FRESHWATER ASSESSMENT FOR THE PROPOSED ESKOM GOURIKWA-BLANCO POWERLINE AND SUBSTATION UPGRADES

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APPROVED BY Mr Dana Grobler

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EXECUTIVE SUMMARY

This freshwater assessment is intended to inform the authorisation process for the proposed Eskom Project between the Gourikwa and Blanco Substations. The project will consist of the construction of an approximately 60km 400kV transmission power line, including the construction of the new Blanco Substation approximately 60km north-east of the existing Gourikwa Substation.

Aquatic features which occur within the study area include the following:

- *Lower Gouritz tributaries – Stink and Buffels Rivers;*
- *Some small coastal streams at Mossel Bay;*
- *Hartenbos River and its tributaries;*
- *Klein Brak and its tributaries;*
- *Groot Brak and its tributaries; and*
- *Maalgate River.*

Wetland areas within the study area consist largely of valley bottom wetlands that are associated with the rivers and are of similar ecological condition and importance.

The habitat integrity of the rivers range from being moderately modified (upper reaches of the larger rivers as well as the smaller streams) to being in the seriously modified ecological state (lower reaches of the larger river systems). The riparian habitat of these rivers tends to be more impacted by the direct impact of the surrounding land use activities which has resulted in removal of the natural indigenous vegetation and the subsequent growth of invasive alien plants. Within the instream habitat, water abstraction and flow modification have the most impact, particularly on the lower reaches.

The ecological importance and sensitivity of the rivers within the study area range from being of a moderate (smaller tributaries and streams) to very high ecological importance and sensitivity (larger estuarine systems). This is due to the fact that these relatively small coastal rivers are very sensitive to flow and water quality changes and contain habitats (such as Gouritz Valley Thicket, coastal riparian forests and link to the Hartenbos, Klein Brak and Groot Brak Estuaries) and biota (frog species and fresh and estuarine fish species including the Knysna or Cape seahorse Hippocampus capensis) that are unique to the area.

With the potential impacts of the proposed activities, it is often the access roads associated with the transmission lines that are likely to have a greater impact on the freshwater features than the power lines themselves as the lines can usually span the freshwater features such that the pylons can be constructed outside of the rivers and wetland areas as well as their recommended buffer areas, whereas the roads need to be constructed through the freshwater features. It is thus often best if the new power lines are placed adjacent to existing lines or roads where new roads do not need to be constructed as part of the project.

In terms of the selection of the route selection for the transmission lines, it is recommended that a buffer of 50 from the top of the river banks and/or approximately 100m from the edge of the wetland areas be allowed for as a development setback for the construction of the pylons. This recommended buffer would also apply to the proposed new Blanco Substation.

Although the upper reaches of the rivers in the study are in general in a less modified ecological state, the alternative corridor with the least potential impact on the freshwater features in the area is likely to be the northern-most route (Alternative 1) as it would be more likely to be able to span the river valleys with little to no impact on the rivers and associated wetlands at the valley bottoms, while the southern corridors (Alternative 2 and the Deviation of Alternative 2) will need to cross the wide floodplains of the rivers. The alignment of the route within the corridor could also be determined to minimise the potential impact on the freshwater features within the study area. With mitigation, Alternative 1 is likely to have an impact of a very low significance to be insignificant on the freshwater features while Alternative 2 is likely to have an impact of a very low impact. The proposed Alternative 2 Deviation would have the largest potential impact on the freshwater features.

Assessment Criteria	**Alternative 1**	
	Without Mitigation	With Mitigation
Locality/Extent	Local	Local
Duration	Short and longer term	Short term
Intensity	Low	Low
Probability	Probable	Probable to improbable
Significance	Low to Very Low	Very Low to insignificant
Confidence	Medium to High	Medium to High
Nature of Cumulative impact	Loss of aquatic habitat with some flow and water quality impacts	
Degree to which impact can be reversed	Partially to fully reversible	
Degree impact may cause irreplaceable loss of resources	Low	
Degree to which impact can be mitigated	Low to very low	
Assessment Criteria	**Alternative 2**	
	Without Mitigation	With Mitigation
Locality/Extent	Local	Local
Duration	Short and longer term	Short term
Intensity	Medium to Low	Medium to Low
Probability	Probable	Probable to improbable
Significance	Medium to Low	Low
Confidence	Medium to High	Medium to High
Nature of Cumulative impact	Loss of aquatic habitat with some flow and water quality impacts	
Degree to which impact can be reversed	Partially to fully Reversible	
Degree impact may cause irreplaceable loss of resources	Low	
Degree to which impact can be mitigated	Low to very low	

A water use authorization may need to be obtained from the Department of Water and Sanitation: Western Cape Regional Office for approval of the water use aspects of the proposed activities.

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1. BACKGROUND

The need to upgrade the existing Eskom infrastructure was identified in the Western Cape Generation Expansion Planning report, where a third line needs to be built out of the Gourikwa power station. As a first step to address this need it is proposed to construct a 400kV transmission power line from the Gourikwa substation to Blanco (Narina) substation, a new substation to be constructed approximately 60km to the north-east of the Gourikwa substation. The Gourikwa Substation is located approximately 15km West of Mossel Bay, just north of the N2 road. Three alternative routes have been selected for the proposed transmission line route. This freshwater assessment is intended to inform the authorisation process for the proposed Eskom Project between the Gourikwa and Blanco Substations.

Figure 1. Locality map of the proposed alternative routes and the substations (SANBI Biodiversity GIS, 2015)

2. TERMS OF REFERENCE

The suggested and agreed upon work programme based on the above terms of reference were:

Task 1: Freshwater impact Assessment

Task 1.1.Literature Review and assessment of existing information: Conduct a review of existing studies, reports and data of the area and the detail on the proposed solar energy facility.

Task 1.2.Site Assessment of the freshwater ecosystems that may be impacted upon by the proposed development activities: Undertake a site assessment of the area in which the lines are proposed. The assessment will include:

- an assessment of the ecological condition of the freshwater features (rivers) and wetlands (pans) in the study area and ephemeral streams and drainage lines to determine the overall ecostatus of the streams and provide data that will inform Task 1.3 of the project;

Task 1.3.Compilation of the report: Impact assessment: Based on the data and information collected in the previous tasks, describe ecological characteristics of the freshwater systems to be impacted. Evaluate the proposed development activities and their potential impacts, and propose mitigation measures for the development. Describe the potential impacts, the significance of those impacts, and weigh and rank each impact during the project life cycle stages, according to the assessment, ranking, weighting and scaling criteria as laid out in the EIA Regulations. Write up findings and recommendations for EIA process.

Task 1.4.Review reports and findings in line with alternative options presented: Most likely the final routes cannot be determined before some of the technical studies have been undertaken to inform the decisions. This will lead to changes in the layout plans and will require the updating of reports to reflect the changes.

Task 1.5: Review and liaison and finalisation of the report: Liaise with the DWS in the Western Cape to determine the need to make comment on report and the need for water used authorisation.

3. LIMITATIONS AND ASSUMPTIONS OF THE STUDY

Input into this report was informed by a combination of desktop assessments of existing freshwater ecosystem information for the study area and catchment, as well as by a more detailed assessment of the freshwater features at the dam site. The site was visited in May 2015. During the field visit, the characterisation and integrity assessments of the freshwater features were undertaken. Mapping of the freshwater features was undertaken using a Garmin Colorado 300 GPS and mapped in PlanetGIS Professional. The SANBI Biodiversity GIS website was also consulted to identify any constraints in terms of fine-scale biodiversity conservation mapping as well as possible freshwater features mapped in the Freshwater Ecosystem Priority Areas maps. This information/data was used to inform the resource protection related recommendations as well as the instream flow requirement determination.

Limitations and uncertainties often exist within the various techniques adopted to assess the condition of ecosystems. The following limitations apply to the techniques and methodology utilized to undertake this study:

- Analysis of the freshwater ecosystems was undertaken at a rapid level and did not involve detailed habitat and biota assessments;
- The river health assessment was carried out using South African Department of Water and Sanitation developed methodologies. River Health assessments were carried out to provide information on the ecological condition and ecological importance and sensitivity of the river systems impacted.
- The ecological importance and sensitivity assessment was conducted according to the guidelines as developed by DWAF (1999).
- Recommendations are made with respect to the adoption of buffer zones within the development site, based on the river's functioning and site characteristics.

The level of aquatic assessment undertaken was considered to be adequate for this study.

4. USE OF THIS REPORT

This report reflects the professional judgment of its authors. The full and unedited content of this should be presented to the client. Any summary of these findings should only be produced in consultation with the authors.

5. OVERVIEW OF THE PROJECT AND STUDY AREA

5.1. OVERVIEW OF THE STUDY AREA

The study area lies in the George and Mossel Bay Municipal areas on the Southern Cape coast. Most of the proposed routes lie within the coastal plain between the foothills of the Outeniqua Mountains and the Indian Ocean. This area falls largely within the catchments of the small coastal rivers in the Gouritz Water Management Area, with most of the rivers being considered to be of a high ecological important and sensitivity. The surrounding land use consists largely of cultivated land and livestock as well as plantations. The vegetation within the river valleys is in general densely invaded with black wattle *Acacia mearnsii* trees.

Table 1 provides a summary of the main features of the freshwater and hydrological features of the area.

Table 1: Key information related to the water resources which may be impacted by the proposed activities

Descriptor	Name / details	Notes
Water Management Area	Gouritz WMAs	
Catchment Area	Lower Gouritz tributaries; Hartenbos; Klein and Groot Brak and Maalgate Catchments	
Quaternary Catchment	Lower Gouritz tributaries – Stink and Buffels (J40E); Hartenbos; Klein Brak and small coastal streams (K10A, B, D&F); Groot Brak (K20A); and Maalgate (K30A)	
Present Ecological state*	Lower Gouritz tributaries: Stink (C); Buffels (D); Hartenbos, Klein Brak and small coastal streams (D); Groot Brak (C); and Maalgate (D)	DWA 2012
EISC – Ecological Importance and Sensitivity	Lower Gouritz tributaries: Stink & Buffels (High); Hartenbos, Klein Brak and small coastal streams (Moderate/High); Groot Brak (High/Very high); and Maalgate (High/Very high)	DWA 2012
Type of water resource	Rivers and streams	
Latitude	34°09'58.5"S	Location of Gourikwa Substation
Longitude	21°57'37.3"E	
Latitude	33°55'32.0"S	Location of Blanco Substation
Longitude	22°22'08.4"E	
Status of Environmental authorisation process	This freshwater assessment report is prepared as input into the EIA process	Envirolution Consulting, 223 Columbine Avenue, Mondeor
Site visit	Mr Dana Grobler and Ms Toni Belcher	May 2015

* *Where C = moderately modified; D = largely modified*

5.2. ACTIVITY DESCRIPTION

The project will consist of the construction of an approximately 60km 400kV power line from the Gourikwa Substation to Blanco Substation, including the construction of the new Blanco (Narina) Substation.

The line starts north of Mossel Bay and runs in a north-easterly direction. Different route alternatives are being investigated (Figure 1). Two corridors (red and purple) have been identified for the proposed Gourikwa – Blanco 400kV power-line. There is a third corridor (yellow) which is a slight deviation from the purple corridor.

The red corridor exits Gourikwa Substation from the north-eastern side and is aligned to the north, following an existing 66kV power line. The alignment then turns north-easterly and runs parallel to the existing Proteus – Droerivier 400kV power-line for approximately 45km until it reaches the site of the proposed Blanco Substation.

The purple corridor exits Gourikwa substation in the same direction as the red corridor. The purple corridor turns easterly to cross over the R327 road and run parallel to the existing distribution power-lines. The purple corridor will cross over approximately four dams. The corridor is heavily characterised by water features and a more hilly terrain. It is proposed that the line runs parallel to the existing power-lines, to encourage better access during the studies and at construction phase.

The yellow deviation is an alternative of the purple corridor. The corridor is aligned easterly towards Hartenbos along the existing distribution power lines to avoid creating a completely new corridor. The yellow deviation joins the purple corridor on the northern side of Brandwacht River.

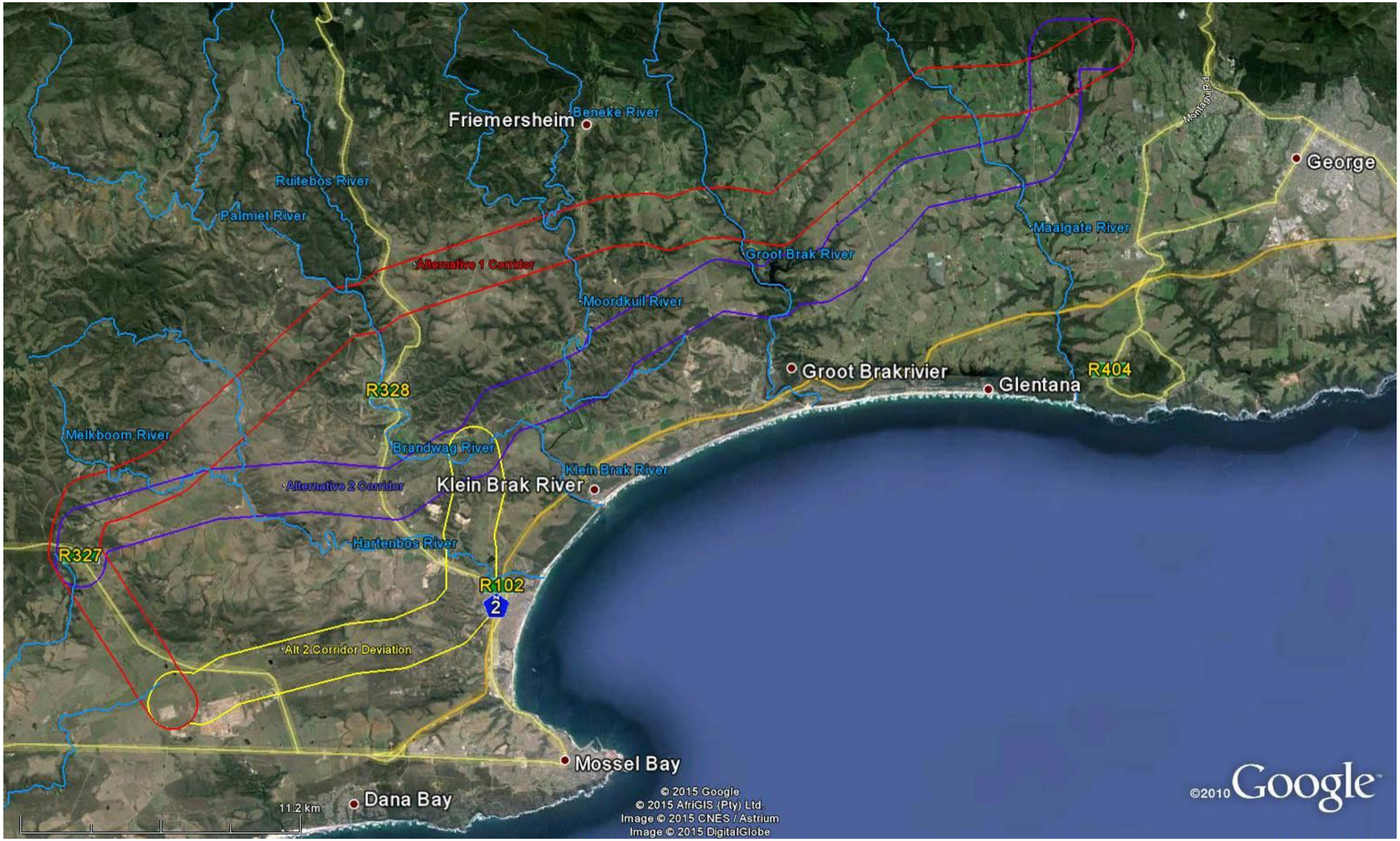

Figure 2: Google Earth image showing the alternative routes under consideration for the transmission line between Gourikwa and Blanco

6. DESCRIPTION OF THE STUDY AREA

6.1. VISUAL CHARACTERISTICS

The study area largely lies within the southern coastal strip between Mossel Bay and George. The topography in general slopes relatively steeply from the Outeniqua Mountains towards the sea, with foothills just south of the mountains followed by a narrow, flat coastal strip which is interspersed with river valleys. The rivers within the study area are short rivers with a relatively steep gradient that are fed by numerous small tributaries. Numerous storage dams have been constructed within the rivers.

Figure 3: View of the typical landscape within the study area with the foothills in the background

6.2. CLIMATE

The area normally receives about 662mm of rain per year, with rainfall occurring throughout the year. The lowest rainfall (36mm) occurs in June and the highest (78mm) in November. The average midday temperatures for George range from 18.2°C in July to 27.6°C in February. The region is the coldest during July when the mercury drops below 7°C on average during the night (Figure 4).

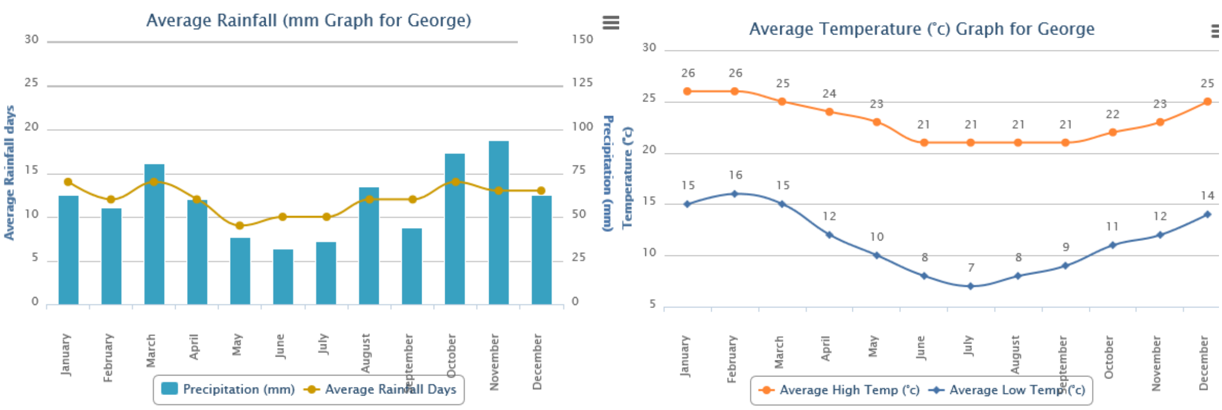

Figure 4: Average monthly rainfall and temperature graphs for the area (worldweatheronline.com)

6.3. GEOLOGY AND SOIL

Rocks of the Cape Supergroup underlie most of the area, while Pre-Cape and Cretaceous rocks and unconsolidated deposits of recent age occupy smaller areas. The Pre-Cape rocks comprise the Maalgaten Granite to the west of George. Strata of the pre-Cretaceous Table Mountain Group, which consists mainly of super mature quartz sandstones with subordinate shales, were subjected to severe north-south orientated compressive stresses. This produced the Cape Fold Belt with the more resistant strata, the Peninsula and Kouga Formations, forming the prominent east-west trending mountain ranges. The softer sandstones of the Tchando Formation and the shales of the Cederberg and Baviaanskloof Formations have weathered to form the intermontane and platform valleys.

The soils consist largely of poorly drained soils with a marked clay accumulation (dusky pink areas in Figure 5), becoming seasonally wet and having a high erosion potential. Within the valley floors of the lower river reaches as well as along the coastal strip (cream/pale brown areas) grey sandy soils occur that overlie deeper alluvial soils. On the slopes of the foothills (grey/brown areas), sandy leeched soils with organic matter overlie hard or weathering rock.

6.4. FLORA

The study area lies within the Fynbos Biome and, according to Marcina (2006) consists of the following indigenous vegetation types (Figure 6):

Vegetation Type	Conservation Status	Colour in Figure 6
Garden Route Shale Fynbos (FFc1)	Endangered	
Garden Route Granite Fynbos (FFg5)	Endangered	
Groot Brak Dune Strandveld (FS9)	Endangered	
South Outeniqua Sandstone Fynbos (FFs19)	Vulnerable	
North Langeberg Sandstone Fynbos (FFs15)	Least threatened	
Albertina Sand Fynbos (FFd9)	Vulnerable	

Much of the indigenous vegetation within the coastal plan has however been transformed by agriculture, with only the steeper hill and mountain slopes still containing largely indigenous vegetation. Within the river valleys, indigenous vegetation still remains within narrow riparian zones but has become invaded by alien shrubs and trees such as black wattles *Acacia mearnsii* and *Eucalyptus* sp. Sedges and reeds occur within the stream channels. More detail on the vegetation occurring associated with the streams in the study area is provided in the following section.

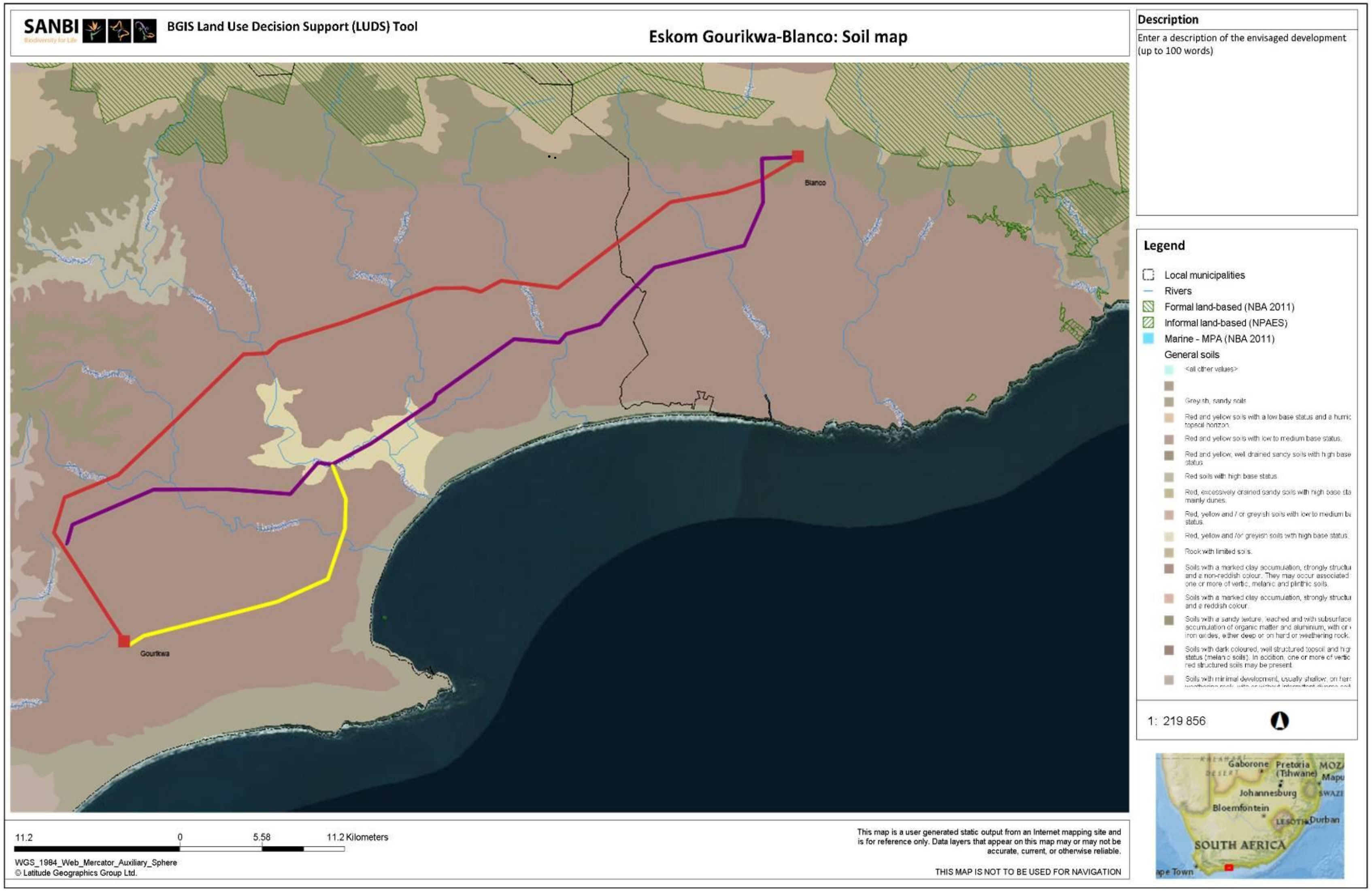

Figure 5: Soils map for the area and surroundings (SANBI Biodiversity GIS, 2015)

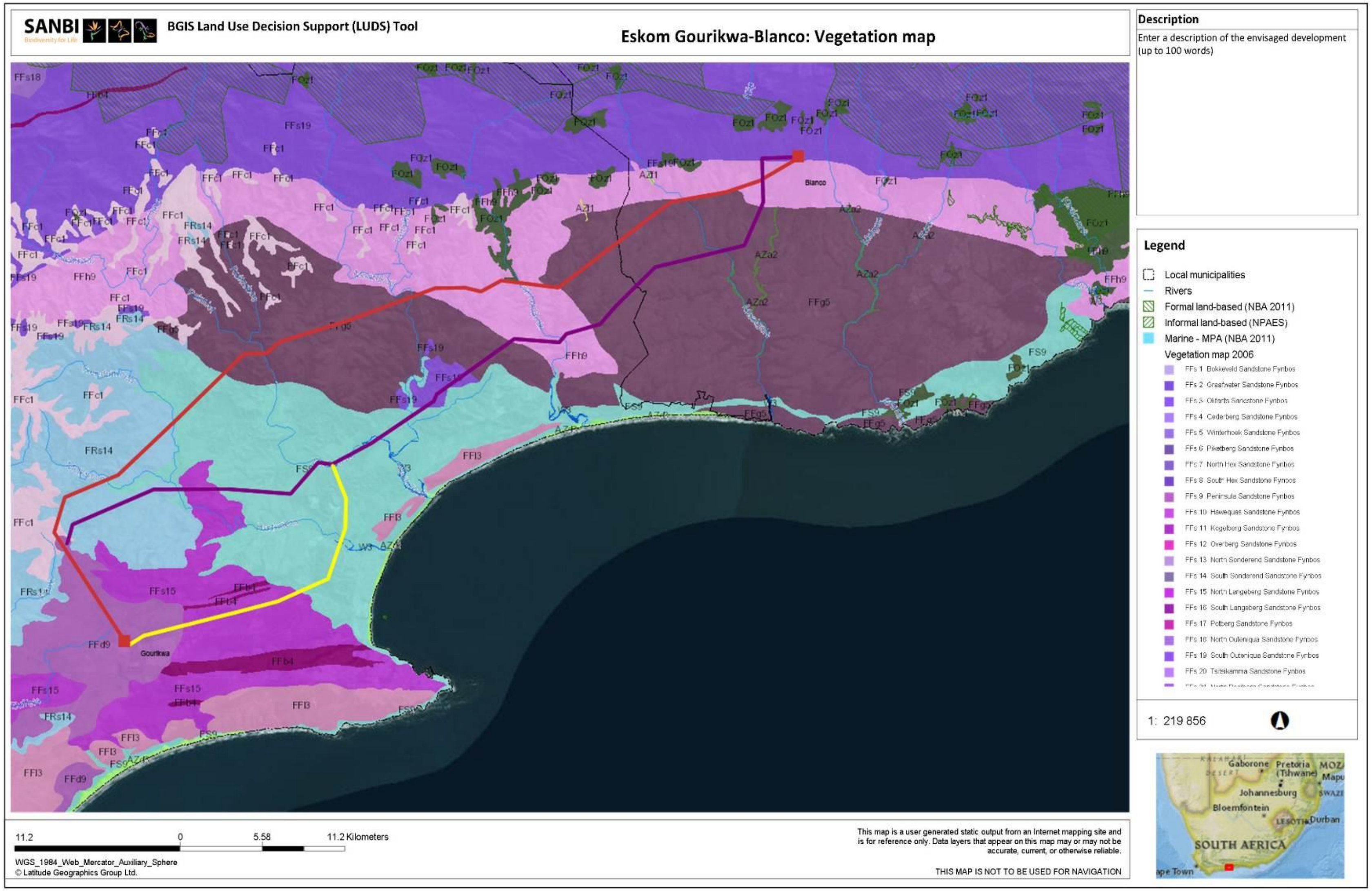

Figure 6: Vegetation map for the area (SANBI Biodiversity GIS, 2015)

6.5. AQUATIC FEATURES AND FAUNA

Aquatic features which occur within the study area (Figure 2) include the following:

- Lower Gouritz tributaries – Stink and Buffels Rivers (J40E);
- Some small coastal streams at Mossel Bay (K10A);
- Hartenbos River and its tributaries (K10B);
- Klein Brak and its tributaries (K10D&F);
- Groot Brak and its tributaries (K20A); and
- Maalgate River (K30A).

Wetland areas within the study area (Figure 7) consist largely of valley bottom wetlands that are associated with the rivers. The river systems and associated wetland areas are discussed in more detail in the following section.

6.6. BIODIVERSITY CONSERVATION AND PROTECTED AREAS

In South Africa two sets of mapping initiatives are available for the study area that are of relevance to the conservation and biodiversity importance of the aquatic ecosystems, that is, the Critical Biodiversity Areas (CBA) maps and the Freshwater Ecosystem Priority Areas (FEPA) maps.

The CBA maps serve as the common reference for all multi-sectorial planning procedures, advising which areas can be developed, and which areas of critical biodiversity value and their support zones should be protected against impacts. The main CBA categories are Critical Biodiversity Areas (Terrestrial and Aquatic), Ecological Support Areas (Critical and Other), Other Natural Remaining Areas and No Natural Remaining Areas. The first two mentioned categories represent the biodiversity priority areas which should be maintained in a natural to near natural state. The last two mentioned categories are not considered as priority areas and a loss of biodiversity within these areas may be acceptable. The Garden Route Critical Biodiversity Areas map is of relevance to the study area.

FEPAs are strategic spatial priorities for conserving freshwater ecosystems and associated biodiversity. FEPAs were determined through a process of systematic biodiversity planning and were identified using a range of criteria for serving ecosystems and associated biodiversity of rivers, wetlands and estuaries. FEPA rivers and Fish Support Areas should be maintained in their current condition should not be degraded any further. Phase 2 FEPA should be considered for rehabilitation. Upstream catchment areas should be maintained in such a manner so as not to allow downstream of a FEPA river to become degraded. In terms of wetland FEPAs, wetlands currently in an A or B ecological condition should be managed to maintain their good condition. Those currently in a condition lower than A or B should be rehabilitated to the best attainable ecological condition.

The conservation value of the river systems in the study area is depicted in Figure 8 (FEPAs) and Figure 9 (CBAs) and summarised in Table 2.

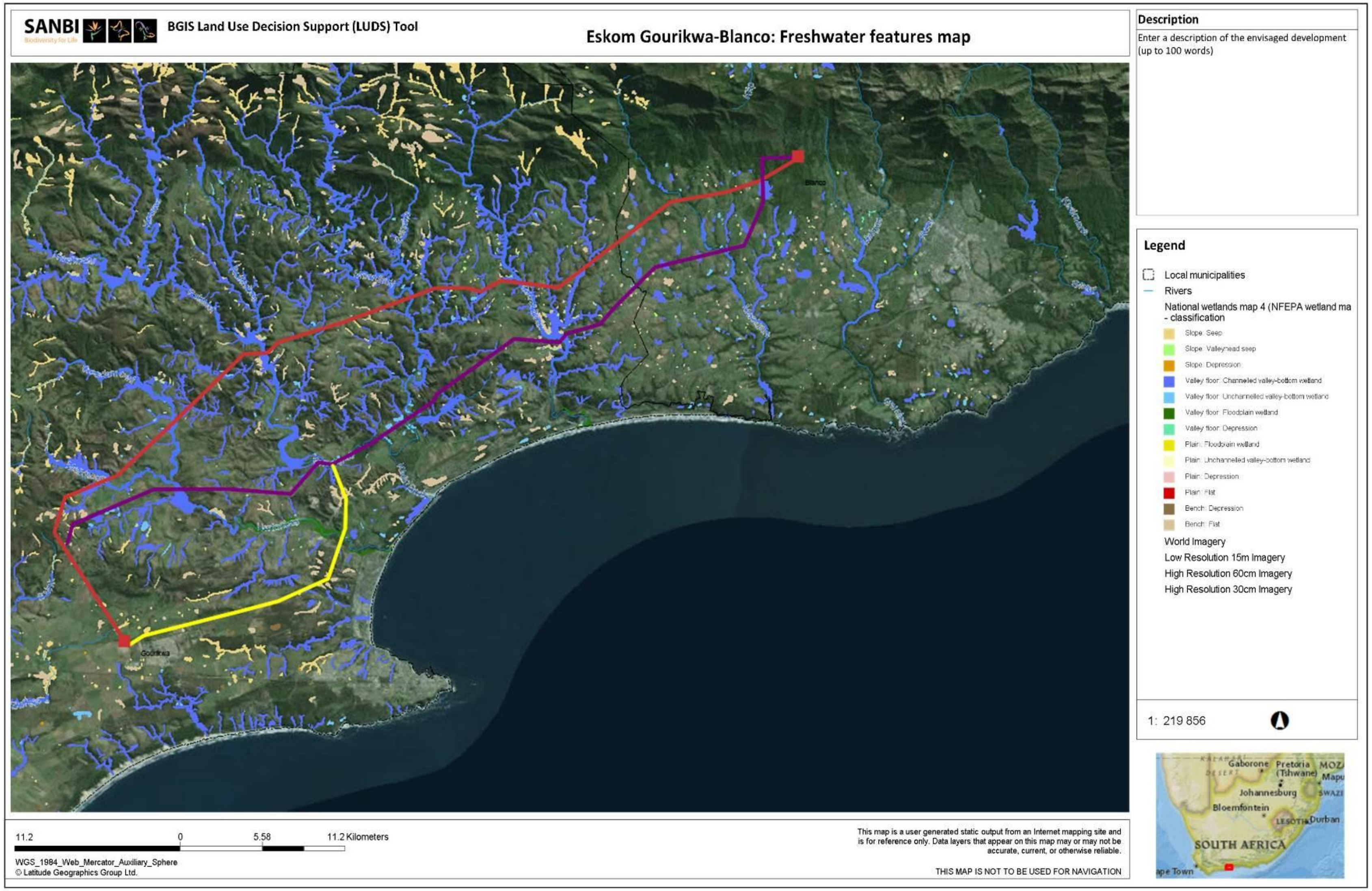

Figure 7: Rivers and wetlands within the study area (SANBI Biodiversity GIS, 2015)

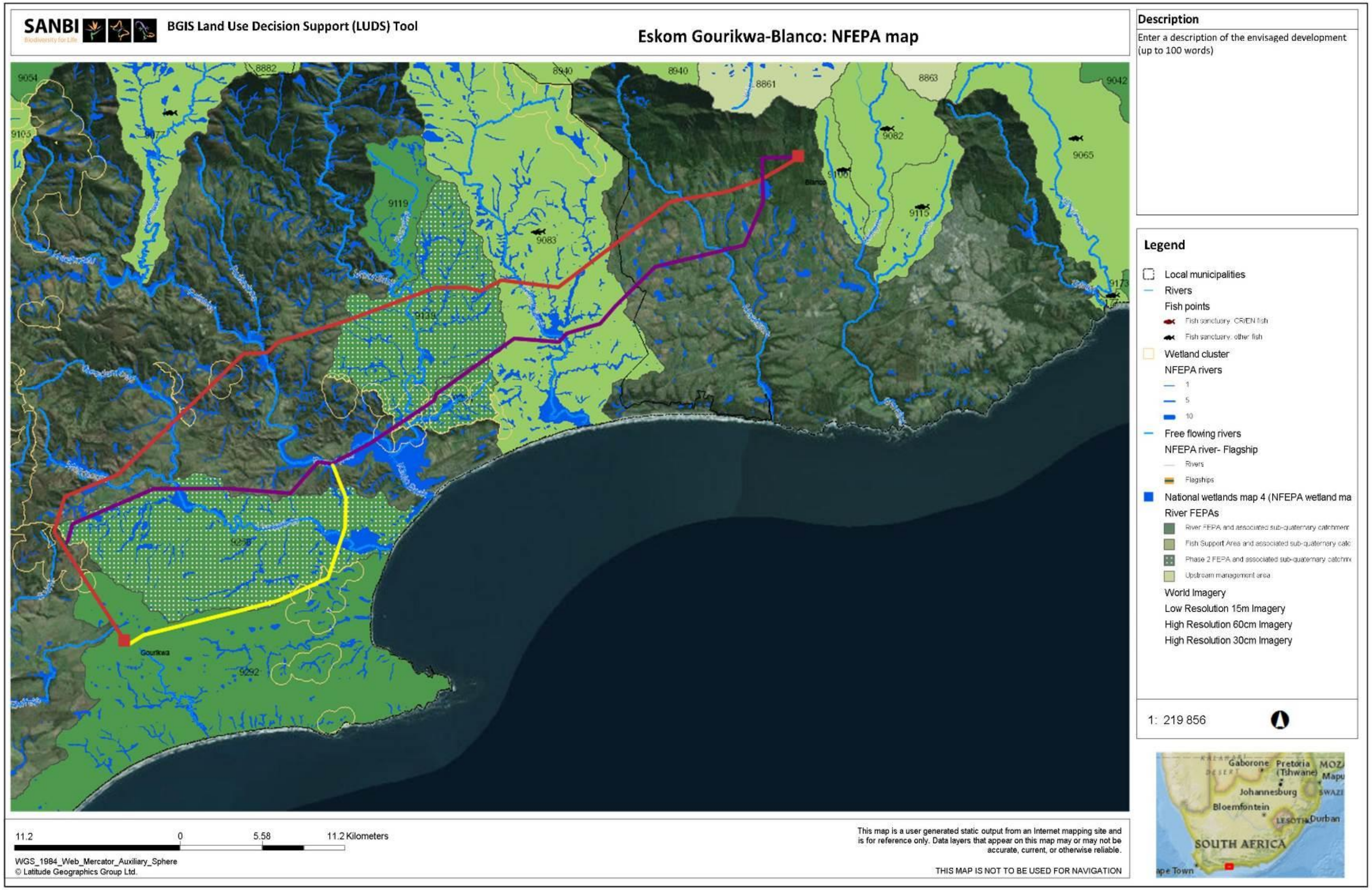

Figure 8: FEPA map for the study area (SANBI Biodiversity GIS, 2015)

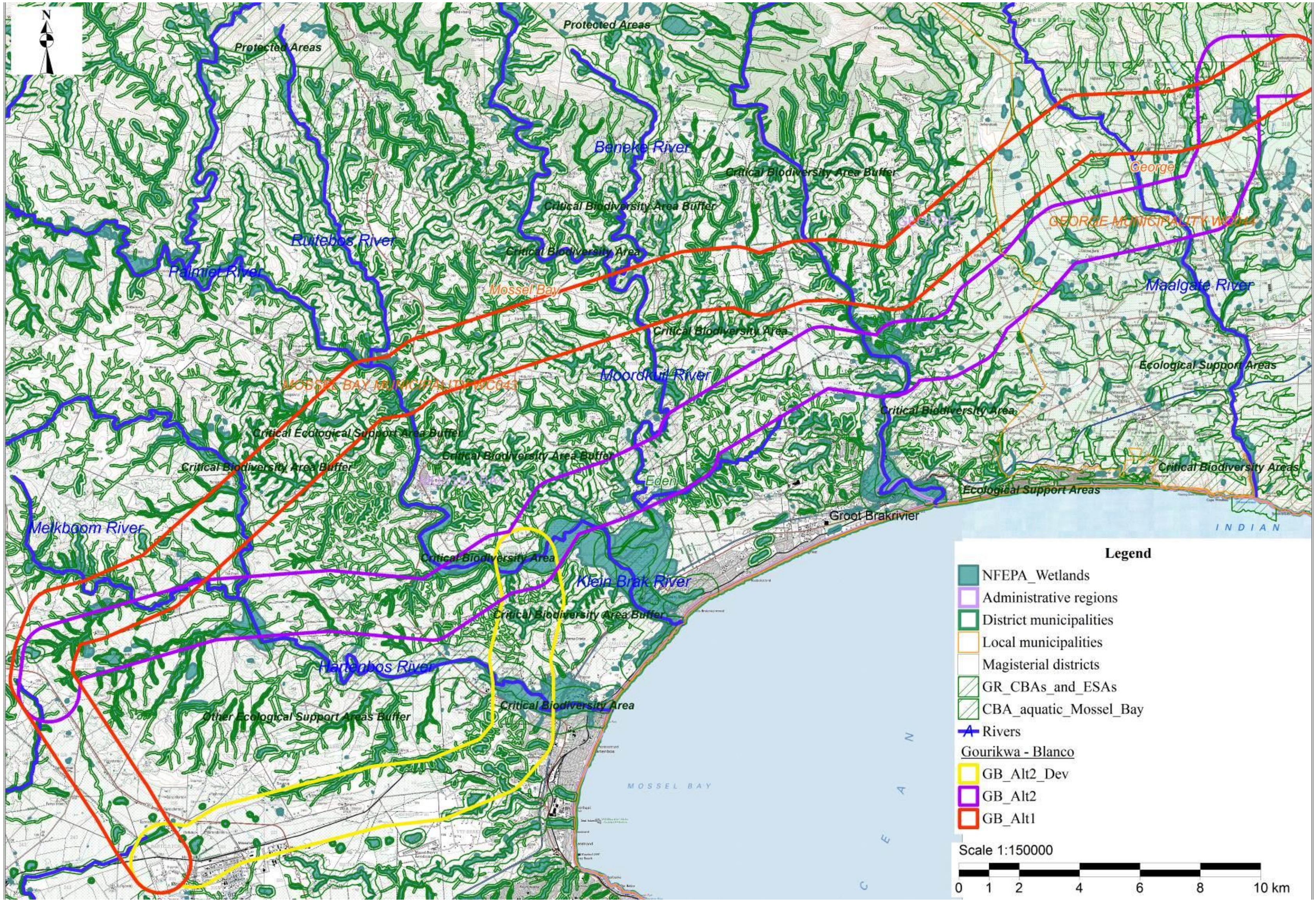

Figure 9: Aquatic CBA and FEPA wetland map for the study area

Table 2. Biodiversity Conservation Value of the Rivers

River	FEPA status	CBA status
Lower Gouritz tributaries – Stink and Buffels Rivers	No River FEPAs only Valley bottom wetland areas	River corridors and associated wetland areas contained within aquatic Critical Biodiversity Area with buffers or within Ecological Support Area
Some small coastal streams at Mossel Bay	FEPA River Catchment and Valley bottom wetland areas	
Hartenbos River and its tributaries	Phase 2 FEPA and Valley bottom wetland areas	
Klein Brak and its tributaries	Phase 2 FEPA for Moordkuil Catchment and Valley bottom wetland areas	
Groot Brak and its tributaries	Fish Support Area and Valley bottom wetland areas	
Maalgate River	No River FEPAs only Valley bottom wetland areas	

6.7. LAND USE

Land use within the study area consists largely of cultivated land (yellow areas in Figure 10) with some natural areas (pale green areas) along river valleys and on higher lying areas. Mossel Bay and George are larger towns in the immediate area, with the smaller residential areas of Hartenbos, Klein Brak and Groot Brak along the coastline (grey areas). A number of storage dams (blue areas) occur along the rivers, particularly in the Klein Brak River System. Forestry occurs along the foot of the Outeniqua Mountains.

A number of formally protected areas (green hatched areas) occur within the Outeniqua Mountains such as Ruitersbos and Witfontein Nature Reserves and the Doringrivier Wilderness Area. The rivers in the area, in particular the Groot and Klein Brak Rivers and their estuaries are also considered to be of a very high ecological importance and sensitivity.

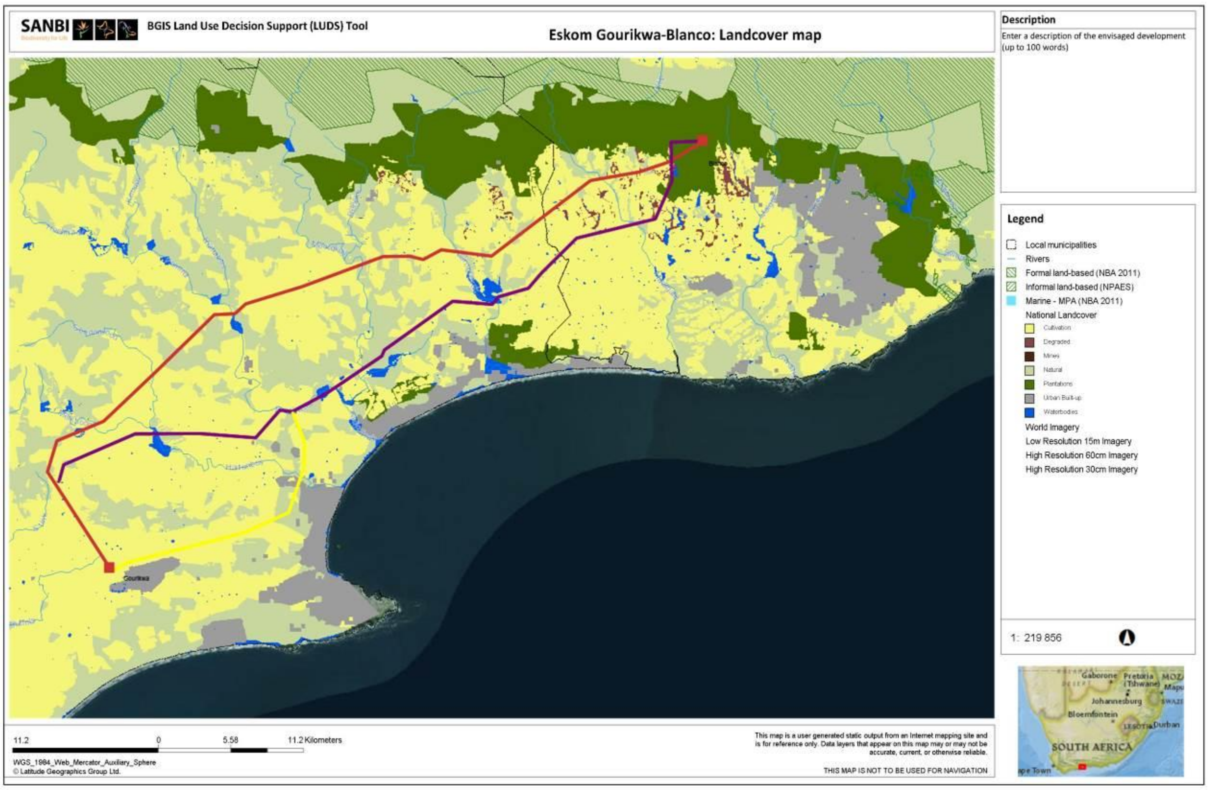

Figure 10: Land cover in the area (SANBI Biodiversity GIS, 2015)

7. AQUATIC ASSESSMENT FOR THE STUDY AREA

The purpose of the freshwater assessment is to determine the relative importance, sensitivity and current condition (ecological state) of the significant freshwater features in order to assess the impact of proposed development activities on those freshwater resources. This assessment of the rivers and streams identified within the study area is based on existing information as well as the field assessment. The Index for Habitat Integrity (IHI) and Site Characterisation assessments were utilised to provide information on the ecological condition and physical characteristics of the streams and significant drainage lines in the study area. No wetland assessments were undertaken as the wetland areas are predominantly valley bottom wetlands that are linked to the rivers that the ecological condition and importance is directly linked to that of the rivers.

7.1. DESCRIPTION OF THE RIVERS

The Stink and Buffels Rivers are two south-westerly flowing tributaries of the lower Gouritz River that enter the river just upstream of and within the Gouritz Estuary. Only the very upper reaches lie within the corridor of Alternative 1. Both rivers are approximately 30km in length and drain a relatively flat area that has been largely modified by farming activities. As a result the rivers have also been significantly modified with much of the indigenous vegetation along the river banks having been removed.

At Mossel Bay there are a number of small rivers that drain the coastal plain, which is relatively flat or gently undulating and incised by river valleys. The more significant of these streams the occur within the study area are the Blinded River, a small stream which discharges into Vales Bay to the west of Mossel Bay and the Tweekuilen River which rises near the PetroSA refinery and flows for approximately 10 kms to the sea. The surrounding land cover consists of cultivated land interspersed with natural vegetative cover and industrial areas of Mossel Bay (Mossdustria and Voorvaai). The Gourikwa Substation is located at the headwaters of the Blinde River.

The Hartenbos River is approximately 34km long and rises in the coastal plain near Mossel Bay, discharging into the sea via a small estuary at Hartenbos. The surrounding catchment and the river have been modified significantly by grain/wheat farming, livestock grazing, sand mining and urban development (lower reaches). The Hartebeeskuil Dam has also been constructed about 12km upstream of the estuary.

The Klein Brak, Groot Brak and Maalgate Rivers rise in the Outeniqua Mountains east of George. These rivers flow across the narrow coastal plain to the sea near the small towns of Klein-Brakrivier, Groot-Brakrivier and Glentana/Herolds Bay respectively. The rivers are still largely natural within their upper reaches that lie within formally protected areas, however their middle and lower reaches are also progressively impacted by pine forests immediately below the protected areas and then mostly by agricultural activities on the lower lying areas. Urban development tends to only occur near the river mouths. Many of the tributaries and parts of the main stem of the rivers however flow within deep valleys that have not been impacted by the surrounding land use activities. These valley however tend to be invaded primarily by alien black wattle *Acacia mearnsii* trees.

Figure 11. View of a tributary in the upper Hartenbos River within the proposed Alternative 1 corridor

Figure 12. View of the lower reaches of the Hartenbos River and the lower reaches of the Hartenbos River within the proposed Alternative 2 Deviation corridor

Figure 13. View of a tributaries in the upper Klein Brak River (top photograph is in the Brandwacht Catchment; bottom photograph is in the Moordkuil Catchment) within the proposed Alternative 1 corridor

Figure 14. View of the lower Brandwacht (top) and Moordkuil (bottom) Rivers within the proposed Alternative 2 corridor

Figure 15. View of the middle reaches of the Groot Brak River (top) and the Varings Tributary of the Groot Brak River (bottom) within the proposed Alternative 1 corridor

Figure 16. View of the Witels (top) and Moeras (bottom) Tributaries of the Maalgate River near the corridors of both Alternative 1 and 2

7.2. RIVER CHARACTERISATION

River typing or classification involves the hierarchical grouping of rivers into ecologically similar units so that inter- and intra-river variation in factors that influence water chemistry, channel type, substratum composition and hydrology are best accounted for. Any comparative assessment of river/stream condition should only be done between rivers or streams that share similar physical and biological characteristics under natural conditions. Thus, the classification of rivers/streams provides the basis for assessing their ecological condition and allows comparison between similar river/stream types. The primary classification of rivers and streams is a division into Ecoregions. Rivers within an ecoregion are further divided into sub-regions.

Ecoregions: groups of rivers and streams within South Africa, which share similar physiography, climate, geology, soils and potential natural vegetation (DWAF 1999). For the purposes of this study, the ecoregional classification presented in DWAF (1999), which divides the country's rivers into ecoregions, was used. The rivers assessed are within the Southern and South Eastern Coastal Belt Ecoregions, with the characteristics as described in Table 3.

Table 3. Southern and South Eastern Coastal Belt Ecoregion Characteristics (Dominant Types In Bold)

Main Attributes	Southern Coastal Belt	South Eastern Coastal Belt
Terrain Morphology	Plains; Low Relief; Plains Moderate Relief; Open Hills; Lowlands; Mountains; Moderate to High Relief; **Closed Hills; Mountains; Moderate and High Relief**	Plains; Low Relief (limited); Plains Moderate Relief; **Closed Hills; Mountains; Moderate and High Relief**
Vegetation types	**South and South West Coast Renosterveld;** Central Mountain Renosterveld; Limestone fynbos; Mountain Fynbos; Laterite Fynbos; Dune Thicket; Patches Afromontane Forest	Dune Thicket; **Mesic Succulent Thicket;** Valley Thicket; Coastal Grassland; Eastern Thorn Bushveld; Grassy Fynbos (limited); Mountain Fynbos; South and South West Coast Renosterveld; **Afromontane Forest**;
Altitude (m a.m.s.l)	0-700	0-500; 500-700 limited
MAP (mm)	300 to 600	300 to 1000
Rainfall seasonality	Winter to all year	All year to very late summer
Mean annual temp. (°C)	10 to 20	14 to 20
Median annual runoff (mm) for quaternary catchment	10 to >250	10 to >250

Sub-regions: sub-regions (or geomorphological zones) are groups of rivers, or segments of rivers, within an ecoregion, which share similar geomorphological features, of which gradient is the most important. The use of geomorphological features is based on the assumption that these are a major factor in the determination of the distribution of the biota.

Table 4. Geomorphological and Physical features of the rivers

<table>
<tr><td>River</td><td>Lower Gouritz tributaries – Stink and Buffels Rivers</td><td>Some small coastal streams at Mossel Bay</td><td>Hartenbos River and its tributaries</td><td>Klein Brak and its tributaries</td><td>Groot Brak and its tributaries</td><td>Maalgate River</td></tr>
<tr><td>Geomorphological Zone</td><td colspan="2">Headwaters</td><td colspan="2">Foothills and Lowland</td><td colspan="2">Lower foothill river</td></tr>
<tr><td>Lateral mobility</td><td colspan="2">Largely Confined</td><td colspan="2">Largely Confined to unconfined in lower reaches</td><td colspan="2">Largely Confined</td></tr>
<tr><td>Channel form</td><td colspan="6">Simple</td></tr>
<tr><td>Channel pattern</td><td colspan="6">Single thread: moderate to low sinuosity</td></tr>
<tr><td>Channel type</td><td colspan="2">Gravel/Cobble-bed</td><td colspan="2">Cobbles becoming Alluvium</td><td colspan="2">Cobble-bed</td></tr>
<tr><td>Channel modification</td><td colspan="6">Moderate to large modification, generally increasing in a downstream direction</td></tr>
<tr><td>Hydrological type</td><td colspan="3">Seasonal/ Perennial</td><td colspan="3">Perennial</td></tr>
<tr><td>Ecoregion</td><td colspan="4">Southern Coastal Belt</td><td colspan="2">South Eastern Coastal Belt</td></tr>
<tr><td>DWA catchment</td><td>J40E</td><td>K10A</td><td>K10B</td><td>K10D&F</td><td>K20A</td><td>K30A</td></tr>
<tr><td>Vegetation type</td><td>Albertina Sand Fynbos</td><td>North Langeberg Sandstone Fynbos</td><td>Groot Brak Dune Strandveld</td><td>Groot Brak Dune Strandveld, Garden Route Granite Fynbos</td><td colspan="2">Garden Route Shale/Granite Fynbos / South Outeniqua Sandstone Fynbos</td></tr>
<tr><td>Rainfall region</td><td colspan="6">Throughout the year</td></tr>
</table>

7.3. HABITAT INTEGRITY

The evaluation of Habitat Integrity (HI) provides a measure of the degree to which a river or stream has been modified from its natural state. The methodology (DWAF, 1999) involves a qualitative assessment of the number and severity of anthropogenic perturbations on a river and the damage they potentially inflict upon the system. These disturbances include both abiotic and biotic factors, which are regarded as the primary causes of degradation of a river. The severity of each impact is ranked using a six-point scale with 0 (no impact), 1 to 5 (small impact), 6 to 10 (moderate impact), 11 to 15 (large impact), 16 to 20 (serious impact) and 21 to 25 (critical impact).

The Habitat Integrity Assessment is based on assessment of the impacts of two components of the river, the riparian zone (Table 6) and the instream habitat (Table 7). Assessments are made separately for both components, but data for the riparian zone are interpreted primarily in terms of the potential impact on the instream component. The estimated impact of each criterion is calculated as follows:

Rating for the criterion/maximum value (25) x weight (percent)

The estimated impacts of all criteria calculated in this way are summed, expressed as a percentage and subtracted from 100 to arrive at an assessment of habitat integrity for the instream and riparian components respectively. The total scores for the instream and riparian zone components are then used to place the habitat integrity of both in a specific habitat category (Table 5).

Table 5. Habitat Integrity categories (From DWAF, 1999)

Category	Description	Score (%)
A	Unmodified, natural.	90-100
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	80-90
C	Moderately modified. A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged.	60-79
D	Largely modified. Large loss of natural habitat, biota and basic ecosystem functions has occurred.	40-59
E	The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39
F	Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota. In worst instances, basic ecosystem functions have been destroyed and changes are irreversible.	0

Table 6. Riparian Habitat Integrity Assessment of the tributaries in the study area

Riparian Zone Habitat Integrity	Lower Gouritz tributaries – Stink and Buffels Rivers	Some small coastal streams at Mossel Bay	Upper Hartenbos River and its tributaries	Lower Hartenbos River and its tributaries	Upper Klein Brak and its tributaries	Lower Klein Brak and its tributaries	Groot Brak and its tributaries	Maalgate River
Vegetation Removal	12	12	10	11	11	10	9	13
Exotic Vegetation	8	10	8	10	10	10	11	12
Bank Erosion	7	9	10	7	10	11	6	9
Channel Modification	6	7	7	8	6	6	8	11
Water Abstraction	8	7	8	11	7	10	12	14
Inundation	7	6	5	5	5	8	9	9
Flow Modification	6	6	5	8	6	10	12	10
Water Quality	8	12	7	12	5	9	7	9
Integrity Class	**C/D**	**D**	**C**	**D/E**	**C/D**	**D**	**D**	**E**

Table 7. Instream Habitat Integrity Assessment of the tributaries in the study area

Instream Habitat Integrity	Lower Gouritz tributaries – Stink and Buffels Rivers	Some small coastal streams at Mossel Bay	Upper Hartenbos River and its tributaries	Lower Hartenbos River and its tributaries	Upper Klein Brak and its tributaries	Lower Klein Brak and its tributaries	Groot Brak and its tributaries	Maalgate River
Water Abstraction	8	7	8	14	7	12	14	15
Flow Modification	6	6	5	13	6	12	16	12
Bed Modification	9	10	9	14	8	10	10	14
Channel Modification	6	7	7	9	6	7	8	12
Water Quality	8	12	7	12	5	12	8	11
Inundation	7	6	5	8	5	8	11	9
Exotic Macrophytes	5	5	4	9	4	6	4	5
Exotic Fauna	2	2	4	6	4	5	2	4
Rubbish Dumping	6	10	4	10	4	26	5	5
Integrity Class	**C**	**C**	**C**	**D**	**C**	**D**	**D**	**D**

The habitat integrity of the rivers range from being moderately modified to being in the seriously modified ecological state. The riparian habitat of these rivers tends to be more impacted by the direct impact of the surrounding land use activities which has resulted in removal of the natural indigenous vegetation and the subsequent growth of invasive alien plants. Within the instream habitat, water abstraction and flow modification have the most impact, particularly on the lower reaches.

7.4. ECOLOGICAL IMPORTANCE AND SENSITIVITY

The Ecological Importance and Sensitivity (EIS) assessment considers a number of biotic and habitat determinants surmised to indicate either importance or sensitivity. The determinants are rated according to a scale (Table 7). The median of the resultant score is calculated to derive the EIS category (Table 9).

Table 8. Scale used to assess biotic and habitat determinants indicate either importance or sensitivity

Scale	Definition
1	One species/taxon judged as rare or endangered at a local scale.
2	More than one species/taxon judged to be rare or endangered on a local scale.
3	One or more species/taxon judged to be rare or endangered on a Provincial/regional scale.
4	One or more species/taxon judged as rare or endangered on a National scale (i.e. SA Red Data Books)

Table 9. Results of the EIS assessment for the tributaries within the study area

Biotic Determinants	Lower Gouritz tributaries – Stink and Buffels Rivers	Some small coastal streams at Mossel Bay	Hartenbos River and its tributaries	Klein Brak and its tributaries	Groot Brak and its tributaries	Maalgate River
Rare and endangered biota	2	2	3	4	4	3
Unique biota	2	2	3	4	4	3
Intolerant biota	3	3	3	3	3	3
Species/taxon richness	2	2	3	4	4	3
Aquatic Habitat Determinants						
Diversity of aquatic habitat types or features	2	2	3	4	4	2
Refuge value of habitat type	2	2	2	3	3	3
Sensitivity of habitat to flow changes	2	3	3	3	3	3
Sensitivity of flow related water quality changes	2	3	3	3	3	3
Migration route/corridor for instream and riparian biota	3	2	3	3	3	2
National parks, wilderness areas, Nature Reserves, Natural Heritage sites & areas, PNEs	1	1	2	4	4	2
Median	2.1	2.1	2.8	3.5	3.5	2.7
EIS CATEGORY	Moderate/ High	Moderate/ High	High	Very high	Very high	High

Table 10. Ecological importance and sensitivity categories (DWAF, 1999)

EISC	General description	Median
Very high	Quaternaries/delineations that are considered to be unique on a national and international level based on unique biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are usually very sensitive to flow modifications and have no or only a small capacity for use.	>3-4
High	Quaternaries/delineations that are considered to be unique on a national scale based on their biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) may be sensitive to flow modifications but in some cases may have substantial capacity for use.	>2-≤3
Moderate	Quaternaries/delineations that are considered to be unique on a provincial or local scale due to biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are not usually very sensitive to flow modifications and often have substantial capacity for use.	>1-≤2
Low/ marginal	Quaternaries/delineations that are not unique on any scale. These rivers (in terms of biota and habitat) are generally not very sensitive to flow modifications and usually have substantial capacity for use.	≤1

The ecological importance and sensitivity of the rivers within the study area range from being of a moderate to very high ecological importance and sensitivity. This is due to the fact that these relatively small rivers are very sensitive to flow and water quality changes and contain habitats (such as Gouritz Valley Thicket, coastal riparian forests and link to the Hartenbos, Klein Brak and Groot Brak Estuaries) and biota (frog species and fresh and estuarine fish species including the Knysna or Cape seahorse *Hippocampus capensis*) that are unique to the area.

Freshwater fish species that are endemic to these rivers are retail barb *Barbus Gurney* that occur within the tributaries of the lower Gouritz River, as well as Cape galaxias *Galaxia zebratus*, Cape Kuyper *Scandella capensis* and Eastern Cape red fins *Pseudobarbus afer* that occur in the Southern Cape rivers. These fish species all have a *Near threatened* conservation status. The Knysna seahorse has been formally recognized as endangered by the World Conservation Union as it has the most limited distribution of all seahorse species and is the only estuarine seahorse species.

8. CONSTRAINTS MAP AND CONSIDERATION OF ALTERNATIVES

Approximately 60km of 400kV power line is being considered from the Gourikwa Substation to the new Blanco Substation. Three alternative routes (one is a deviation of the second alternative) are being considered where a 2km wide corridor is being investigated for all the route alternatives. These alternative route will need to cross the small coastal rivers that occur within the coastal strip between Mossel Bay and George, either crossing the upper reaches of the rivers (Alternative 1) or the middle reaches (Alternative 2), or in the case of the deviation of Alternative 2, the lower reaches of the rivers in the western portion of the study area. Figure 17 provides an overview of the freshwater constraints within the study area for the rivers only. Figures 18a-c provide more detailed mapping of the area with the mapped wetland areas included.

With the potential impacts of the proposed activities, it is often the access roads associated with the transmission lines that are likely to have a greater impact on the freshwater features than the power lines themselves as the lines can usually span the freshwater features such that the pylons can be constructed outside of the rivers and wetland areas as well as their recommended buffer areas, whereas the roads need to be constructed through the freshwater features. It is thus often best if the new power lines are placed adjacent to existing lines or roads where new roads do not need to be constructed as part of the project.

In terms of the selection of the route selection for the transmission lines, it is recommended that a buffer of 50 from the top of the river banks and/or approximately 100m from the edge of the wetland areas be allowed for as a development setback for the construction of the pylons. This recommended buffer would also apply to the proposed new Blanco Substation.

Although the upper reaches of the rivers in the study are in general in a less modified ecological state, the alternative corridor with the least potential impact on the freshwater features in the area is likely to be the northern-most route (Alternative 1) as it would be more likely to be able to span the river valleys with little to no impact on the rivers and associated wetlands at the valley bottoms, while the southern corridors (Alternative 2 and the Deviation of Alternative 2) will need to cross the wide floodplains of the rivers. The alignment of the route within the corridor could also be determined to minimise the potential impact on the freshwater features within the study area.

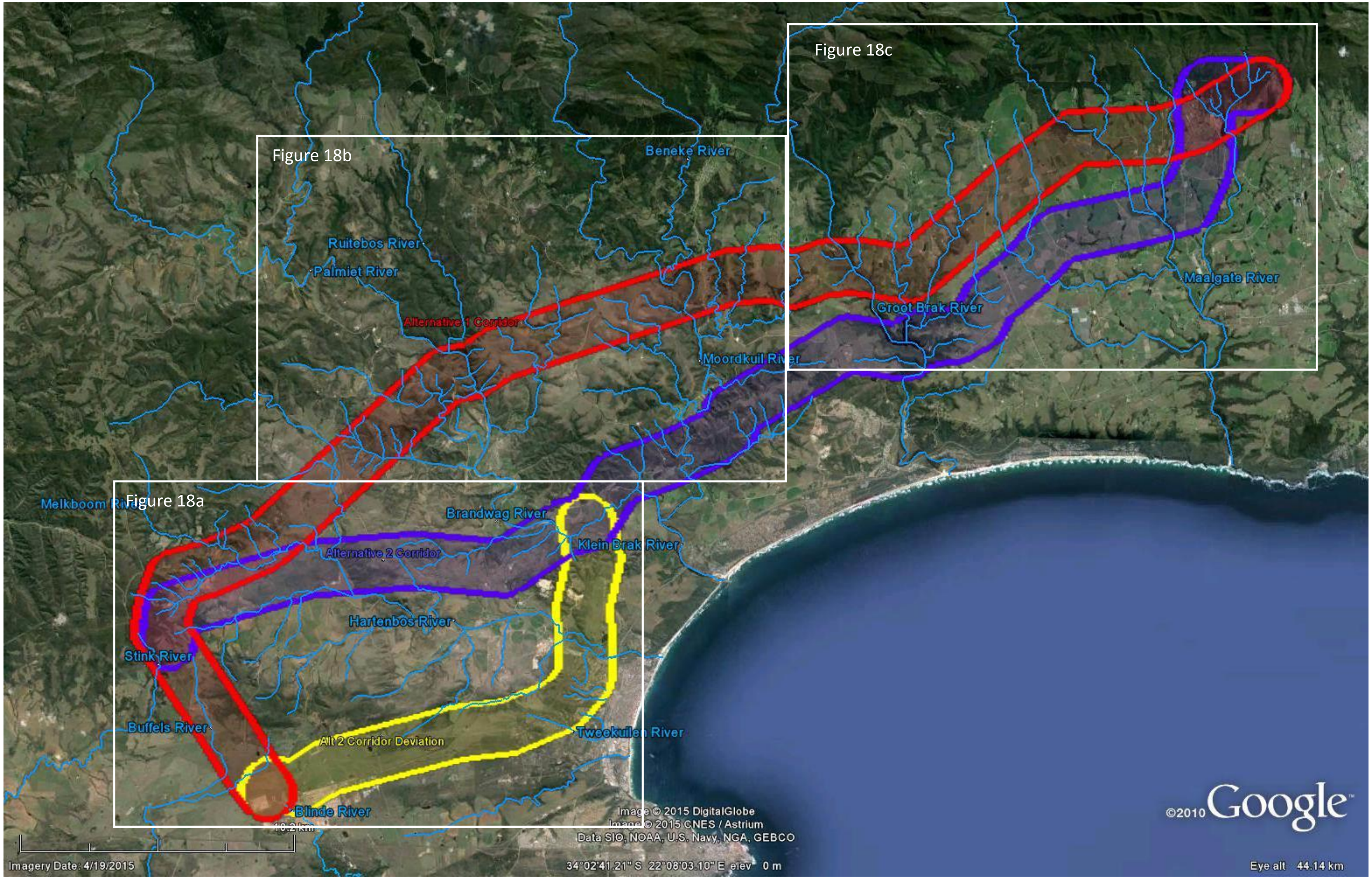

Figure 17: Overview of Freshwater constraints map in Google Earth showing the alternative routes for the proposed new power line, where the red line represents Alternative 1, the purple line Alternative 2; the yellow line the Deviation of Alternative 2 and blue lines indicate rivers

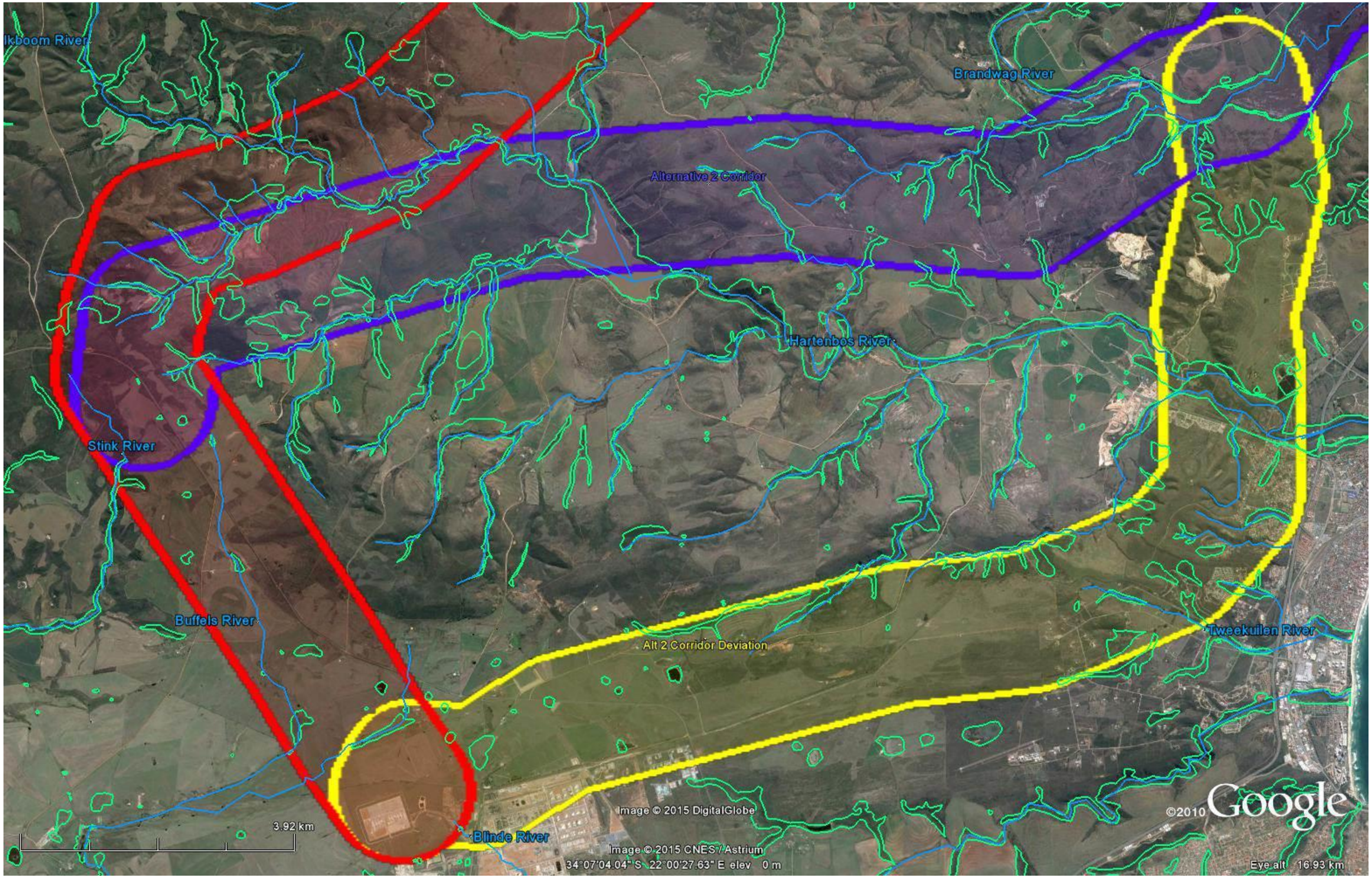

Figure 18a: Freshwater constraints map (Part 1) in Google Earth showing the alternative routes for the proposed new power line, where the red line represents Alternative 1, the purple line Alternative 2 and the yellow line the Deviation of Alternative 2; blue lines indicate rivers and green polygons wetland areas

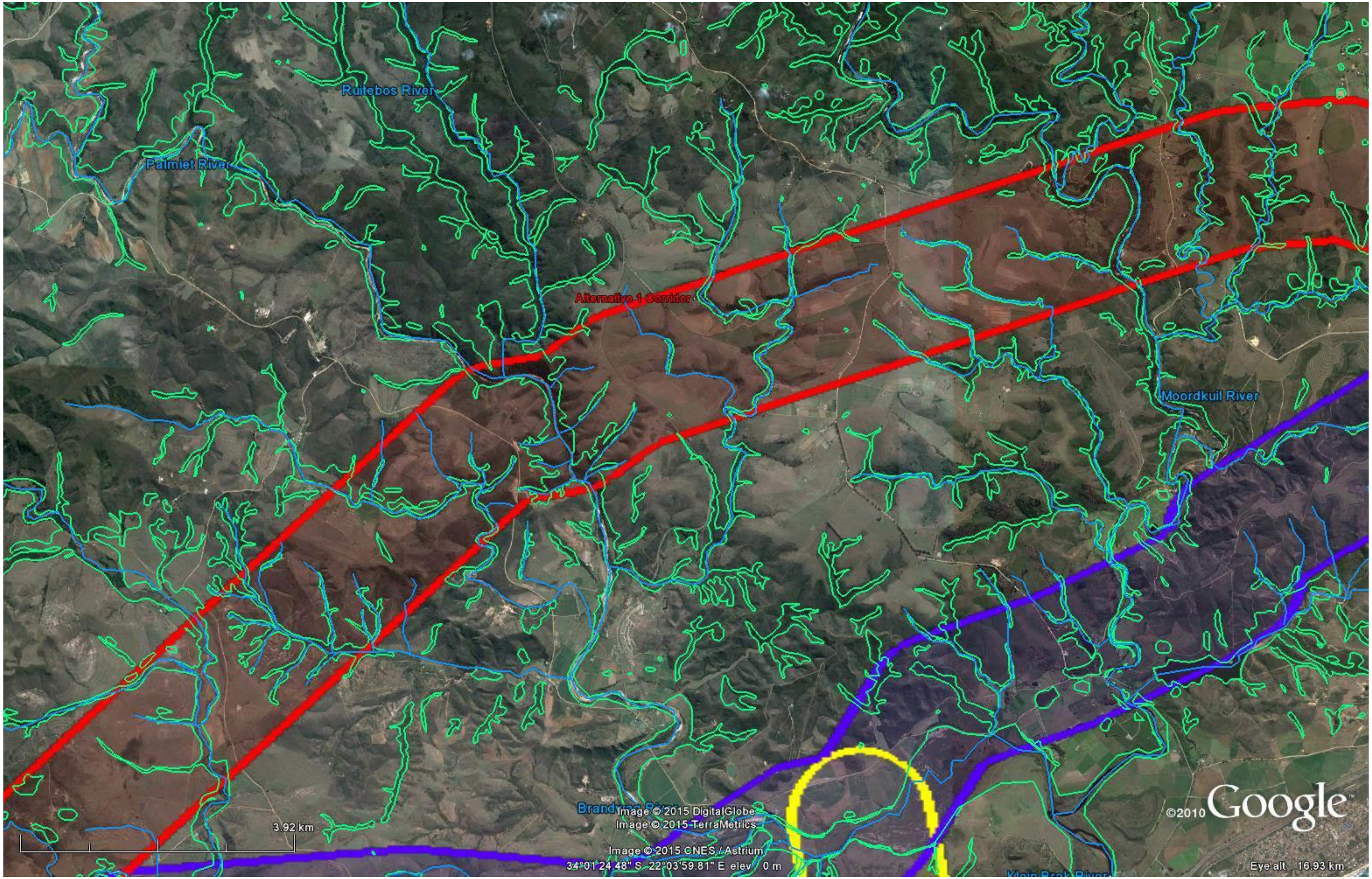

Figure 18b: Freshwater constraints map (Part 2) in Google Earth showing the alternative routes for the proposed new power line, where the red line represents Alternative 1, the purple line Alternative 2; the yellow line the Deviation of Alternative 2; blue lines indicate rivers and green polygons wetland areas

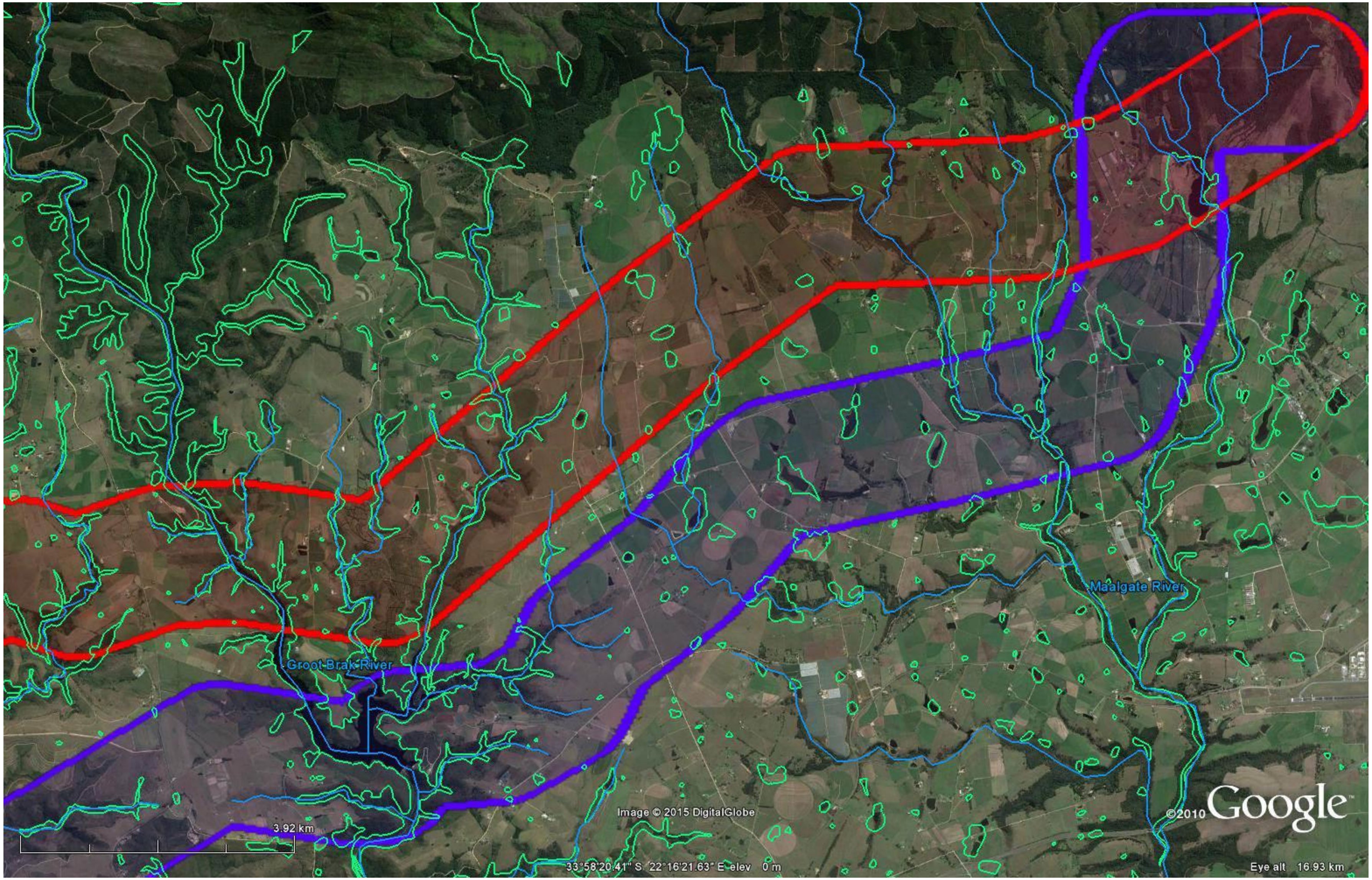

Figure 18c: Freshwater constraints map (Part 1) in Google Earth showing the alternative routes for the proposed new power line, where the red line represents Alternative 1, the purple line Alternative 2; blue lines indicate rivers and green polygons wetland areas

9. IMPACTS OF PROPOSED OVERHEAD POWER LINE FOR THE ALTERNATIVES

9.1. DESCRIPTION AND ASSESSMENT OF IMPACTS OF PROPOSED ACTIVITIES

This section provides a generic description of the potential impacts to freshwater ecosystems that are likely to be associated with proposed power line development. The potential impacts on the freshwater resources can be divided into impacts associated with the construction of the power lines and those impacts related to the maintenance activities.

IMPACT OF OVERHEAD POWER LINES

CONSTRUCTION PHASE ACTIVITIES

Nature of Impact: Approximately 60km of 400kV power line is being considered from the Gourikwa Substation to the proposed new Blanco Substation. Activities that would be associated with the construction activities would include the installation of foundations and pylons. The impacts will also include the construction of the new substation at Blanco.

Activities during the construction phase of the project could be expected to result in some shorter term disturbance of stream/riverine and wetland associated vegetation cover and to the bed and banks of the freshwater features where access for the construction works associated with the line may need to cross freshwater features.

Significance of impacts without mitigation: As a whole Alternative 1 has the potential to impact less of the freshwater features within the study area. Should this alignment be selected, a localized shorter term impact of moderate to low intensity (depending on the distance between the construction activities and the freshwater features) with a low overall significance in terms of its impact on the identified aquatic ecosystems in the area could be expected.

Proposed mitigation: Construction activities should as far as possible be limited to the area outside the proposed buffer zones. In general a buffer of 50 from the top of banks of the rivers and approximately 100m from the edge of the wetland areas should be allowed for. Neither the pylons nor the anchors should be constructed within the proposed buffer zones. The power lines may cross over the buffer zones for the wetlands and drainage lines as the limitations are not applicable to overhead infrastructure.

With regards to the temporary crossings over the watercourses required for the construction phase, existing access should be used as far as possible. Where this is unavoidable, the disturbance to the watercourse should be minimised as far as possible and wetland areas should be avoided. The disturbed areas should be rehabilitated as soon as possible after construction is complete by reshaping and revegetating the disturbed areas with suitable indigenous vegetation (replace indigenous riparian and instream vegetation where possible). Any invasive alien plants that currently exist within the immediate area of the construction activities should also be removed. To reduce the risk of erosion, run-off over the exposed areas should be mitigated to reduce the rate and volume of run-off and prevent erosion occurring within the freshwater features.

Contaminated runoff from the construction sites should be prevented from entering the rivers/streams and wetland areas. All materials on the construction sites should be properly stored and contained. Disposal of waste from the sites should also be properly managed. Construction workers should be given ablution facilities at the construction sites that are located at least 50m away from the river/stream systems and regularly serviced. These measures should be addressed, implemented and monitored in terms of the EMP for the construction phase.

Significance of impacts after mitigation: A localized, short-term impact will still occur during the construction phase; however, the overall significance of the impact on the aquatic ecosystems is expected to be very low.

OPERATION PHASE ACTIVITIES

Nature of Impact: Some disturbance of the freshwater features in the area of the constructed power line could be expected over the longer term that would be associated with the maintenance activities for the project.

Significance of impacts without mitigation: The severity of this impact will depend on the final route selected as well as the area in which the substation is constructed. A localized longer term impact of low intensity may occur that is expected to have a very low overall significance in terms of its impact on the identified aquatic ecosystems in the area.

Proposed mitigation: Maintenance of the power lines should only take place via the designated access routes. The establishment of alien vegetation in the riparian zones along the transmission line route should specifically be prevented, and controlled if it does occur.

Significance of impacts after mitigation: A localized, long-term impact of a very low overall significance could be expected to occur.

IMPACT OF THE ACCESS ROUTES:

CONSTRUCTION PHASE ACTIVITIES

Nature of Impact: The major impacts associated with the establishment of the service road along the line relate to the potential loss of habitat within wetland areas and the rivers/streams, invasive alien plant growth, flow and water quality impacts and erosion of drainage channels/stream or river banks.

Significance of impacts without mitigation: The severity of this impact will depend on the final route selected. A localized shorter term impact of moderate to low intensity that is expected to have a low to very low overall significance in terms of its impact on the identified aquatic ecosystems in the area.

Proposed mitigation: The existing road infrastructure should be utilized as far as possible to minimize the overall disturbance created by the proposed project. Where access routes need to be constructed through streams, disturbance of the channel should be limited and multiple crossings should not be created. Any new roads parallel to the watercourses should remain outside of the 50m buffer zone from the top of bank of the rivers/streams and outside of the indicated buffer areas for the wetland areas (approx. 100m). All crossings over drainage channels or stream beds should be such that the flow within the drainage channel is not impeded. Road infrastructure and cable alignments should coincide as much as possible to minimize the impact. Any disturbed areas should be rehabilitated to ensure that these areas do not become subject to erosion or invasive alien plant growth.

Significance of impacts after mitigation: A localized, short-term impact will occur during the construction phase; however, the overall significance of the impact on the aquatic ecosystems is expected to be a very low impact.

OPERATION PHASE ACTIVITIES

Nature of Impact: The major impacts associated with the access roads during the operation phase relate to disturbance to the instream and riparian habitat of the freshwater ecosystems along the designated routes.

Significance of impacts without mitigation: The severity of this impact will depend on the final route selected as well as the area in which the substation is to be expanded. A localized longer term impact of moderate to low intensity that is expected to have a low to very low overall significance in terms of its impact on the identified aquatic ecosystems in the area.

Proposed mitigation: Maintenance of infrastructure related to the project should only take place via the designated access routes. Disturbed areas along the access routes should be monitored to ensure that these areas do not become subject to erosion or invasive alien plant growth.

Significance of impacts after mitigation: A localized, longer-term impact will occur during the operation phase; however, the overall significance of the impact on the aquatic ecosystems is expected to be a very low impact.

9.2. CUMULATIVE IMPACT OF THE ACTIVITIES ON FRESHWATER ECOSYSTEMS

The freshwater features within the proposed corridors are already in a moderately to seriously modified ecological state as a result of the existing land use activities. The proposed lines are in general proposed along routes where there are already power lines in place. Provided the new lines are constructed close to these lines such that the associated access roads can be shared, the cumulative impacts are likely to be low. Erosion and sedimentation from the project activities, together with invasive alien plant growth and the possible modification of surface water runoff and water quality may lead to additional impacts on the freshwater habitats within the study area. In general, by selecting the route with the least impact, one can prevent any unacceptable impacts, particularly over the longer term, from taking place within the freshwater features within the study area. These impacts are likely to be of a low significance and can be monitored and easily mitigated. The proposed mitigation measures are largely intended to minimise the impacts that may occur within the construction phase when the potential impact is the greatest.

9.3. CONSIDERATION OF ALTERNATIVES

Each of the proposed power line route alternative's impacts on freshwater ecosystems of varying ecological condition, conservation importance and ecological sensitivities. Table 11 provides a comparative assessment of the potential impacts of each alternative considered.

Table 11: Summary of assessment of potential impacts of the proposed activities for the alternatives considered

Alternative 1	**Without mitigation**	**With mitigation**
Construction phase		
Nature: Limited modification of freshwater habitat, water quality impacts and possibly impedance of flow at river crossings associated with the construction of the transmission line and any access roads required		
Extent	Local (2)	Local (1)
Duration	Medium to Short-term (2)	Short-term (1)
Magnitude	Low (4)	Very Low (2)
Probability	Probable (3)	Probable to improbable (2)
Significance	**24 (Low)**	**8 (Very Low)**
Status (positive or negative)	Negative	Negative
Operation phase		
Nature: Limited long term disturbance of aquatic habitat and the facilitation for invasive alien plant growth associated with maintenance of the transmission lines		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Very low (2)	Very Low (1)
Probability	Probable to improbable (2)	Probable to improbable (2)
Significance	**16 (Low)**	**12 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	High (Fully reversible)
Irreplaceable loss of resources?	Medium to low	Low
Can impacts be mitigated? Impacts can be mitigated during the construction phase, but little mitigation is possible during the operational phase. The impacts during this phase are however also minimal.		
Mitigation: See Section 9.1 for more detailed description of potential impacts and the associated recommended mitigation measures.		
Cumulative impacts: Cumulative Impacts are as described in Section 9.2.		
Residual Risks: Residual risks are associated with the need to access and maintain the power lines that require ongoing disturbance to aquatic features along the transmission line route that will need to take place for the lifetime of the project.		
Alternative 2	**Without mitigation**	**With mitigation**
Construction phase		
Nature: Limited modification of freshwater habitat, water quality impacts and possibly impedance of flow at river crossings associated with the construction of the transmission line and any access roads required		
Extent	Local (2)	Local (2)
Duration	Medium to Short-term (2)	Short-term (1)
Magnitude	Medium to Low (5)	Low (3)
Probability	Highly Probable (4)	Probable (3)
Significance	**38 (Medium)**	**18 (Low)**
Status (positive or negative)	Negative	Negative
Operation phase		
Nature: Limited long term disturbance of aquatic habitat and the facilitation for invasive alien plant growth associated with maintenance of the transmission lines		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Very low (2)	Very Low (1)
Probability	Highly Probable (4)	Probable (3)

Significance	**32 (Medium to Low)**	**21 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium (Partially reversible)
Irreplaceable loss of resources?	Medium to low	Low
Can impacts be mitigated? Impacts can be mitigated to a certain extent during the construction phase, but due to the fact that the line will need to cross the lower reaches of the rivers with their wide associated floodplain wetlands, the probability that there will be some loss or modification of aquatic habitat that is more sensitive is greater. Little mitigation is possible during the operational phase. The impacts during this phase are however also minimal.		
Mitigation: See Section 9.1 for more detailed description of potential impacts and the associated recommended mitigation measures.		
Cumulative impacts: Cumulative Impacts are as described in Section 9.2.		
Residual Risks: Residual risks are associated with the need to access and maintain the power lines that require ongoing disturbance to aquatic features along the transmission line route that will need to take place for the lifetime of the project.		

Alternative 2 Deviation	**Without mitigation**	**With mitigation**
Construction phase		
Nature: Limited modification of freshwater habitat, water quality impacts and possibly impedance of flow at river crossings associated with the construction of the transmission line and any access roads required		
Extent	Local (2)	Local (2)
Duration	Medium to Short-term (2)	Short-term (1)
Magnitude	Medium to Low (6)	Low (4)
Probability	Highly Probable (4)	Probable (3)
Significance	**42 (Medium)**	**21 (Low)**
Status (positive or negative)	Negative	Negative
Operation phase		
Nature: Limited long term disturbance of aquatic habitat and the facilitation for invasive alien plant growth associated with maintenance of the transmission lines		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Very low (2)	Very Low (1)
Probability	Highly Probable (4)	Probable (3)
Significance	**32 (Medium to Low)**	**21 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium (Partially reversible)
Irreplaceable loss of resources?	Medium to low	Low
Can impacts be mitigated? Impacts can be mitigated to a certain extent during the construction phase, but due to the fact that the line will need to cross the lower reaches of the rivers with their wide associated floodplain wetlands, the probability that there will be some loss or modification of aquatic habitat that is more sensitive is greater. Little mitigation is possible during the operational phase. The impacts during this phase are however also minimal.		
Mitigation: See Section 9.1 for more detailed description of potential impacts and the associated recommended mitigation measures.		
Cumulative impacts: Cumulative Impacts are as described in Section 9.2.		
Residual Risks: Residual risks are associated with the need to access and maintain the power lines that require ongoing disturbance to aquatic features along the transmission line route that will need to take place for the lifetime of the project.		

As mentioned in the previous section, the alternative corridor with the least potential impact on the freshwater features in the area is likely to be the northern-most route (Alternative 1) as it would be more likely to be able to span the river valleys with little to no impact on the rivers and associated wetlands at the valley bottoms, while the southern corridors (Alternative 2 and the Deviation of Alternative 2) will need to cross the wide floodplains of the rivers. With mitigation, Alternative 1 is likely to have an impact of a very low significance to be insignificant on the freshwater features while

Alternative 2 is likely to have an impact of a low to very low impact. The proposed Alternative 2 Deviation would have the largest potential impact on the freshwater features.

10. CONCLUSIONS AND RECOMMENDATIONS

Aquatic features which occur within the study area include the following:

- Lower Gouritz tributaries – Stink and Buffels Rivers;
- Some small coastal streams at Mossel Bay;
- Hartenbos River and its tributaries;
- Klein Brak and its tributaries;
- Groot Brak and its tributaries; and
- Maalgate River.

Wetland areas within the study area consist largely of valley bottom wetlands that are associated with the rivers and are of similar ecological condition and importance.

The habitat integrity of the rivers range from being moderately modified (upper reaches of the larger rivers as well as the smaller streams) to being in the seriously modified ecological state (lower reaches of the larger river systems). The riparian habitat of these rivers tends to be more impacted by the direct impact of the surrounding land use activities which has resulted in removal of the natural indigenous vegetation and the subsequent growth of invasive alien plants. Within the instream habitat, water abstraction and flow modification have the most impact, particularly on the lower reaches.

The ecological importance and sensitivity of the rivers within the study area range from being of a moderate (smaller tributaries and streams) to very high ecological importance and sensitivity (larger estuarine systems). This is due to the fact that these relatively small coastal rivers are very sensitive to flow and water quality changes and contain habitats (such as Gouritz Valley Thicket, coastal riparian forests and link to the Hartenbos, Klein Brak and Groot Brak Estuaries) and biota (frog species and fresh and estuarine fish species including the Knysna or Cape seahorse *Hippocampus capensis*) that are unique to the area.

With the potential impacts of the proposed activities, it is often the access roads associated with the transmission lines that are likely to have a greater impact on the freshwater features than the power lines themselves as the lines can usually span the freshwater features such that the pylons can be constructed outside of the rivers and wetland areas as well as their recommended buffer areas, whereas the roads need to be constructed through the freshwater features. It is thus often best if the new power lines are placed adjacent to existing lines or roads where new roads do not need to be constructed as part of the project.

In terms of the selection of the route selection for the transmission lines, it is recommended that a buffer of 50 from the top of the river banks and/or approximately 100m from the edge of the wetland areas be allowed for as a development setback for the construction of the pylons. This recommended buffer would also apply to the proposed new Blanco Substation.

Although the upper reaches of the rivers in the study are in general in a less modified ecological state, the alternative corridor with the least potential impact on the freshwater features in the area is likely to be the northern-most route (Alternative 1) as it would be more likely to be able to span the river valleys with little to no impact on the rivers and associated wetlands at the valley bottoms, while the southern corridors (Alternative 2 and the Deviation of Alternative 2) will need to cross the wide floodplains of the rivers. The alignment of the route within the corridor could also be determined to minimise the potential impact on the freshwater features within the study area. With mitigation, Alternative 1 is likely to have an impact of a very low significance to be insignificant on the freshwater features while Alternative 2 is likely to have an impact of a very low impact. The proposed Alternative 2 Deviation would have the largest potential impact on the freshwater features.

A water use authorization may need to be obtained from the Department of Water and Sanitation: Western Cape Regional Office for approval of the water use aspects of the proposed activities.

11. REFERENCES

Department of Water Affairs and Forestry. (1999). *Resource Directed Measures for Protection of Water Resources. Volume 3: River Ecosystems Version 1.0*. Resource Directed Measures for Protection of Water Resources, Pretoria, South Africa.

Department of Water Affairs and Forestry. (2005). A practical field procedure for identification and delineation of wetlands and riparian areas. Department of Water Affairs and Forestry, Pretoria.

Department of Water Affairs and Forestry. (2007). *River Ecoclassification: Manual for Ecostatus Determination (Version 2)*. Water Research Commission Report Number KV 168/05. Pretoria.

Dickens, C. Kotze, D. Mashigo, S. MacKay H. & Graham M. Guidelines for integrating the protection, conservation and management of wetlands into catchment management planning (Report TT220/04)

Driver, Nel, Snaddon, Murray, Roux, Hill. (2011). Implementation Manual for Freshwater Ecosystem Priority Areas. Draft Report for the Water Research Commission.

Holness, S., Bradshaw, P., & Brown, A. (2010). *Critical Biodiversity Areas of the Garden Route: Conservation Planning Technical Report.*

Kleynhans, CJ, Thirion, C and Moolman, J (2005). *A Level I River Ecoregion classification System for South Africa, Lesotho and Swaziland.* Report No. N/0000/00/REQ0104. Resource Quality Services, Department of Water Affairs and Forestry, Pretoria, South Africa.

Kleynhans CJ, Louw MD, Graham M. (2008). Module G: EcoClassification and EcoStatus determination in River EcoClassification: Index of Habitat Integrity (Section 1, Technical manual) Joint Water Research Commission and Department of Water Affairs and Forestry report. WRC Report No. TT 377-08

Marneweck, G.C. and Batchelor, A. 2002. *Wetland inventory and classification.* In: Ecological and economic evaluation of wetlands in the upper Olifants River catchment. (Palmer, R.W., Turpie, J., Marneweck, G.C and Batchelor (eds.). Water Research Commission Report No. 1162/1/02.

Mucina, L. and M. Rutherford. *Eds.* (2006). Vegetation map of South Africa, Lesotho, and Swaziland. *Strelitzia 19*. South African National Biodiversity Institute, Pretoria.

SANBI. 2009. Further Development of a Proposed National Wetland Classification System for South Africa. Primary Project Report. Prepared by the Freshwater Consulting Group (FCG) for the South African National Biodiversity Institute (SANBI).

SANBI Biodiversity GIS: http://bgis.sanbi.org/

River Health Programme (2007). *State-of-Rivers Report: River of the Gouritz Water Management Area*. Department of Water Affairs and Forestry, Pretoria. ISBN No: 0-620-30757-9.

Van Ginkel, C. E., Glen, R. P., Gordon-Gray, K. D., Cilliers, C. J., Muasya, M. and P. P. van Deventer (2011) *Easy identification of some South African wetland plants.* WRC Report No TT 479/10

Vlok, J.H.J., Euston-Brown D.I.W. and Wolf, T. 2008. A vegetation map for the Garden Route Initiative

WRC. 2011. *Atlas for Freshwater Ecosystem Priority Areas* – Maps to support sustainable development of water resources (WRC Report No. TT 500/11).

APPENDIX A: DECLARTION OF INDEPENDENCE

I, Antonia Belcher, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, 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 no and will not have any 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;
- am 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
- am aware that a false declaration is an offence in terms of regulation 71 of GN No. R. 543.

Note: The terms of reference is included in the report.

Signature of the specialist:

Ms Antonia Belcher

Date: 30 June 2015

APPENDIX B: QUALIFICATIONS OF SPECIALIST CONSULTANTS

Contact details: PO Box 455, Somerset Mall, 7137

Name: Mr Dana Grobler and Ms Antonia Belcher

Profession: Mr Dana Grobler (Environmental Scientist – *Pr. Sci. Nat 400058/93*) and Ms Antonia Belcher (Aquatic Scientist *Pr. Sci. Nat.* 400040/10);

Fields of Expertise: Specialist in environmental water requirements, river and wetland monitoring and reporting.

Relevant work experience:

Due to Ms Belcher's involvement in the development and implementation of the River Health Programme as well as the Resource Directed Measures (RDM) directorate of the Department of Water Affairs in the Western Cape, she have been a key part of the team that has undertaken six catchment or area wide 'state-of-river' assessments as well as routine monitoring and specialised assessments of rivers and wetlands in all the major catchments in the Western Cape. Ms Belcher and Mr Grobler have also undertaken the River Health Monitoring for the Free State Region in 2011 and 2012.

Relevant publications:

Belcher Toni and Grobler DF. (2014). Freshwater Assessment for the Proposed Eskom Longdown Substation and associated Vyeboom Turn-in Lines

Belcher Toni and Grobler DF. (2014). Freshwater Assessment for the Proposed Upgrade to the Eskom Swartberg Repeater Road Upgrade

Belcher Toni and Grobler DF. (2014). Freshwater assessment for the proposed Eskom Kimberley Strengthening Phase 4 Project: Boundary to Ferrum

Belcher T and Grobler D. (2013). Freshwater Assessment for the proposed electrification of the Mission Station, Farm Goedverwacht No. 146, Piketberg

Belcher T and Grobler D. (2013).Freshwater Assessment for the Proposed Eskom De Hoek-Mountain 66kv Powerline and Associated Infrastructure, Piketberg

Belcher T and Grobler D. (2013).Freshwater Assessment for the Proposed upgrading of the Eskom Firgrove Substation

Belcher T and Grobler D. (2013). Freshwater Assessment for the Proposed 11kv Overheard Power Line linked to the Eskom Palmiet Substation

Belcher T and Grobler D. (2013). Freshwater Assessment for Kwaggaskloof-Hammanshof 66kv Line Refurbishment near Worcester

Grobler D and Belcher T. (2013). Freshwater Assessment for the Proposed Eskom Groblershoop 132/22kv Substation and the Garona – Groblershoop 132kv Kingbird Line of Approximately 20 Km

Grobler D and Belcher T. (2013). Proposed Development of the Gamka River 66kv Substation and Associated 66kv Overhead Powerline (150m), Calitzdorp, Western Cape

Grobler D and Belcher T. (2013). Freshwater Assessment for Proposed Eskom Bredasdorp-Arniston 66kv Powerline Re-Build And Dismantling of the Old Powerline

APPENDIX C: IMPACT ASSESSMENT METHODOLOGY

Criteria and ratings:

1. Extent

"Extent" defines the physical extent or spatial scale of the impact.

Rating	Description
LOCAL	Extending only as far as the activity, limited to the site and its immediate surroundings. Specialist studies to specify extent.
REGIONAL	Western Cape. Specialist studies to specify extent.
NATIONAL	South Africa
INTERNATIONAL	

2. Duration

"Duration" gives an indication of how long the impact would occur.

Rating	Description
SHORT TERM	0 - 5 years
MEDIUM TERM	5 - 15 years
LONG TERM	Where the impact will cease after the operational life of the activity, either because of natural processes or by human intervention.
PERMANENT	Where mitigation either by natural processes or by human intervention will not occur in such a way or in such time span that the impact can be considered transient.

3. Intensity

"Intensity" establishes whether the impact would be destructive or benign.

Rating	Description
ZERO TO VERY LOW	Where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected.
LOW	Where the impact affects the environment in such a way that natural, cultural and social functions and processes continue, albeit in a slightly modified way.
MEDIUM	Where the affected environment is altered, but natural, cultural and social functions and processes continue, albeit in a modified way.
HIGH	Where natural, cultural and social functions or processes are altered to the extent that it will temporarily or permanently cease.

4. Loss of resources

"Loss of resource" refers to the degree to which a resource is permanently affected by the activity, i.e. the degree to which a resource is irreplaceable.

Rating	Description
LOW	Where the activity results in a loss of a particular resource but where the natural, cultural and social functions and processes are not affected.
MEDIUM	Where the loss of a resource occurs, but natural, cultural and social functions and processes continue, albeit in a modified way.
HIGH	Where the activity results in an irreplaceable loss of a resource.

5. Status of impact

The status of an impact is used to describe whether the impact would have a negative, positive or zero effect on the affected environment. An impact may therefore be negative, positive (or referred to as a benefit) or neutral.

6. Probability

"Probability" describes the likelihood of the impact occurring.

Rating	Description
IMPROBABLE	Where the possibility of the impact to materialise is very low either because of design or historic experience.
PROBABLE	Where there is a distinct possibility that the impact will occur.
HIGHLY PROBABLE	Where it is most likely that the impact will occur.
DEFINITE	Where the impact will occur regardless of any prevention measures.

7. Degree of confidence

This indicates the degree of confidence in the impact predictions, based on the availability of information and specialist knowledge.

Rating	Description
HIGH	Greater than 70% sure of impact prediction.
MEDIUM	Between 35% and 70% sure of impact prediction.
LOW	Less than 35% sure of impact prediction.

8. Significance

"Significance" attempts to evaluate the importance of a particular impact, and in doing so incorporates the above three scales (i.e. extent, duration and intensity).

Rating	Description
VERY HIGH	Impacts could be EITHER: of high intensity at a regional level and endure in the long term; OR of high intensity at a national level in the medium term; OR of medium intensity at a national level in the long term.
HIGH	Impacts could be EITHER: of high intensity at a regional level and endure in the medium term; OR of high intensity at a national level in the short term; OR of medium intensity at a national level in the medium term; OR of low intensity at a national level in the long term; OR of high intensity at a local level in the long term; OR of medium intensity at a regional level in the long term.
MEDIUM	Impacts could be EITHER: of high intensity at a local level and endure in the medium term; OR of medium intensity at a regional level in the medium term; OR of high intensity at a regional level in the short term; OR of medium intensity at a national level in the short term; OR of medium intensity at a local level in the long term; OR of low intensity at a national level in the medium term; OR of low intensity at a regional level in the long term.
LOW	Impacts could be EITHER of low intensity at a regional level and endure in the medium term; OR of low intensity at a national level in the short term; OR of high intensity at a local level and endure in the short term; OR of medium intensity at a regional level in the short term; OR of low intensity at a local level in the long term; OR of medium intensity at a local level and endure in the medium term.
VERY LOW	Impacts could be EITHER of low intensity at a local level and endure in the medium term; OR of low intensity at a regional level and endure in the short term; OR of low to medium intensity at a local level and endure in the short term.
INSIGNIFICANT	Impacts with: Zero to very low intensity with any combination of extent and duration.
UNKNOWN	In certain cases it may not be possible to determine the significance of an impact.

9. Degree to which impact can be mitigated

This indicates the degree to which an impact can be reduced / enhanced.

Rating	Description
NONE	No change in impact after mitigation.
VERY LOW	Where the significance rating stays the same, but where mitigation will reduce the intensity of the impact.
LOW	Where the significance rating drops by one level, after mitigation.
MEDIUM	Where the significance rating drops by two to three levels, after mitigation.
HIGH	Where the significance rating drops by more than three levels, after mitigation.

10 Reversibility of an impact

This refers to the degree to which an impact can be reversed.

Rating	Description
IRREVERSIBLE	Where the impact is permanent.
PARTIALLY REVERSIBLE	Where the impact can be partially reversed.
FULLY REVERSIBLE	Where the impact can be completely reversed.