S; 23° 22.968'E) to 043 (34° 0.365'S; 23° 22.865'E) line of pioneer thicket beneath rows of *Eucalyptus* sp. and *Schinus terebinthifolius.*

Substation Site 1

The area comprises a transformed patch of farmland dominated by *Stenotaphrum secundatum* and re-emergent shrubs which include *Searsia lucida, Conyza scabrida, Osteospermum moniliferum, Tarchonanthus camphoratus* (small tree) and *Seriphium cinereum* clumps on the southern half of the site. Additional species include **Vicia* sp., **Briza maxima, *Rubus* cf. *cuneifolius* and *Arctotheca calendula*. The southern boundary comprises the rows of exotic trees and re-emergent pioneer thicket species described between waypoint 042 and 043.

Substation Site 2

The site is similarly transformed as Site 1 and comprises transformed farmland covered *Stenotaphrum secundatum,* with emergent stands of *Euryops virgineus* and isolated patches of *Juncus krausii.*

The site was previously surveyed by McDonald (2007) and corresponds to waypoint Rb20 which noted the same: 'This area is all agricultural land and there is little vegetation left except in the road reserve.' The road reserve vegetation is dominated by *Juncus krausii, Stenotaphrum secundatum, Searsia lucida, Hermannia* sp*. and Euryops virgineus*.

Vegetation type: Cape Lowland Alluvial Vegetation and Garden Route Shale Fynbos.
Mitigation: Only disturbed dryland area should be use to place pylons between the sections described above as Cape Lowland Alluvial Vegetation.

Substation Site 1 at waypoint 045 (34° 0.356'S; 23° 22.961'E)

Substation Site 1 at waypoint 34° 0.335'S; 23° 22.640'E)

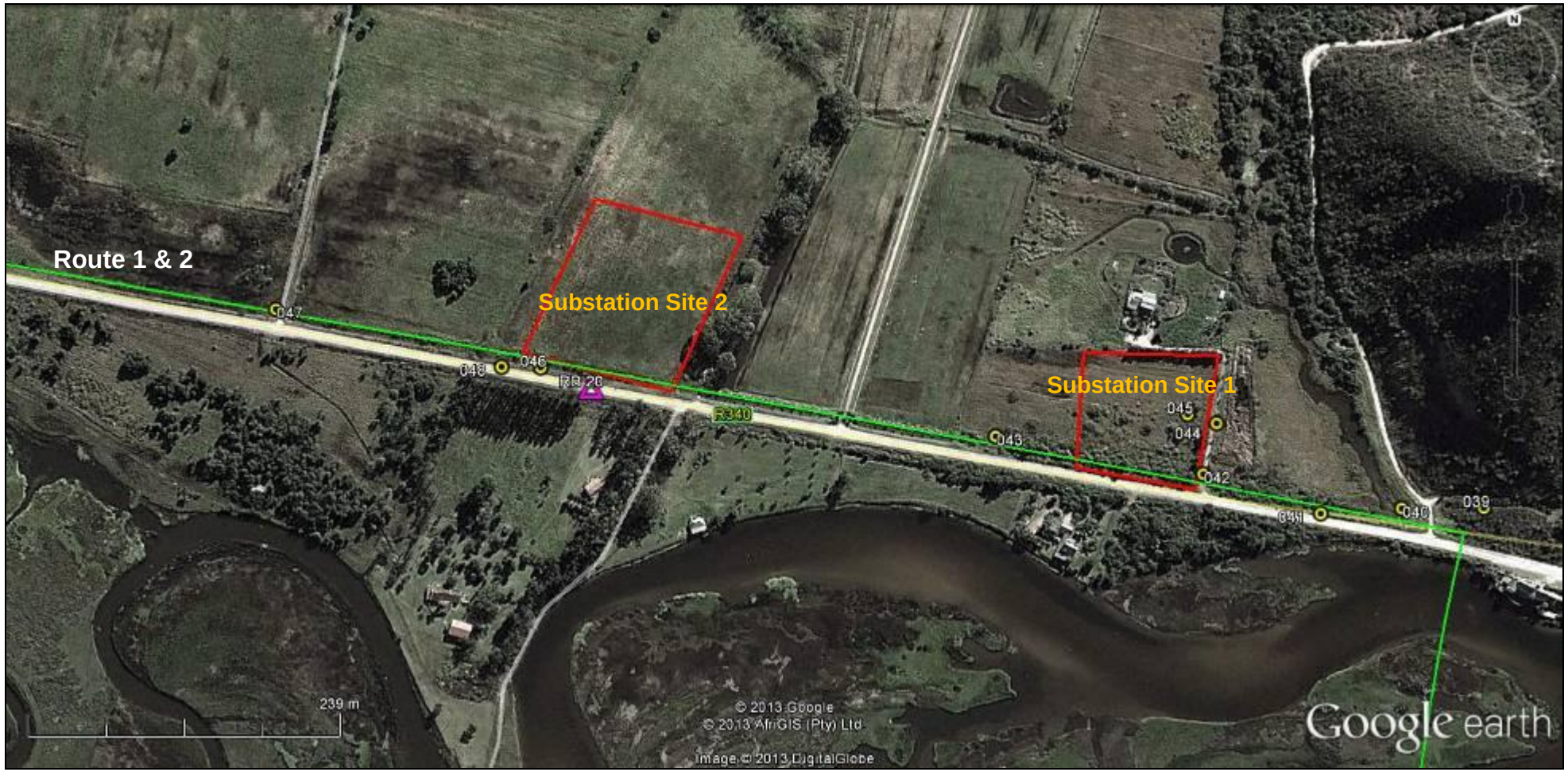


Figure 19. Google Earth™ aerial image showing the proposed 66kV powerline Route 1 & 2 (green lines) between waypoint 040 and placemarks 047, including proposed Substation Site 1 and 2. The numbered yellow circle icons are the waypoints from the 2013 survey.

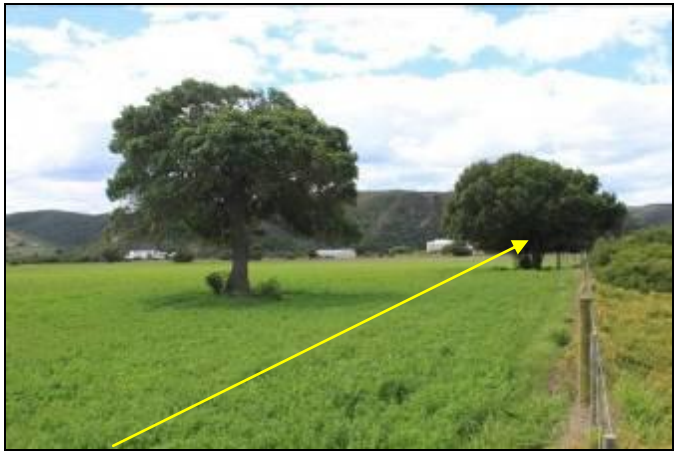
Figure 20. Google Earth™ aerial image showing the proposed 66kV powerline Route 1 & 2 (green lines) between waypoint 049 and placemarks 057, including proposed Substation Site 1 and 2. The numbered yellow circle icons are the waypoints from the 2013 survey. The numbered purple numbered icons with the 'RB' prefix are McDonald's (2007) sample waypoints.

Route 4

Waypoint section	General description and list of species	Images of sample points
waypoint 092 34° 2.181'S 23° 21.807'E to **085** 34° 2.176'S 23° 22.338'E (Figure 21)	Route 4 breaks away to the east from Route 1, 3 & 4 and passes through the black wattle-(*Acacia mearnsii*), *Lantana camara*- and *Nerium oleander*-infested river course, before reaching the WWTW. The habitat has remnant forest species noted previously in the vicinity of waypoint 095, which includes *Sideroxylon inerme, Olinia ventosa, Cassine peragua, Scolopia mundii* and *Olea* cf. *europea subsp. africana.* From waypoint 092 the route passes through a narrow cleared servitude supporting a mixed vegetation type of fynbos and forest with moderate infestations of black wattle (*Acacia mearnsii*), rooikrans (*Acacia cyclops*) and silky hakea (*Hakea sericea*). The mix of natural species includes *Euryops virgineus, Leucadendron salignum, Cassine peragua, Searsia lucida, Olea europea* subsp *africana, Erica* sp., *Anthospermum aethiopicum, Osteospermum moniliferum, Elytropappus rhinocerotis, Passerina falcifolia,* and, most notably, a large milkwood tree (*Sideroxylon inerme*) at waypoint 093 (34° 2.183'S; 23° 21.822'E). In the vicinity of waypoint 090 the proposed route becomes densely infested with black wattle yet there are several important forest species within the infestations. These include large individuals of *Podocarpus falcatus, Sideroxylon inerme, Olea europaea subsp. africana* and *Buddleja saligna*. Additional species include *Searsia lucida*, *Osyris compressa* and *Diospyros dichrophylla.* The opposite, or north side of the gravel track, contains better quality forest than the south side, and should therefore be avoided. After waypoint 090 the habitat changes to pure black wattle stands. Further along, at waypoint 088 (34° 2.184'S; 23° 22.225'E) there are several forest and thicket species within the wattle infestations, such as *Sideroxylon inerme, Olea europaea* subsp*. africana, Scolopia mundii, Grewia occidentalis, Trimeria grandifolia and Searsia chirindensis*. The alien infestations continue from this point to waypoint 085, where the route meets the N2 National Highway. **Vegetation type:** Garden Route Shale Fynbos and Southern Afrotemperate Forest **Mitigation:** Avoid the protected forest species *Sideroxylon inerme and Podocarpus falcatus*.	 View towards the N2 at waypoint 093 (blue circle = milkwood tree).  View towards the WWTW at waypoint 090.

Figure 21. Google Earth™ aerial image showing the proposed 66kV powerline Route 4 (green lines) between waypoint 092 and placemarks 085. The numbered yellow circle icons are the waypoints from the 2013 survey.

Route 4

Waypoint section	General description and list of species	Images of sample points
waypoint 092 34° 2.181'S 23° 21.807'E to **121** 34° 0.608'S; 23° 23.445'E (Figures 22, 23 & 24)	Most of the route along the N2 highway between Old Nick and Site 3 is transformed. Between waypoint 092 and 099 the area comprises stands of black wattle (*Acacia mearnsii*). Natural species recorded beneath the tree canopy include *Searsia glauca* and *Grewia occidentalis*. At waypoint 099 (34° 1.921'S; 23° 22.514'E) there is a section of degraded, albeit wattle-free, fynbos. Species observed include *Seriphium* sp. *Passerina* sp., *Melinis repens, Hyparrhenia hirta, Ursinia* sp., *Grewia occidentalis, Leucadendron salignum, Carpobrotus* sp., *Selago corymbosa, Anthospermum aethiopicum, Bulbine frutescens*, *Thamnochortus insignis* and *Delosperma* sp. The habitat ends at waypoint 110 (34° 1.768'S; 23° 22.607'E). At waypoint 114 (34° 1.284'S; 23° 22.930'E) the roadside is dominated by the following shrubs: *Grewia occidentalis, Searsia glauca, Osteospermum moniliferum* and *Passerina* sp. This continues to the Bitou River bridge. On the opposite side of the road reserve the land is open farmland that harbours several old milkwood trees (*Sideroxylon inerme*). Most of these are within 80 – 100 m from the fence line, however, two large individuals occur at waypoint 117 (34° 0.866'S; 23° 23.208'E). Clumps of *Euclea racemosa* occur in the road reserve at this point. Another very large milkwood tree occurs at waypoint 121 (34° 0.608'S; 23° 23.445'E) in the area previously surveyed by Porter & Clark (2013) between pylon B15 and B16. **Vegetation type:** Garden Route Shale Fynbos **Mitigation:** The large milkwoods at waypoint 117 and 121 must be avoided. The remnant patch of disturbed fynbos between waypoint 099 and 110 should not be brush cut. An ECO must ensure that none of the other milkwood trees near waypoint 117 are impacted on during the construction phase.	 View along the N2 towards the Bitou Valley at waypoint 109 (34° 1.842'S; 23° 22.557'E).  Very old milkwood trees at waypoint 117 (34° 0.866'S; 23° 23.208'E). View towards the Bitou Valley from the N2.

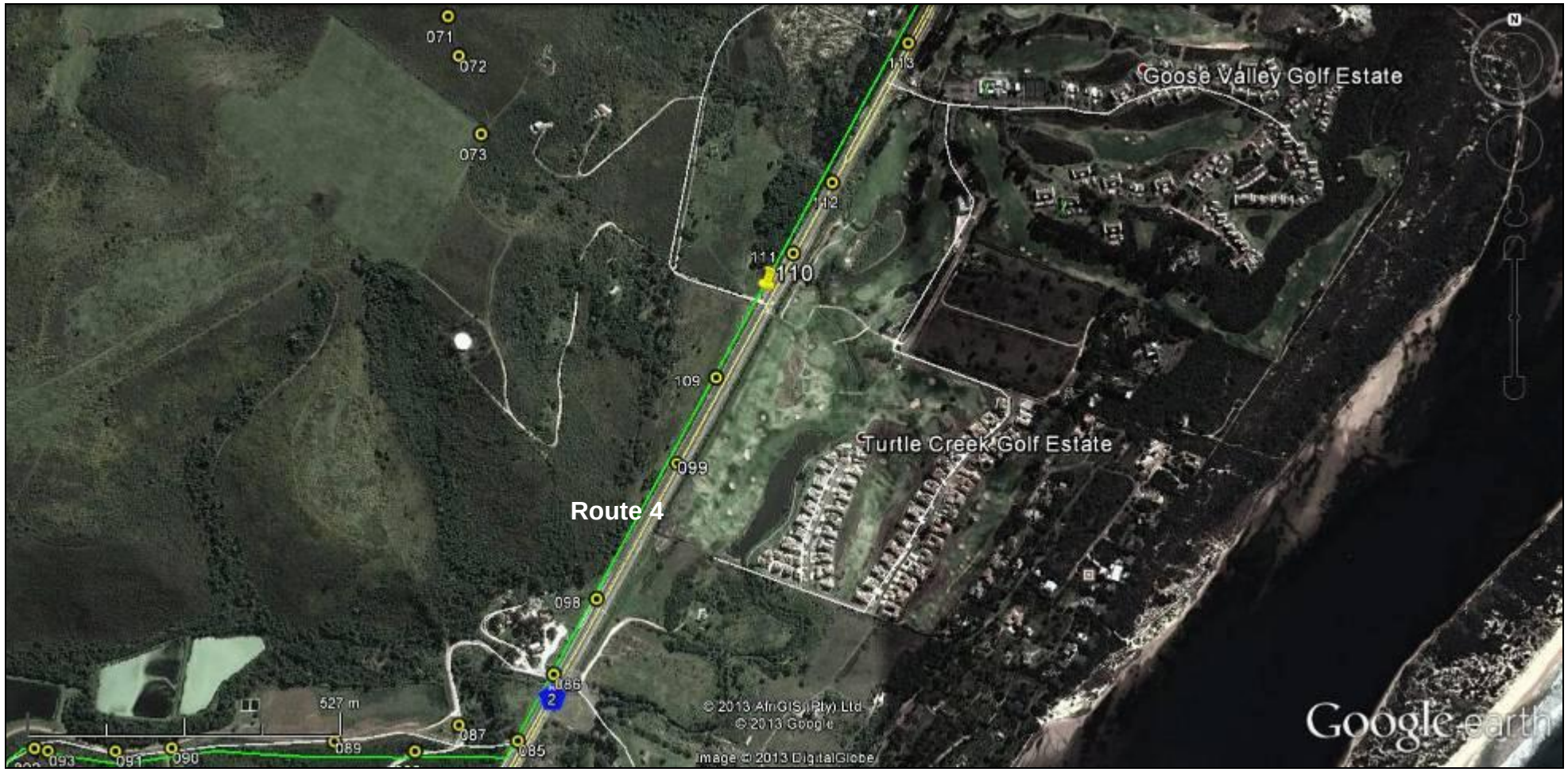


Figure 22. Google Earth™ aerial image showing the proposed 66kV powerline Route 4 (green lines) between waypoint 085 and placemarks 113. The numbered yellow circle icons are the waypoints from the 2013 survey.

Figure 23. Google Earth™ aerial image showing the proposed 66kV powerline Route 4 and Route 3 (green lines) between waypoint 114 and placemarks 117. The numbered yellow circle icons are the waypoints from the 2013 survey.

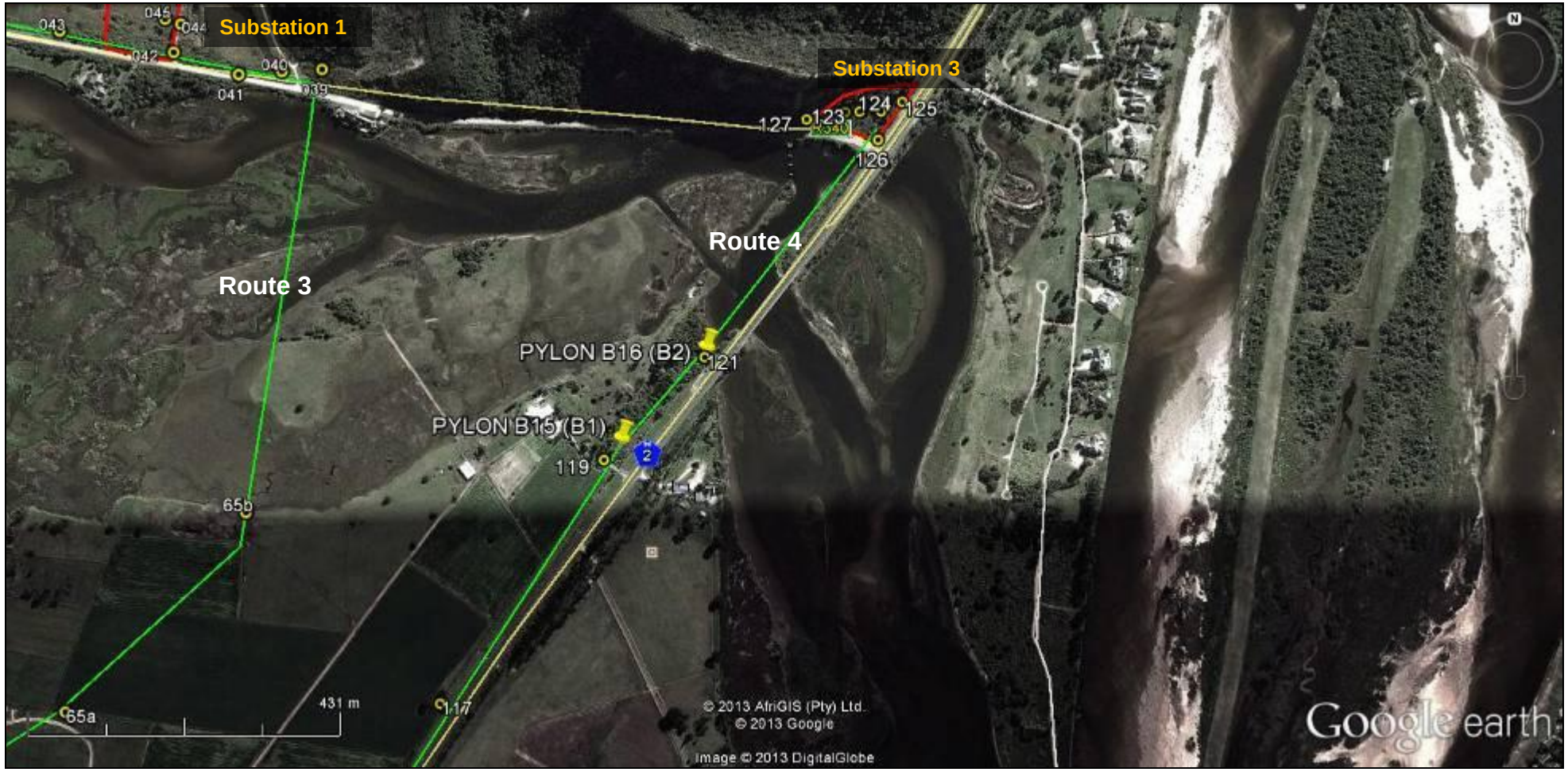


Figure 24. Google Earth™ aerial image showing the proposed 66kV powerline Route 4, Route 3 (green lines) and Substation Sites 2 & 3 between waypoint 117 and placemarks 126 and proposed Substation Site 3. The numbered yellow circle icons are the waypoints from the 2013 survey.

Route 4

Waypoint section	General description and list of species	Images of sample points
waypoint 092 34° 2.181'S 23° 21.807'E to **085** 34° 2.176'S 23° 22.338'E (Figure 21)	**Substation Site 3** The site was surveyed by Turner in 2008 and has not changed since his assessment. Turner noted that the flat portion of Site 3 (also referred to as Site C) was of low conservation priority due to the heavy infestations of black wattle with an understorey of various exotic weeds (e.g. *Bidens pilosa* and *Conyza bonariensis*). It was also noted that the steep cliffs and foot-slopes are of high conservation value. The extent of the wattle infestation was mapped during the 2013 survey (Figure 25). The portions of the site nested against and including the cliff faces are still intact and include several indigenous forest species and a cliff habitat. **The most notable botanical feature is a large and very old (estimated to be over 800 years old) milkwood tree at waypoint 122** (34° 0.427'S; 23° 23.572'E). Additional tree species occurring at the base of the cliff include *Nuxia floribunda, Scolopia mundii, Buddleja saligna, Tarchonanthus camphoratus, Searsia chirindensis* and *Grewia occidentalis*. There are also several individuals of *Buddleja saligna* and *Tarchonanthus camphoratus* on the southern boundary along the road edge. Additional species occurring sparsely include *Tritoniopsis caffra* and *Osteospermum moniliferum.* The cliff habitat has not changed since Turner's assessment. Species recorded in 2008 (Turner) and 2013 (Emms) include *Crassula rupestris, Crassula orbicularis, Bulbine frutescens, Polygala myrtifolia, Stachys aethiopica, Helichrysum cymosum, Dipogon lignosus, Tritoniopsis caffra and Cliffortia serpyllifolia.* **Vegetation type:** Southern Afrotemperate Forest and Coastal Shale Band Vegetation **Mitigation:** The very old milkwood tree must not be disturbed in any way. The area should be cleared of wattle and all litter and alien weeds removed. The site is the least suitable of the three proposed substation sites since the remaining two are located in agricultural land. The site may also be vulnerable to landslides due to the presence of conglomerates and shale on the cliff face.	 Proposed Substation Site 3.  The large and very old milkwood tree (*Sideroxylon inerme*) that occurs at waypoint.

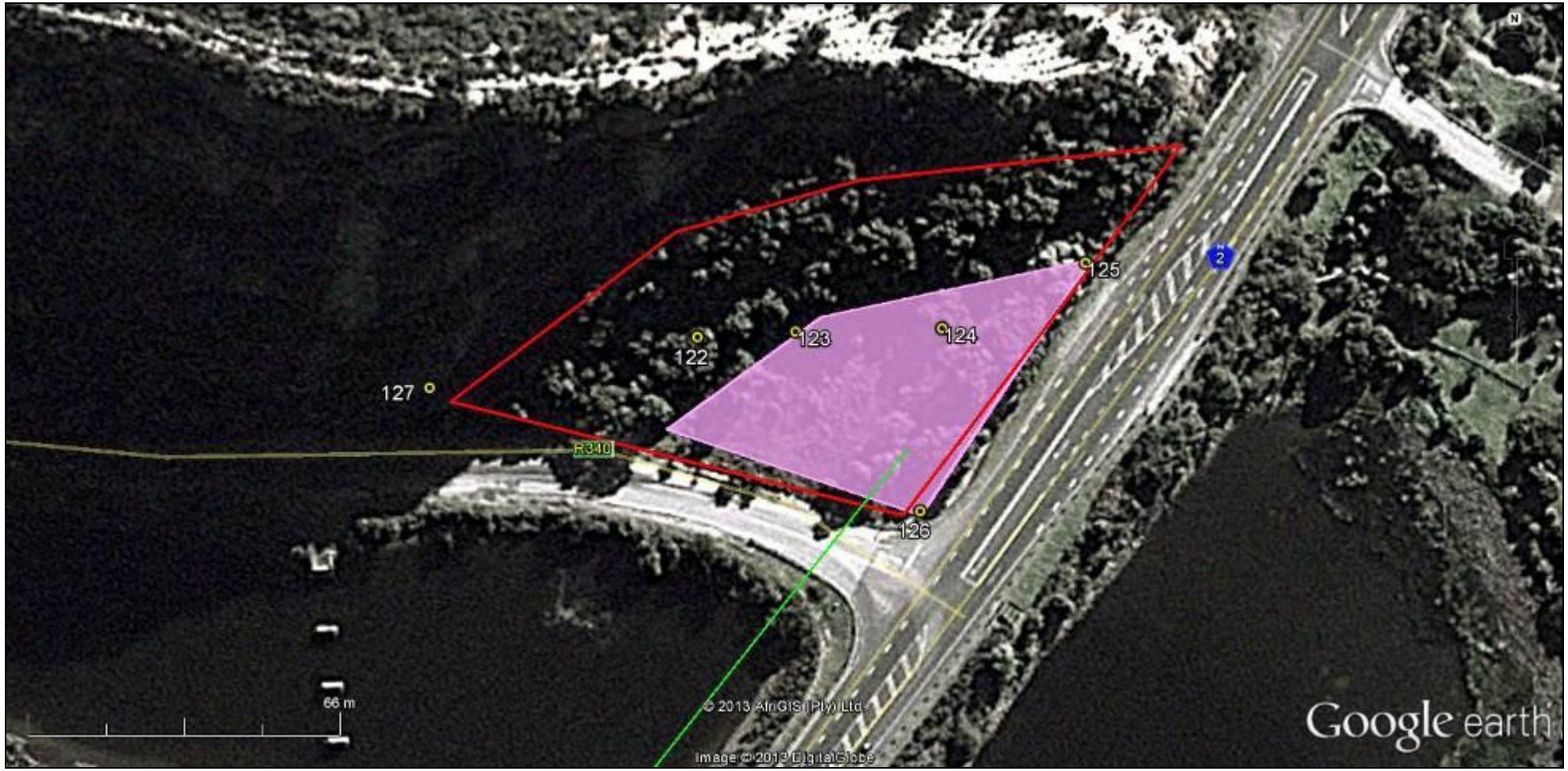


Figure 25. Google Earth™ aerial image showing the proposed Substation Site 3. The numbered yellow circle icons are the waypoints from the 2013 survey. The pink shading indicates the degraded alien-infested portion of the site.

7. Impact Assessment

The assessment of impacts takes into consideration the potential impacts on the environment (i.e. vegetation). The activity of the impact in conjunction with the sensitivity of the habitat determines the level of potential negative effect on the affected habitat. The proposed powerline route entails (1) the removal of vegetation at each pylon location which would be a relatively small surface area (i.e. 20 m x 20 m), (2) construction of tracks for maintenance purposes, and (3) possible repeat (yearly) cutting of vegetation beneath the powerlines. Impacts are assessed according to the construction and operational phase of the project and on the basis of the route alternatives. Mitigation options are also provided. The No Go option is also assessed.

7.1 'No Go' Alternative

The No Go alternative is an assessment of the *status quo* under the no construction scenario. The greatest foreseeable change along several sections of the route under the no construction scenario is an increase in spread of invasive alien vegetation. In terms of other areas the *status quo* would otherwise continue under the No Go scenario.

7.2 Direct impacts

Direct impacts are those that relate directly to the activity, which in this case would be of a higher intensity and significance for the construction of pylons during the construction phase, and of higher intensity and significance for the affected vegetation beneath the powerlines during the operational phase (i.e. long-term). Direct impacts would be caused by (1) clearing of vegetation and disturbance of topsoil in order to construct the pylons, and (2) continued cutting and potential invasion by alien species within the affected habitat beneath the powelines. The impact on the existing vegetation and habitat are assessed in Table 1 according to the following interrelated components:

- Loss of vegetation type – including intact vegetation, ecologically important species and species of conservation concern.

- Loss of ecological processes – associated with the loss of intact vegetation, ecologically important species and species of conservation concern.

Table 1. Impact and Significance – Loss of vegetation and species associated with the proposed Robberg– Bitou 66kV Powerline and Substation Sites during the construction and operational phases.

Actions	Vegetation type	Nature of impact	Extent	Irreplaceability	Duration	Magnitude	Significance	Status	Probability of occurrence	Confidence
No Go	All vegetation types and habitats	Loss of natural vegetation & species	National	Very low	Long-term	Very low	Very low	Neutral	Unlikely	High
Without mitigation Intact vegetation	Cape Lowland Alluvial Vegetation (CRITICALLY ENDANGERED)	Loss of natural vegetation & species	National	Very High	Long-term	High	High	-ve	Unlikely	High
With mitigation Intact vegetation	Cape Lowland Alluvial Vegetation (CRITICALLY ENDANGERED)	Loss of natural vegetation & species	National	Very High	Long-term	Medium to High	Low to Medium	-ve	Unlikely	High
Without mitigation Intact vegetation	Garden Route Shale Fynbos (VULNERABLE)	Loss of natural vegetation & species	National	High	Long-term	Medium to High	Medium	-ve	Likely	High
With mitigation Intact vegetation	Garden Route Shale Fynbos (VULNERABLE)	Loss of natural vegetation & species	National	High	Long-term	Medium	Medium	-ve	Likely	High
Without mitigation Intact vegetation	Southern Afrotemperate Forest Includes protected milkwood trees (*Sideroxylon inerme*) and yellowwood trees (*Podocarpus falcatus*)	Loss of natural vegetation & species	National	Medium to High	Long-term	Medium	Medium to High	-ve	Uncertain	High

With mitigation Intact vegetation	Southern Afrotemperate Forest	Loss of natural vegetation & species	National	Medium to High	Long-term	Low to Medium	Medium	-ve	Uncertain	High
Without mitigation Intact vegetation	Outeniqua Sandstone Fynbos	Loss of natural vegetation & species	Local	Low to Medium	Long-term	Medium	Medium	-ve	Likely	High
With mitigation Intact vegetation	Outeniqua Sandstone Fynbos	Loss of natural vegetation & species	Local	Low to Medium	Long-term	Low to Medium	Low to Medium	-ve	Likely	High
Without mitigation Intact vegetation	Cape Estuarine Salt Marshes	Loss of natural vegetation & species	National	High	Long-term	Medium	Medium to High	-ve	Unlikely	High
With mitigation Intact vegetation	Cape Estuarine Salt Marshes	Loss of natural vegetation & species	National	High	Long-term	Low to Medium	Low to Medium	-ve	Unlikely	High

- **Loss of vegetation type and important species identified**

  Loss of vegetation is assessed according to loss of intact natural vegetation, since the natural vegetation observed is generally either intact or transformed. The transformed farmland sections of the routes were not assessed since there would be no loss of natural vegetation in these areas. Table 1 lists the various habitats which occur across the route alternatives. Table 2 lists the habitat types, impacts and preferred alternative routes based on the overall impact expected.

- **Loss of ecological processes**

  Loss of ecological processes would be of a similar order of magnitude to loss of vegetation type since most of the ecological processes are dependent on the vegetation either directly or indirectly. Loss of ecological processes would be most severely negatively impacted by loss of habitat and if the habitat is altered due to alien infestations occurring in newly disturbed servitudes.

Mitigation

The most important form of mitigation would be to avoid all sensitive habitat, which includes all intact patches of natural vegetation and important species identified. Site specific mitigation has been given at each sample point and should be considered along with the following:

- Disturbance to vegetation should be kept to a minimum. This should include only single track access (i.e no turn-around points) and these should be constructed as a once off, so that the vegetation can regenerate after cutting to prevent the spread of invasive alien vegetation.
- Pylons should, as a far as possible, be placed in disturbed areas only. The ECO must ensure that no sensitive habitats are negatively impacted on as highlighted in the site-specific vegetation descriptions.
- Important plant species (e.g. *Podocarpus falcatus* and *Sideroxylon inerme*) must be tagged so that maintenance staff do not destroy them.

- An Environmental Control Officer (ECO) to be present during all phases of the project, which should include training and monitoring to ensure best practice with respect to vegetation management.

Management of vegetation along servitudes (taken from Emms & McDonald, 2013)

- Vegetation management should be based on site-specific assessment. Sensitive vegetation types and species must be identified and included in a specifically focused Environmental Management Program (EMP). The intention would be to inform managers and contractors so that sensitive plant species or patches of vegetation are avoided.
- Consider Eskom's ToR as provided in ESKASABG3 (2000) (page 7) for developing EMP's.
- Fire is needed to maintain reseeding species, thus fire should be seen as *the* ideal for maintaining ecological integrity and preventing loss of species. As a general rule, fynbos should burn every 12 to 15 years and not more or less frequently.
- Vegetation at any site must not ever be brush cut in two consecutive years. Time should be allowed for seed set and seed bank accumulation (e.g. no heavy cutting of sensitive species for three to four years since certain species retain seeds for this long). The severity of damage caused by cutting is different for each species and vegetation type.
- Pruning of old stems to be AVOIDED wherever possible.
- Any ancient trees found must not be pruned down.
- All Invasive Alien Plants (IAPs) must be removed.
- No herbicides to be used on natural vegetation. Restrict application to IAPs.
- Specialist **monitoring, including impact and compliance monitoring** of servitudes along CBA sites and all sections of the route, in particular sensitive areas.
- Contractors involved in the construction and operational phases of the project, including placement of pylons and management of vegetation must be trained and informed about the sensitive areas highlighted in this report. Method Statements must specify this.
- With regard to the construction phase of the 66kV line(s) it is important that any disturbance of vegetation outside the proposed construction area be rehabilitated to its original state.

Table 2. Overall preference rating for the proposed 66kV powerline route alternatives and substation sites

Route Alternative	Concluding remarks and adjusted (relative) impact rating for all alternatives	Sensitivity (1 = preferred to 7 = least preferred) & general impact rating	Preferred route of paired alternatives	
1 & 3 & 4	Outeniqua Sandstone Fynbos: Medium impact Garden Route Shale Fynbos: Medium impact Alien infested wattle at the WWTW: Low Impact	Low to Medium	N/A	1st preference with Route 4
1 & 3	Garden Route Shale Fynbos: Medium impact	Medium	N/A	2nd preference
3	Garden Route Shale Fynbos : Medium Cape Lowland Freshwater Wetlands: Would be avoided Riverine thicket Cape Estuarine Salt Marsh	Low to Medium	N/A	2nd preference
2	Outeniqua Sandstone Fynbos: Low impact Garden Route Shale Fynbos: Medium impact Thicket patches: Low impact Southern Afrotemperate Forest: Medium to High Southern Afrotemperate Forest – Riparian Forest and milkwood clumps: Medium to High Cape Lowland Alluvial Vegetation: High thicket Cape Estuarine Salt Marsh: Medium to High	Medium to High	N/A	3rd preference
1 & 2	Cape Lowland Alluvial Vegetation: High Garden Route Shale Fynbos: Medium Cape Estuarine Salt Marshes: Medium to High	Medium to High	N/A	3rd preference
1e	Garden Route Shale Fynbos: Medium	Medium to High	Yes	3rd preference

	Thicket patches Cape Lowland Alluvial Vegetation: High Southern Afrotemperate Forest – Riparian Forest and milkwood clumps: Medium to High			
1d	Garden Route Shale Fynbos: Medium Cape Lowland Alluvial Vegetation: High Southern Afrotemperate Forest – Riparian Forest and milkwood clumps: Medium to High	Medium to High	No	3rd preference
1b	Garden Route Shale Fynbos: Medium (insipient) Southern Afrotemperate Forest: Low to Medium Thicket pathes: Low	Medium	Yes	3rd preference
1c	Garden Route Shale Fynbos: Medium Thicket pathes: Low to Medium	Low to Medium	No	3rd preference
4	Garden Route Shale Fynbos: Low Southern Afrotemperate Forest: Medium to High	Low to Medium	N/A	1st preference with Routes 1 & 3 & 4
Substation 1	Transformed farmland: Low	Low	Yes	2nd preference
Substation 2	Transformed farmland: Low	Low	Yes	1st preference
Substation 3	Southern Afrotemperate Forest: Medium to High Coastal Shale Band Vegetation: Low to Medium	Medium	No	3rd preference

7.3 Indirect impacts

Indirect impacts are those that are not experienced in the proposed development area but occur away from the source of impact. This would potentially occur if the salt marshes (Cape Estuarine Salt Marshes) were impacted if pylons and service roads are placed in this habitat. Any changes to flow or nutrient load and composition would potentially affect the system up- and down-stream. This aspect is, strictly speaking, more appropriately dealt with in the estuarine study, however, any loss of riparian vegetation or salt marsh vegetation is expected to contribute to erosion and should therefore be avoided completely.

7.4 Cumulative impacts

Cumulative impacts are incremental changes that result from continued pressure on a particular habitat, resource or ecological process. In the Western Cape cumulative impacts are a threat to many ecosystems since a number of these are threatened in some way. Cumulative impacts may also relate to 'Least Threatened' ecosystems. In this case the loss of CRITICALLY ENDANGERED Cape Lowland Alluvial Vegetation would be most severe, followed by loss of VULNERABLE Garden Route Shale Fynbos. Loss of Southern Afrotemperate Forest, which includes riparian forest and milkwood trees (*Sideroxylon inerme*) would also contribute to overall loss of the ecosystem habitats and species.

The natural forests, thicket and fynbos vegetation between George and The Crags has been detrimentally fragmented by farming, plantations, road infrastructure, coastal development and invasive alien vegetation. The ecological links between these ecosystems becomes increasingly compromised with added development pressure. The impacts linked to the construction of powerlines can have both positive and negative implications in terms of the nature of the impact. Servitudes are, however, destructive in nature, since they require road infrastructure and clearing of vegetation at each pylon or substation point. Cumulative impacts would relate to the following:

1. Fragmentation and potential loss of habitat. Further loss in any ecosystems raises the risk of threat in terms of the conservation status. Further loss of Garden Route Shale Fynbos, which is a VULNERABLE ecosystem, would result in a negative cumulative impact if further loss occurs. This also applies to the CRITICALLY ENDANGERED Cape Lowland Alluvial Vegetation. In the same way loss of the remaining unlisted ecosystems would have negative cumulative impact as previously stated. Lastly, any loss of very old forest

tree species such as *Podocarpus falcatus, Podocarpus latifolius* and *Sideroxylon inerme* would have a negative cumulative impact.

2. Clearing of vegetation acts a conduit for invasion by alien vegetation due to the disturbance or gap creation.

8. Conclusions and Recommendations

- The results of the 2013 re-survey show that there has not been substantial change in the vegetation along the surveyed routes form 2007 when they were originally surveyed by McDonald (2007) to the recent survey in 2013. There have been no major fires in the area and the greatest change is the increase in invasive alien infestation.
- The assessment of the proposed powerline routes and substation sites and the rank of each alternative, based on the relative impact significance rating, is presented and summarized in Table 2.
- Route 4, which is ESKOM's preferred alternative, was also rated as the preferred route alternative in this assessment since impacts would be lowest due to the high levels of transformation along the route. Highlighted areas of sensitivity should, however, be avoided to reduce impacts as far as possible. The proposed Substation Site 3 is the least preferred of the three sites due to the presence of a large and very old milkwood tree, along with a sensitive cliff habitat. It is noted that the site may be at risk from landslides but this would have to be assessed by a geotechnical specialist.
- Route 2, which includes a section of Route 1, is the least preferred of the three alternatives due to (1) the most extensive stretches of intact vegetation that would be affected and (2) variety of habitats, which includes CRITICALLY ENDANGERED Cape Lowland Alluvial Vegetation (sedgelands and reed bed).
- If any milkwood (*Sideroxylon inerme*) or yellowwoods trees (*Podocarpus falcatus* and *Podocarpus latifolius*) have to be removed or in any other way affected, application to the Department of Agriculture, Forestry & Fisheries (Western Cape region) for permits would be required. The above trees are protected under the National Forests Act of 1998 (Act No. 84 of 1998). It is strongly recommended that these species are therefore avoided wherever possible.

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Report submitted: 9 December 2013