FRESHWATER ASSESSMENT FOR THE PROPOSED 132 KV POWER LINE BETWEEN THE OUTENIQUA AND OUDTSHOORN SUBSTATIONS

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1. BACKGROUND

The existing 132kV line from Dysselsdorp to Oudtshoorn requires refurbishment. This is however not possible due to the fact that the line is going partly through a built up area. Thus for practical reasons, and as part of an overall network solution, a future 132kV corridor between Outeniqua and Outdsthoorn is proposed (see Figure 1). To make this possible ESKOM will need to obtain a servitude for a single circuit 132 kV line, consisting of monopole steel poles, from the Outeniqua- to Oudtshoorn substation, with associated technical additions. This freshwater assessment serves as input into that EIA process as there are a number of freshwater features that may be impacted on by the proposed project.

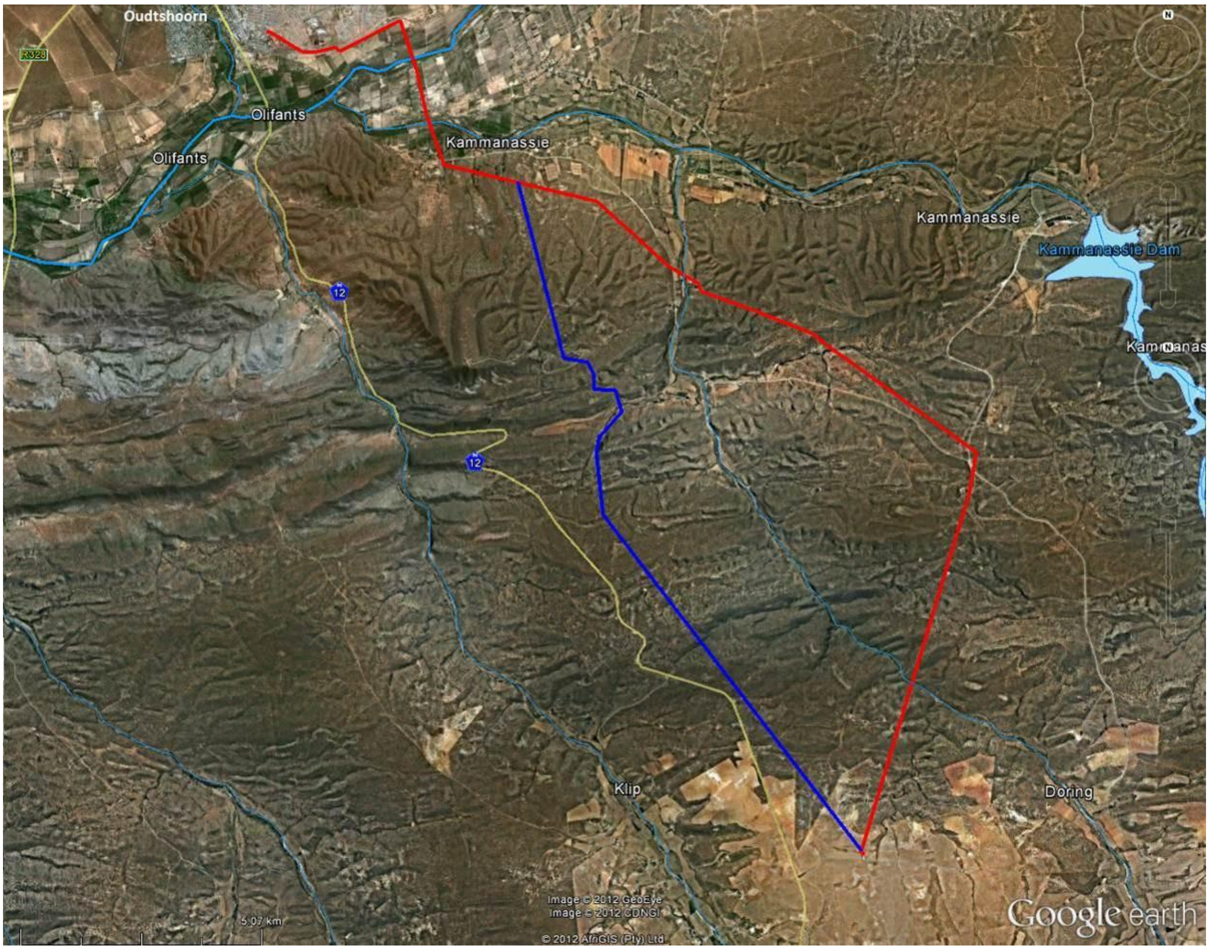

Figure 1: Google Earth image indicating the proposed preferred (red line) and proposed alternative (blue line) routes for the proposed powerline.

2. TERMS OF REFERENCE

The specific terms of reference provided for the freshwater assessment study are as follows:

- Undertake a baseline study of the two alternative routes and indicate (with a motivational rationale) any areas where sensitive features are located, due to specific freshwater ecological features and conditions.
- Identify and indicate (with a motivational rationale) any sites which should be precluded from further consideration due to specific freshwater ecological conditions (no-go areas).
- Provide a broad, baseline description of the freshwater systems (including rivers, watercourses and wetlands) of the study area, covering all five Components and placing it in a regional context.
- Provide specific information relating to the freshwater systems of each alternative route in relation to study area, with reference to locations of special concern and their conservation status and/or ecological importance, which can be used as baseline information for the assessment of potential impacts of the proposed project.
- Provide guidance on any special standards prescribed by the Department of Water Affairs (DWA) or any other authority in relation to the freshwater systems included in this study, as well as on the authorisation process that would be required in terms of the relevant legislation pertaining to freshwater systems.
- Investigate ecological/biodiversity processes that could be affected by the proposed project.
- Identify, describe and assess the impacts of the proposed activities and any project alternatives on freshwater ecosystems.
- Recommend appropriate, practicable mitigation measures that will reduce all major (significant) impacts or enhance potential benefits, if any.

3. LIMITATIONS AND ASSUMPTIONS OF THE STUDY

Limitations and uncertainties often exist within the various techniques adopted to assess the condition of ecosystems. Analysis of the freshwater ecosystems was undertaken according to nationally developed methodologies and was undertaken at a rapid level. This level of assessment was felt to be sufficient to address the proposed development activities. The entire route could also not be visited due to restricted accessibility. Areas that were not visited were assessed by means of historical data and satellite images.

4. USE OF THIS REPORT

This report reflects the professional judgment of its author. 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 author.

5. OVERVIEW OF THE PROPOSAL

5.1. OVERVIEW OF THE STUDY AREA

Both of the alternatives for the proposed new power line are located just east of the N12 between George and Oudtshoorn and start just north of the Heimesrivier Road. The starting point lies approximately 30 km south east out of Oudtshoorn town central and the endpoint in Oudtshoorn itself at the Oudtshoorn substation. Large freshwater features possibly impacted by the power line include the Doring-, Kammanassie- and Olifants Rivers, which all form part of the Gouritz River System within the Gouritz Water Management Area (WMA).

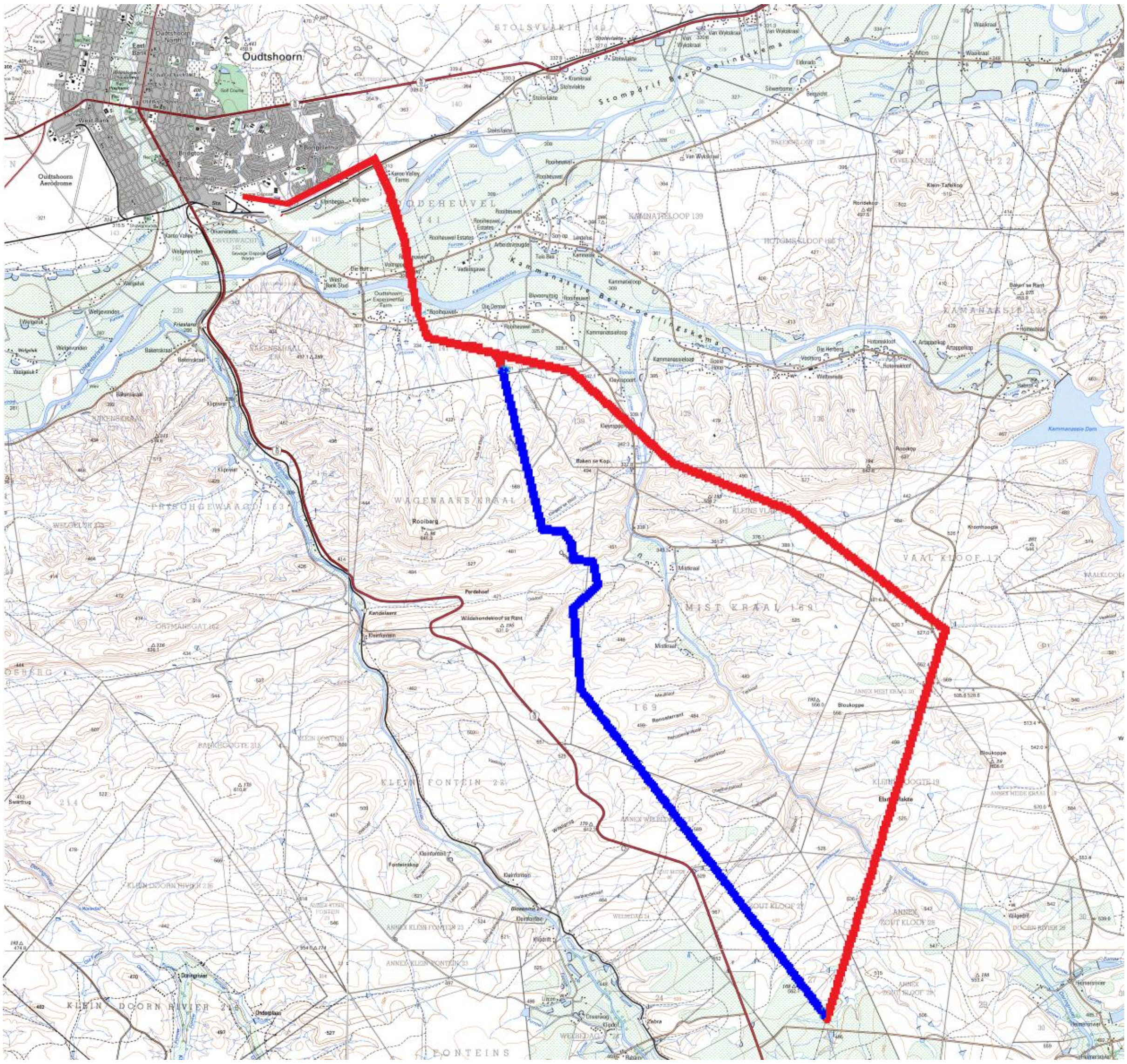

Figure 2: Locality map (1 in 50 000 topographical map reference 3322CA, 3322CB, 3322CC and 2211CD_3422AB) of the study area

The proposed power lines are primarily within the Doring- Olifants- and Kammanassie River Catchment areas, crossing some of their non-perennial tributaries. The main land use in the area is agriculture (dryland farming and livestock).

5.2. ACTIVITY DESCRIPTION

ESKOM proposes a future 132kV corridor between Outeniqua and Oudtshoorn (Figure 3). The proposed activities will include the following:

- The existing Outeniqua substation will not be enlarged and no new substation will be required next to the Outeniqua substation site. There is space within the existing substation for the additional feeder bay.
- Oudtshoorn substation is thus to make provision for new 132 kV feeder bay and incoming line will be positioned accordingly.
- Monopole steel poles are to be used
- A servitude for a single circuit 132 kV line from Outeniqua- to Oudtshoorn substation will be obtained and the Kingbird conductor prepared.

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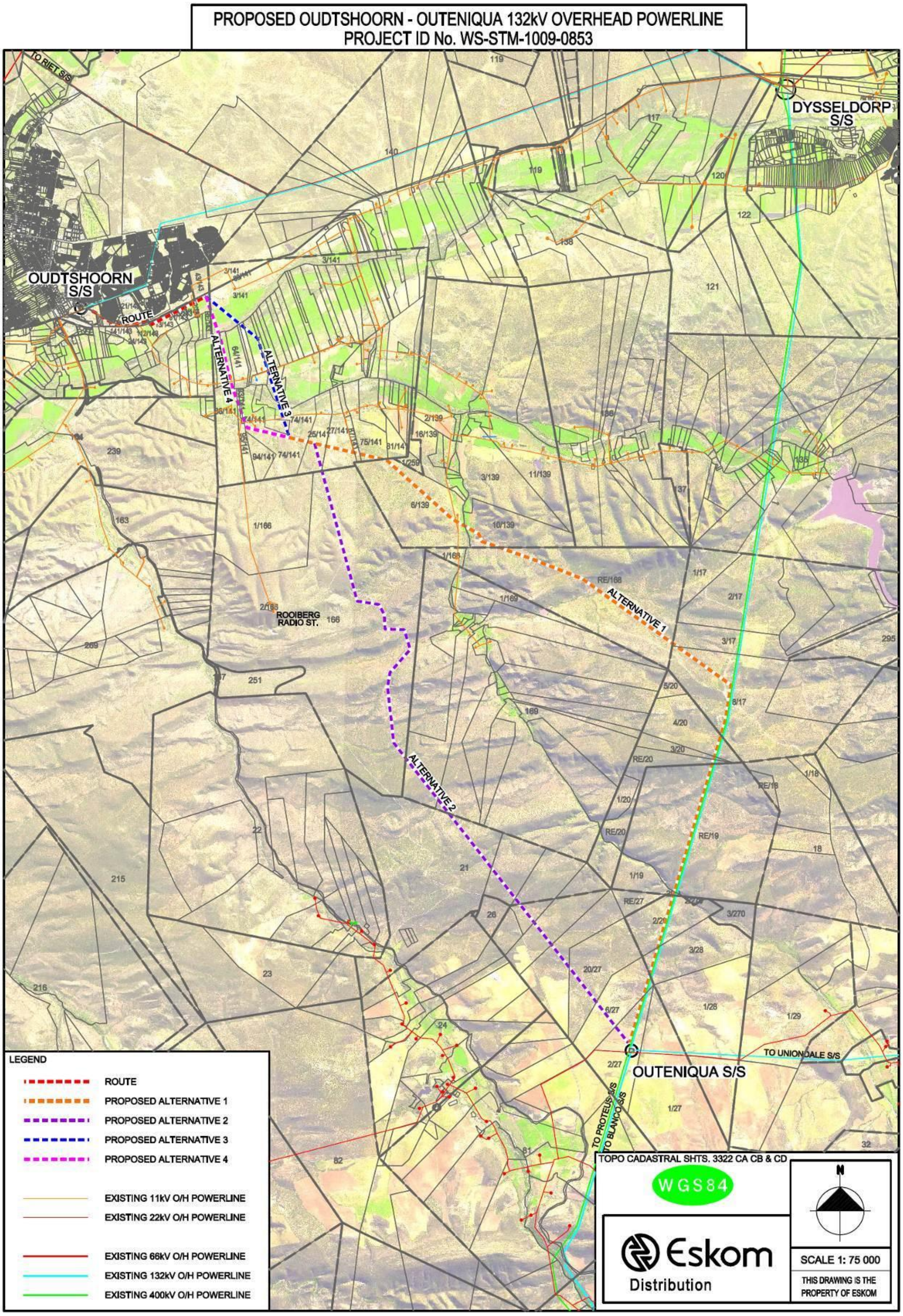


Figure 3: Proposed power line plan indicating all alternatives.

6. AQUATIC SYSTEMS IN THE STUDY AREA

6.1. DESCRIPTION OF THE STUDY SITE

A. PHYSICAL CHARACTERISTICS

The proposed routes for the alternatives of the Outeniqua to Oudtshoorn power line are located over a mountainous area with a series of hills and valleys. The preferred alternative crosses the Doring River (tributary of the Kammanassie River) twice prior to crossing both the Kammanassie and Olifants Rivers and before reaching the Oudtshoorn substation. The Kammanassie River is a tributary to the Olifants River which flows westwards and eventually joins the Gamka River to become the Gouritz River, which discharges into the Indian Ocean near Gouritz Mouth.

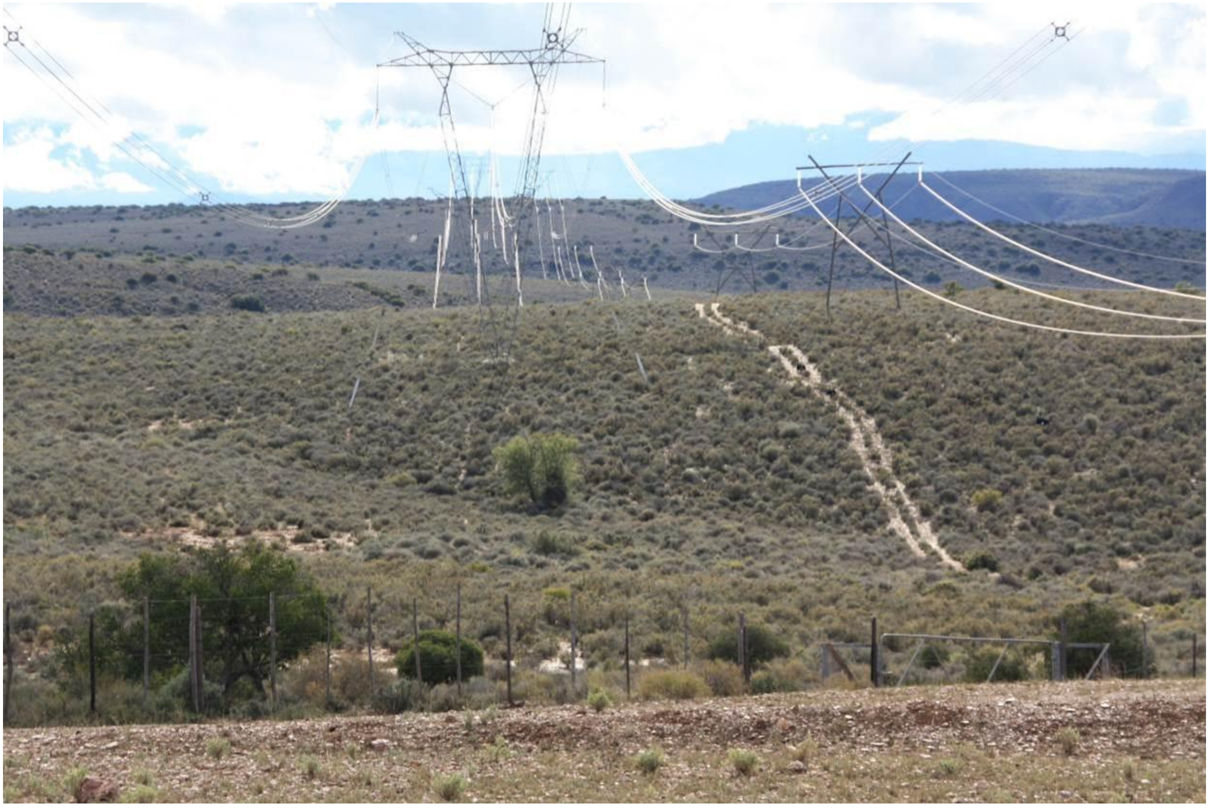


Figure 4: View of the landscape which the proposed power line will follow.

B. CLIMATE

Oudtshoorn normally receives about 172 mm of rain per year, with rainfall occurring throughout the year. As can be seen in below charts, it receives the lowest rainfall (10mm) in January and the highest (22mm) in March. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Oudtshoorn range from 18.9 ^{o}C in July to 32^{o}C in January. The region is coldest during July when an average of 4.9^{o}C is experienced.

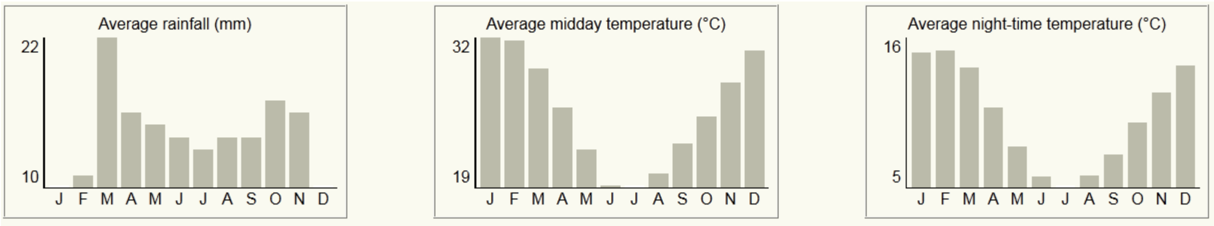


Figure 5: Average monthly rainfall and temperatures for the area (SA Explorer, 2012)

C. GEOLOGY AND SOIL

The geology of the proposed routes changes from Lithosoils (Figure 6 – tan areas) which are shallow soils on hard rock, over undifferentiated shallow soils (Figure 6 – Grey area) towards freely drained structureless soils with restricted depth, excessive drainage, high erodibility and a natural low fertility (Figure 6 – Brown area). In general, the soils have minimal development, being shallow on hard or weathering rock with limestone generally being present. Along the Kammanassie and Olifants Rivers, deep alluvial soils occur.

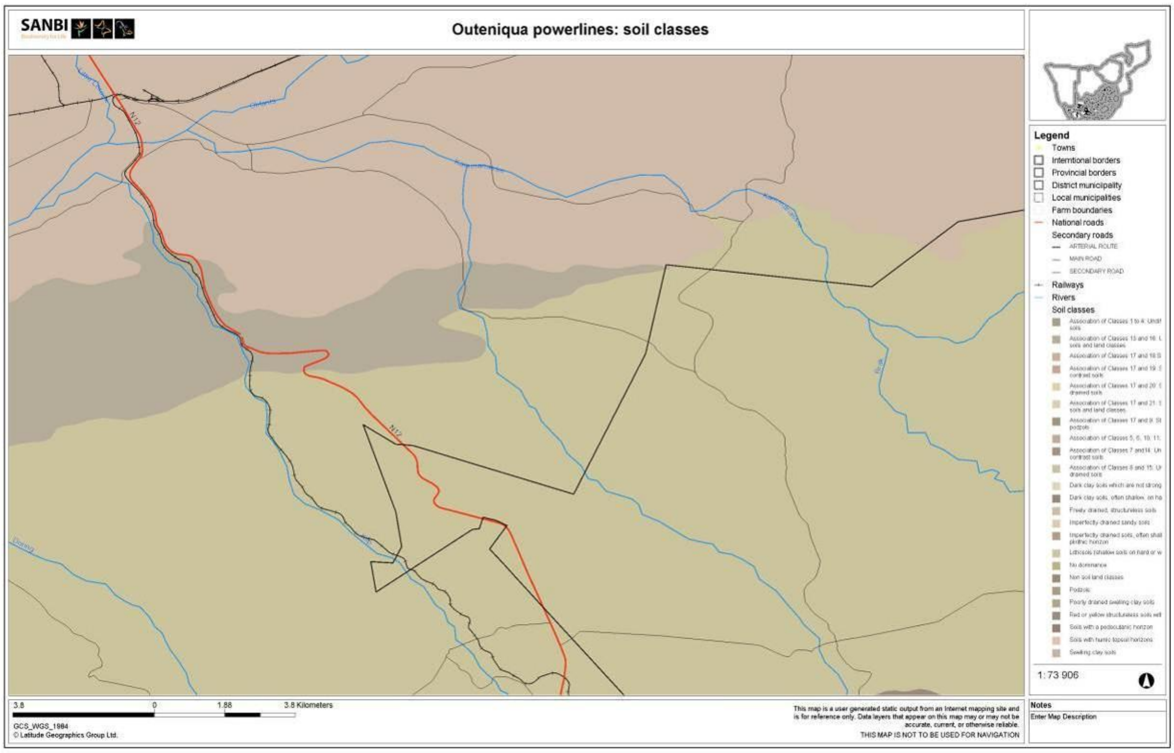


Figure 6: Soil map for the area (Biodiversity GIS, 2012)

D. FLORA

The natural vegetation on the site is mapped as a mix of Olifants River and floodplain vegetation (Green in river valleys, Figure 7), Blossoms Asbos-Gwarrieveld (Blue), Kandelaars Arid Spekboomveld (Pink), Kandelaars Ganneveld (Maroon), De Rust Sandolien – Spekboomveld (Olive Green) and

Grootkop Apronveldsee (Pink/purple). The natural vegetation has however at most places been completely transformed into cultivated areas. It is only in the more mountainous areas where vegetation has been exposed to some grazing that the vegetation is still largely natural to moderately modified. Some of the riparian vegetation found in the rivers and ephemeral streams includes Sweet thorn (*Acacia karoo*), Karee trees (*Searsia lancea*), the Common reed (*Phragmites australis*) in the marginal zone and some invasive species such as Spannish reed (*Arundo donax*), Pepper trees (*Schinus molle*) and some *Prosopis* trees.

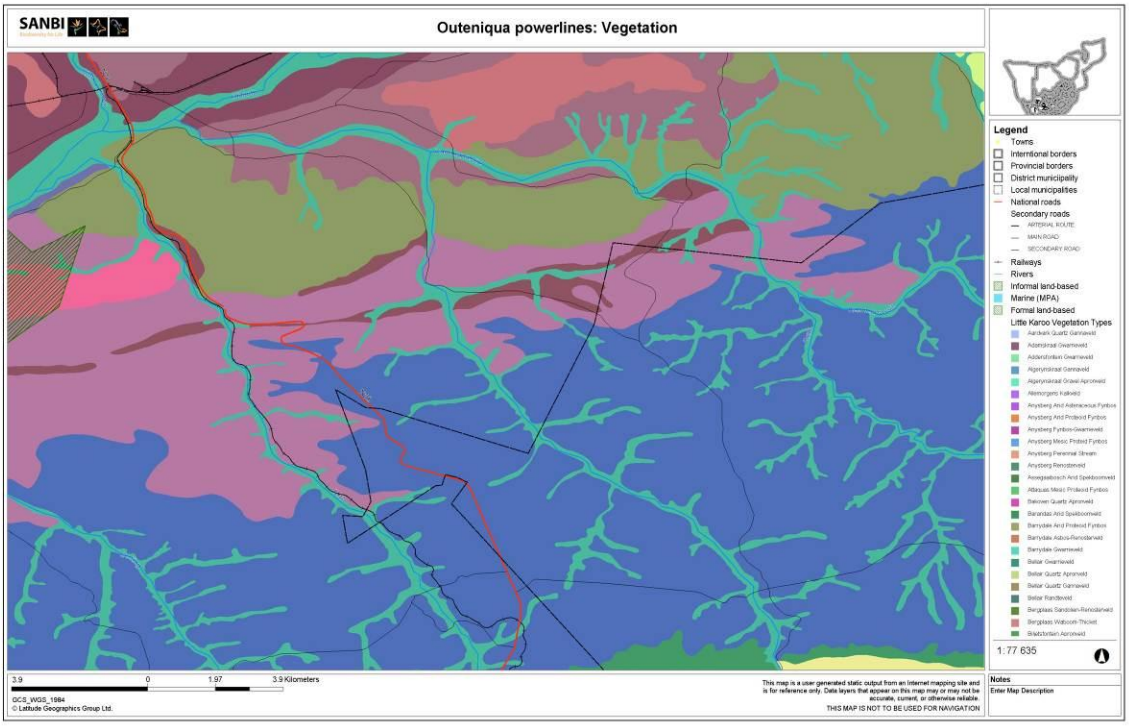


Figure 7: Vegetation map for the area (SANBI Biodiversity GIS, 2012)

In terms of Critical Biodiversity Areas (CBA), there are areas along the proposed power lines that are considered CBAs especially in more natural mountainous areas as well as some parts along the Doring- and Kammanassie Rivers (See Figure 8). All the ephemeral streams have been identified as being important ecological support areas.

E. AQUATIC FEATURES AND CONSERVATION VALUE

The main aquatic features consist of the Doring-, Kammanassie- and Olifants River as well as several of their small ephemeral tributaries. Whilst the Doring-, Kammanassie- and Olifants Rivers are all perennial, and relatively slow flowing rivers, all the tributaries potentially impacted by the power line development are ephemeral tributaries which flow only sporadically for short periods after heavy rainfall with some still being in a largely natural state and others largely modified by instream dams and agriculture activities. There are also some longitudinal wetland areas associated with these rivers and streams. The freshwater features are discussed in more detail in the following section.

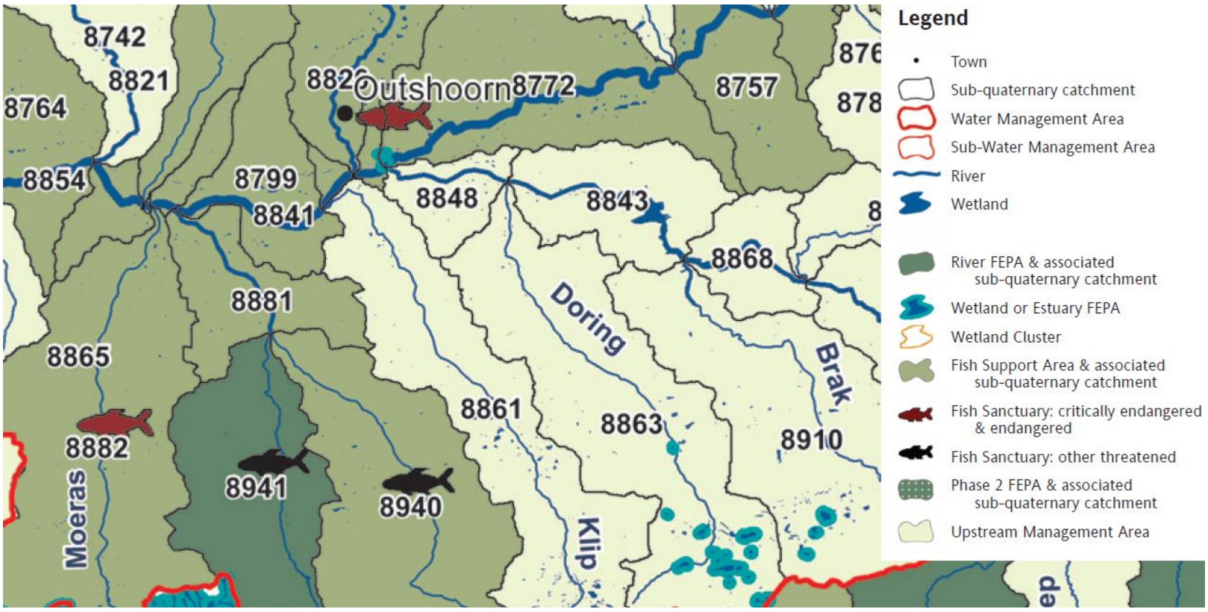


Figure 8: FEPA areas (Biodiversity GIS, 2012)

Freshwater Ecosystem Priority Areas (FEPAs) have been identified at a national scale and are intended to provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. 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. The river and wetland FEPAs are required to be maintained in a largely natural ecological state while fish support areas (the Olifants River) should not be allowed to degrade from their existing ecological condition. The shading of the whole sub-quaternary catchment (FEPA) indicates that the surrounding land and smaller stream network need to be managed in a way that maintains the good condition of the river reach.

The Kammanassie River (and its tributaries including the Doring River) has been indentified as an upstream management area where human activities need to be managed to prevent degradation of the downstream Olifants and Grouritz Rivers which act as a river FEPA and Fish Sanctuary Areas. (Figure 8). The Middle Olifants River acts as fish support area and fish sanctuary for critically endangered and endangered fish. Fish sanctuaries are rivers that are essential for protecting threatened freshwater fish that are indigenous to South Africa, and the middle Olifants River is shown to have at least one population of a critically endangered or endangered fish species within its sub-quaternary catchment. No further deterioration in river condition in fish sanctuaries should be allowed.

F. LAND USE

The dominant land use in the area is dry land agriculture and livestock farming. The closest urban developments are Bongolethu and Oudtshoorn approximately 30 km to the north of the starting point of the proposed power line.

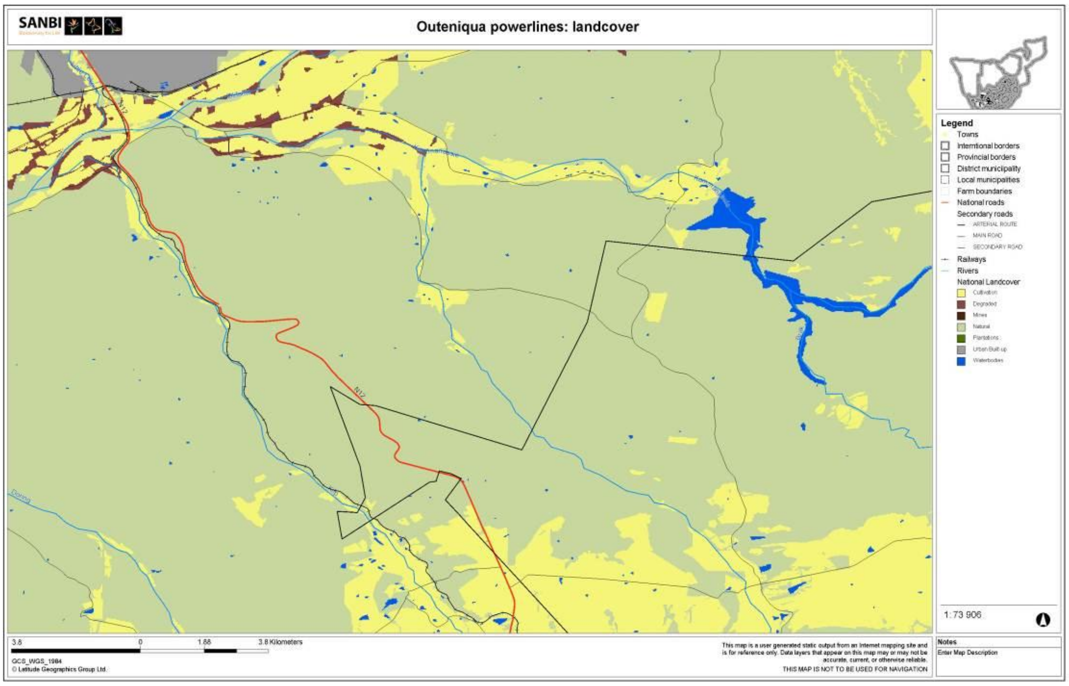


Figure 9: Landcover map for the area (SANBI Biodiversity GIS, 2012)

6.2. FRESHWATER ASSESSMENT OF THE STUDY AREA

The following water features were identified and assessed within the study area:

- The mid to lower Doring River;
- Unnamed ephemeral tributaries of the Doring River;
- The lower Kammanassie River;
- Unnamed ephemeral tributaries of the Kammanassie River;
- The middle reaches of the Olifants River;
- An unnamed tributary near the Oudtshoorn substation; and
- Associated wetlands of the above rivers and streams (Figure 11).

The Doring River is a tributary of the Kammanassie River, which in turn is a tributary of the Olifants River, flowing westwards until its confluence with the Gamka River to form the Gouritz River. All sites visited can be seen marked in Figure 10.

The Index for Habitat Integrity (IHI) and Site Characterisation Assessments were utilised to provide information on the ecological condition of the tributaries assessed. Historical SASS data was taken into account for the perennial rivers, but not for the ephemeral streams as there is hardly ever any flow. No detailed assessments were undertaken in terms of stream geomorphology, fish and aquatic biota. Results of the Site Characterisation Assessment were used to provide a desktop estimate of the site habitat integrity.

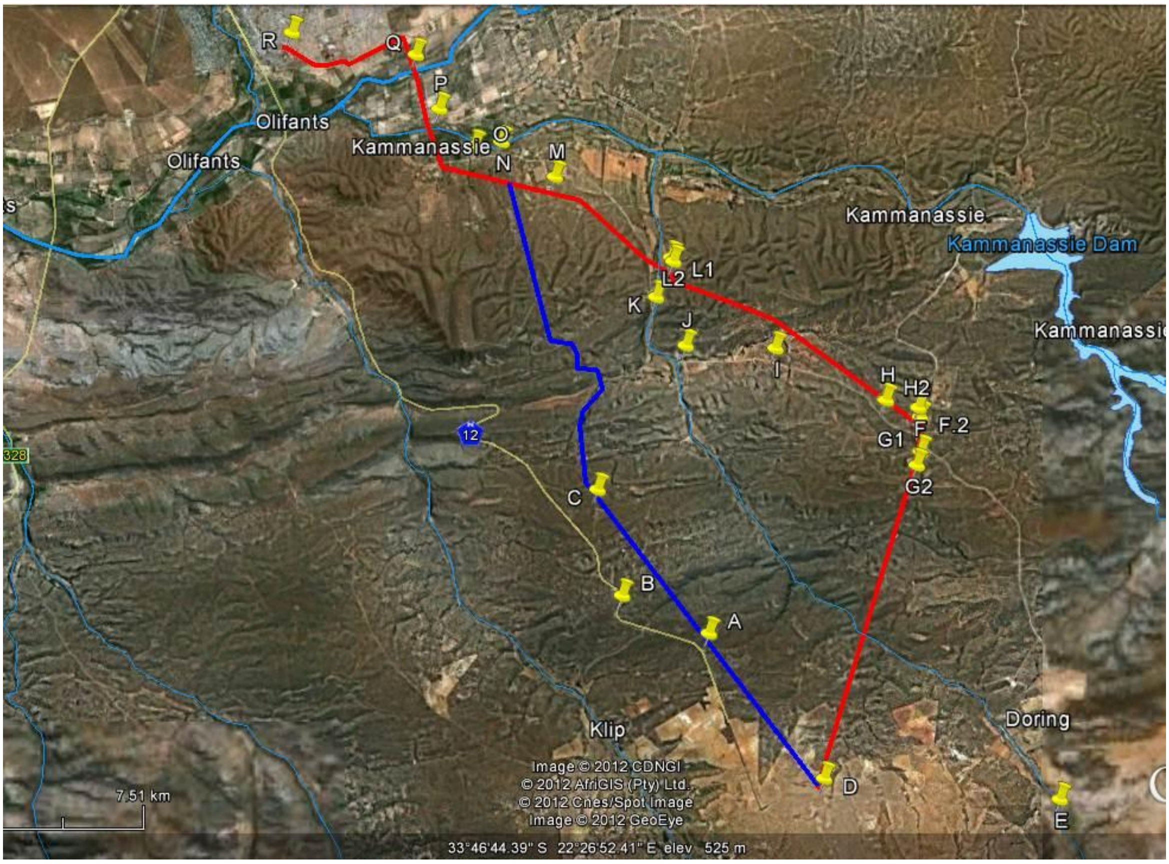


Figure 10: Freshwater features within the study area with points visited during the freshwater assessment.

6.2.1. RIVERS ASSESSMENT

A. RIVER CLASSIFICATION

In order assess the condition and ecological importance and sensitivity of the streams, it is necessary to understand how these streams might have appeared under unimpacted conditions. This is achieved through classifying rivers according to their ecological characteristics, in order that it can be compared to ecologically similar rivers.

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 condition should only be done between rivers that share similar physical and biological characteristics under natural conditions. Thus, the classification of rivers provides the basis for assessing river condition to allow comparison between similar river types. The primary classification of rivers is a division into Ecoregions. Rivers within an ecoregion are further divided into sub-regions.

Ecoregions are groups of rivers within South Africa, which share similar physiography, climate, geology, soils and potential natural vegetation. 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 fall into the Southern Folded Mountains Ecoregion.

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 1: Characteristics of the South Western Coastal Belt Ecoregion (Dominant Types In Bold)

Main Attributes	Southern Folded Mountains Ecoregion Characteristics
Terrain Morphology: Broad division	Plains; Low Relief (limited); Plains Moderate Relief (limited); Lowlands; Hills and Mountains; Moderate and High Relief; Open Hills; Lowlands; Mountains; Moderate to High Relief; **Closed Hills; Mountains; Moderate and High Relief**
Vegetation types	Patches Afromontane Forest; Xeric Succulent Thicket (limited); Valley Thicket (limited); Spekboom Succulent Thicket; **Grassy Fynbos; Mountain Fynbos;** Limestone Fynbos (limited); Sand Plain Fynbos (Limited); South and South West Coast Renosterveld; Central Mountain Renosterveld; West Coast Renosterveld (very limited) Eastern Mixed Nama Karoo; Central Nama Karoo; Great Nama Karoo; Eastern Thorn Bushveld (very limited); **Little Succulent Karoo;** Lowland Succulent Karoo (very limited);
Altitude (m a.m.s.l)	0-300 limited; 300-1900
MAP (mm)	200 to 1500
Rainfall concentration index	<15 to 54
Rainfall seasonality	Very late summer to winter to all year
Mean annual temp. (°C)	10 to 20

B. SITE CHARACTERISATION

From the Site Characterisation assessment, the geomorphological and physical characteristics of the Doring-, Kammanassie and Olifants rivers that were assessed can be classified as follows:

Table 2: Geomorphological and Physical features of the Rivers

River	Doring River	Kammanassie River	Olifants River
Valley Form	Foothill – Cobble bed	Lower Foothill – gravel bed	Lower Foothill – gravel bed
Lateral mobility or entrenchment	Moderately confined to unconfined	Unconfined	Moderately confined to unconfined
Channel form	Simple	Simple	
Channel pattern	Multiple thread: anatomosing/anabranching	Multiple thread: anatomosing/anabranching	Multiple thread: anatomosing/anabranching
Channel type	Cobble (upstream) to sandy (downstream) bed	Sandy bed	Sandy bed
Hydrology	Perennial	Perennial	Perennial

Table 3: Geomorphological and Physical features of the smaller unnamed streams

River	Unnamed tributaries	Unnamed tributary at Oudtshoorn substation
Valley Form	Mountain stream to Foothill – Cobble bed	Lowland stream
Lateral mobility or entrenchment	Moderately confined	Confined
Channel form	Simple	Simple
Channel pattern	Single thread to Multiple thread: braded	Single thread
Channel type	Cobble (upstream) to sandy (downstream) bed	Cement and Cobble bed
Hydrology	Ephemeral	Ephemeral

C. INDEX OF HABITAT INTEGRITY

The evaluation of Index of Habitat Integrity (IHI) provides a measure of the degree to which a river has been modified from its natural state. This assessment was undertaken for the Doring, Kammanassie and Olifants rivers and their affected tributaries.

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 IHI assessment is based on an evaluation of the impacts of two components of the river, the riparian zone and the instream habitat. 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 4).

Table 4: Habitat Integrity categories (From DWAF, 1999)

CATEGORY	DESCRIPTION	SCORE (% OF TOTAL)
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. A 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

Doring River:

The Doring River is very disturbed along its middle to lower reaches by the surrounding land use activities. The substrate on the riverbed is cobble to predominantly alluvium downstream. The dominant aquatic (riparian as well as instream) vegetation is the common reed (*Phragmites australis*).

Figure 11: The Doring River upstream (left) and downstream (right) at the Heimesrivier Road crossing prior to the first power line crossing (Figure 10 - point E).

Figure 12: The Doring River upstream (left) and downstream (right) just upstream to the second power line crossing (Figure 10 - point K).

Table 5: Index of Habitat Integrity Assessment results and criteria assessed for the Doring River

RIPARIAN ZONE HABITAT INTEGRITY	Upstream Score	Downstream Score	Comments
Vegetation Removal (Impact 1 - 25)	17	14	Historical farming and land clearing
Exotic Vegetation (Impact 1 - 25)	4	15	General infestation of trees
Bank Erosion (Impact 1 - 25)	4	14	Little erosion visible
Channel Modification (Impact 1 - 25)	2	5	Slight changes of channel due to farming activities
Water Abstraction (Impact 1 - 25)	8	13	Some flow reduction
Inundation (Impact 1 - 25)	2	4	Some farm dams
Flow Modification (Impact 1 - 25)	5	5	Slight modification of flows due to land use activities
Water Quality (Impact 1 - 25)	5	8	Runoff from farmed areas
INTEGRITY CLASS	**C/D**	**E**	**Moderately to Seriously modified**
INSTREAM HABITAT INTEGRITY	Upstream score	Downstream score	Comments
Water Abstraction (Impact 1 - 25)	7	10	See riparian habitat integrity
Flow Modification (Impact 1 - 25)	5	5	See riparian habitat integrity
Bed Modification (Impact 1 - 25)	4	15	Increased sediment from catchment
Channel Modification (Impact 1 - 25)	0	1	See riparian habitat integrity
Water Quality (Impact 1 - 25)	5	8	See riparian habitat integrity
Inundation (Impact 1 - 25)	0	0	None
Exotic Macrophytes (Impact 1 - 25)	0	6	Exotic plants invading instream habitat
Exotic Fauna (Impact 1 - 25)	0	0	None
Rubbish Dumping (Impact 1 - 25)	0	2	Minimal litter
INTEGRITY CLASS	**B**	**C**	**Largely natural to Moderately modified**

The instream habitat integrity is largely natural (upstream) to moderately modified (downstream), whereas the riparian habitat is moderately (upstream) to seriously (downstream) modified. The major impacts to the stream habitat integrity are as a result of physical disturbance into the riparian zone by land clearing and agricultural activities. An increase in sediment due to runoff from agricultural land on erodible soils can clearly be seen at the downstream site.

Kammanassie River:

The Kammanassie River is a naturally braided, large tributary of the Olifants River, rising in the Outeniqua and Kammanassie mountains near Uniondale. With the Kammanassie Dam about 14 km upstream from the area where the proposed power line will cross it, the river flow is completely modified, preventing most natural occurring flooding, thus also lowering the natural floodline. The substrate on the riverbed is predominantly alluvium dominated by vegetation. Embankments to prevent flooding of agricultural lands are also present in the riparian zones. Main aquatic (riparian as well as instream) vegetation is the Sweet thorn (*Acacia karoo*), the Karee trees (*Searsia lancea*), the Common reed (*Phragmites australis*), and some Old man saltbush (*Atriplex nummularia*).

Figure 13: The Kammanassie River upstream (left) and downstream (right) view (Figure 10 - point P)

Table 6: Index of Habitat Integrity Assessment results & criteria assessed for the Kammanassie River

RIPARIAN ZONE HABITAT INTEGRITY	Score	Comments
Vegetation Removal (Impact 1 - 25)	11	Surrounding farming activities
Exotic Vegetation (Impact 1 - 25)	6	Moderate infestation of trees and grasses
Bank Erosion (Impact 1 - 25)	10	Erosion visible at places
Channel Modification (Impact 1 - 25)	3	Some channel modification due to farming activities
Water Abstraction (Impact 1 - 25)	15	Large Kammanassie dam upstream from site
Inundation (Impact 1 - 25)	6	Upstream dam
Flow Modification (Impact 1 - 25)	18	Serious modification of flows due to upstream land use activities and Kammanassie dam
Water Quality (Impact 1 - 25)	11	Contamination of runoff from farmed areas
INTEGRITY CLASS	**E**	**Seriously modified**
INSTREAM HABITAT INTEGRITY	Score	Comments
Water Abstraction (Impact 1 - 25)	15	See riparian habitat integrity
Flow Modification (Impact 1 - 25)	18	See riparian habitat integrity
Bed Modification (Impact 1 - 25)	9	Increased sediment from catchment and decreased ability of river to transport sediment
Channel Modification (Impact 1 - 25)	0	None
Water Quality (Impact 1 - 25)	5	See riparian habitat integrity
Inundation (Impact 1 - 25)	4	See riparian habitat integrity
Exotic Macrophytes (Impact 1 - 25)	0	None
Exotic Fauna (Impact 1 - 25)	0	None
Rubbish Dumping (Impact 1 - 25)	7	Litter on banks
INTEGRITY CLASS	**C/D**	**Moderately to Largely modified**

The Kammanassie River's riparian habitat at the site visited was seriously modified whereas the instream habitat integrity scored a C/D – Moderately to largely modified. The major impacts to the stream habitat integrity are as a result of physical disturbance into the riparian zone by land clearing and agricultural activities as well as the upstream Kammanassie dam, storing most of the high flood flows.

Olifants River:

The Olifants River is also a naturally braided river, which rises to the east and flows westwards between the Swartberg and Kammanassie mountains to its confluence with the Gamka River. The substrate on the riverbed is predominantly alluvium dominated by vegetation. Main aquatic (riparian as well as instream) vegetation is predominantly the common reed (*Phragmites australis*), Sweet thorn (*Acacia karoo*) and some Karee trees (*Searsia lancea*).

Figure 14: The Olifants River upstream (left) and downstream (right) view (Figure 10 – point Q)

Table 7: Index of Habitat Integrity Assessment results and criteria assessed for the Olifants River

RIPARIAN ZONE HABITAT INTEGRITY	Score Downstream	Comments
Vegetation Removal (Impact 1 - 25)	7	Surrounding farming activities
Exotic Vegetation (Impact 1 - 25)	7	Moderate infestation of trees and grasses
Bank Erosion (Impact 1 - 25)	5	Erosion visible at places
Channel Modification (Impact 1 - 25)	3	Some channel modification due to farming activities
Water Abstraction (Impact 1 - 25)	15	Cultivated land alongside river as well as water pumps, dams and weirs upstream
Inundation (Impact 1 - 25)	2	Upstream dam
Flow Modification (Impact 1 - 25)	14	Large modification of flows due to upstream land use activities and dam
Water Quality (Impact 1 - 25)	11	Contamination of runoff from farmed areas
INTEGRITY CLASS	**D**	**Largely modified**
INSTREAM HABITAT INTEGRITY	Downstream score	Comments
Water Abstraction (Impact 1 - 25)	15	See riparian habitat integrity
Flow Modification (Impact 1 - 25)	14	See riparian habitat integrity
Bed Modification (Impact 1 - 25)	11	Increased sediment from catchment and decreased ability of river to transport sediment

Channel Modification (Impact 1 - 25)	0	None
Water Quality (Impact 1 - 25)	8	See riparian habitat integrity
Inundation (Impact 1 - 25)	2	See riparian habitat integrity
Exotic Macrophytes (Impact 1 - 25)	0	None
Exotic Fauna (Impact 1 - 25)	0	None
Rubbish Dumping (Impact 1 - 25)	3	Litter on banks
INTEGRITY CLASS	**C/D**	**Moderately to Largely modified**

The instream habitat integrity for the Olifants River was found to be moderately to largely modified while the riparian habitat integrity was largely modified. Similar to the Kammanassie River, the major impacts to the stream habitat integrity are as a result of physical disturbance into the riparian zone by land clearing and agricultural activities as well as the upstream Stompdrif Dam, storing once again some flood flows and altering the natural flow distribution and the volumes of flow.

Ephemeral tributaries of the Doring- and Kammanassie Rivers:

All the tributaries possibly impacted by the preferred route of the power line, are of ephemeral nature, only flowing sporadically after heavy rainfall for a short period of time. Where possible these tributaries were assessed on site, and for the more inaccessible places they were assessed by use of satellite images. Most of the tributaries are formed by sloped stream channels and the substrate on the riverbed alluvium interspersed with gravel and stone. The main aquatic (riparian as well as instream) vegetation was found to be Sweet thorn (*Acacia karoo*), Spannish reed (*Arundo donax*), Pepper trees (*Schinus molle*) and some exotic *Prosopis sp* trees. Several small farm dams occur in almost all of these tributaries.

Figure 15: A typical unnamed tributary upstream (left) and downstream (right) view (Figure 10 - point J)

Figure 16: View of unnamed tributary (as seen in Figure 15) from a distance

Table 8: Index of Habitat Integrity Assessment results and criteria cumulatively assessed for the unnamed tributaries.

RIPARIAN ZONE HABITAT INTEGRITY	Score	Comments
Vegetation Removal (Impact 1 - 25)	10	Surrounding farming activities
Exotic Vegetation (Impact 1 - 25)	11	Moderate infestation of trees and grasses
Bank Erosion (Impact 1 - 25)	5	Erosion visible at places
Channel Modification (Impact 1 - 25)	3	Some channel modification due to farming activities
Water Abstraction (Impact 1 - 25)	9	Cultivated land alongside stream as well as dams upstream
Inundation (Impact 1 - 25)	5	Upstream dams
Flow Modification (Impact 1 - 25)	10	Moderate modification of flows due to upstream land use activities and dams
Water Quality (Impact 1 - 25)	8	Contamination of runoff from farmed areas
INTEGRITY CLASS	**C/D**	**Moderately to largely modified**
INSTREAM HABITAT INTEGRITY	Score	Comments
Water Abstraction (Impact 1 - 25)	9	See riparian habitat integrity
Flow Modification (Impact 1 - 25)	10	See riparian habitat integrity
Bed Modification (Impact 1 - 25)	12	Increased sediment from catchment and decreased ability of river to transport sediment
Channel Modification (Impact 1 - 25)	0	None
Water Quality (Impact 1 - 25)	8	See riparian habitat integrity
Inundation (Impact 1 - 25)	5	See riparian habitat integrity
Exotic Macrophytes (Impact 1 - 25)	0	None
Exotic Fauna (Impact 1 - 25)	0	None
Rubbish Dumping (Impact 1 - 25)	0	None
INTEGRITY CLASS	**C**	**Moderately modified**

These streams score a C/D (Moderately to largely modified) for riparian habitat integrity and a C (Moderately modified) for the instream habitat integrity. The major impacts to the stream habitat integrity of these streams are as a result of agricultural activities alongside these tributaries, instream farm dams as well as the invasion of several alien plant species. Erosion of highly erodible soils is also of concern in this area and results in increased sediment in the stream beds.

Figure 17: Some of the erosion visible in the area.

Urban unnamed tributary near the Oudtshoorn substation:

This unnamed urban stream is a highly modified stream that is channelised in parts runs through the urban area of Bridgeton southward towards the Olifants River. The channel has been completely modified and the stream subject to extensive pollution. There is no natural riparian or instream vegetation present.

Figure 18: The Unnamed tributary of the Olifants River upstream (left) and downstream (right) view (Figure 10 – point R)

Table 9: Index of Habitat Integrity Assessment results and criteria assessed for the Olifants River

RIPARIAN ZONE HABITAT INTEGRITY	Score	Comments
Vegetation Removal (Impact 1 - 25)	23	Vegetation has almost been completely removed by urban activity
Exotic Vegetation (Impact 1 - 25)	10	Moderate infestation of grasses
Bank Erosion (Impact 1 - 25)	8	Erosion visible at places
Channel Modification (Impact 1 - 25)	18	Serious channel modification
Water Abstraction (Impact 1 - 25)	13	Settlement alongside stream
Inundation (Impact 1 - 25)	8	Possible inundation due to channel and flow modification
Flow Modification (Impact 1 - 25)	5	Some modification due to urban use
Water Quality (Impact 1 - 25)	12	Contamination of runoff from urban and industrial area
INTEGRITY CLASS	**F**	**Critically modified**
INSTREAM HABITAT INTEGRITY	Downstream score	Comments
Water Abstraction (Impact 1 - 25)	10	See riparian habitat integrity
Flow Modification (Impact 1 - 25)	5	See riparian habitat integrity
Bed Modification (Impact 1 - 25)	23	Bed completely modified
Channel Modification (Impact 1 - 25)	18	See riparian habitat integrity
Water Quality (Impact 1 - 25)	12	See riparian habitat integrity
Inundation (Impact 1 - 25)	8	See riparian habitat integrity
Exotic Macrophytes (Impact 1 - 25)	12	Exotic grasses invading instream habitat
Exotic Fauna (Impact 1 - 25)	0	None
Rubbish Dumping (Impact 1 - 25)	19	Litter on banks
INTEGRITY CLASS	**E**	**Seriously modified**

This unnamed tributary's riparian habitat integrity is critically modified and the instream integrity seriously modified. The major impacts on this stream are due to the urban development alongside most of the stream. The stream has been completely channelized and now runs in a stone-in-cement channel. There is a large invasion of kikuyu grass on the stream banks and bed.

D. ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS)

EIS considers a number of biotic and habitat determinants surmised to indicate either importance or sensitivity. The determinants are rated according to a four-point scale. The median of the resultant score is calculated to derive the EIS category.

Table 10: Definition of the four-point scale used to assess biotic and habitat determinants presumed to 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 11: Ecological importance and sensitivity categories (DWAF, 1999)

EISC	General description	Range of 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 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

Table 12: Results of the EIS assessment for both tributaries assessed

Biotic Determinants	Doring River	Kammanassie River	Olifants River	Ephemeral tributaries	Unnamed Oudtshoorn tributary
Rare and endangered biota	2	4	4	0	0
Unique biota	1	2	2	0	0
Intolerant biota	1	2	2	0	0
Species/taxon richness	1	2	2	0	0
Aquatic Habitat Determinants					
Diversity of aquatic habitat types or features	1	2	2	0	0
Refuge value of habitat type	1	2	2	0	0
Sensitivity of habitat to flow changes	1	3	3	1	0
Sensitivity of flow related water quality changes	1	3	3	1	0
Migration route/corridor for instream and riparian biota	1	3	3	1	0
National parks, wilderness areas, Nature Reserves, Natural Heritage sites, Natural areas, PNEs	1	1	1	1	0
RATINGS	1.1	2.4	2.4	0.4	0
EIS CATEGORY	**Moderate to low**	**Moderate to high**	**Moderate to high**	**Low**	**Low**

The larger Kammanassie and Olifants Rivers have a moderate to high ecological importance and sensitivity score as a result of the presence of endemic fish species within the rivers, the Doring River is moderate to low, while the smaller tributaries have a relatively low ecological importance and sensitivity.

6.2.2. WETLANDS ASSESSMENT

The identification and mitigation of potential impacts on wetlands is essential to ensure long term integrity of wetlands. The SANBI wetland map layer (Figure 19a) and the national wetland Freshwater Ecosystem Priority Areas maps (Figure 19b) were used to identify possible wetlands that might be impacted. In the broader study area there are a few small depression wetlands and valley bottom wetlands associated with the river systems and drainage channels. Many of these systems have formed ideal features for the construction of small dams and are often highly modified.

According to the FEPA maps, there are a few depressions that have been identified as possible FEPA wetlands. All the wetlands that are in close proximity of the proposed preferred and alternative routes were identified and verified during the site visits. Many of the mapped wetland areas were thus verified during the field assessment as small farm dams within drainage channels. Figure 19c indicates those areas which were identified and verified.

Wetlands can be broadly classified according to their flow and geomorphic characteristics and this classification is summarised in Table 13.

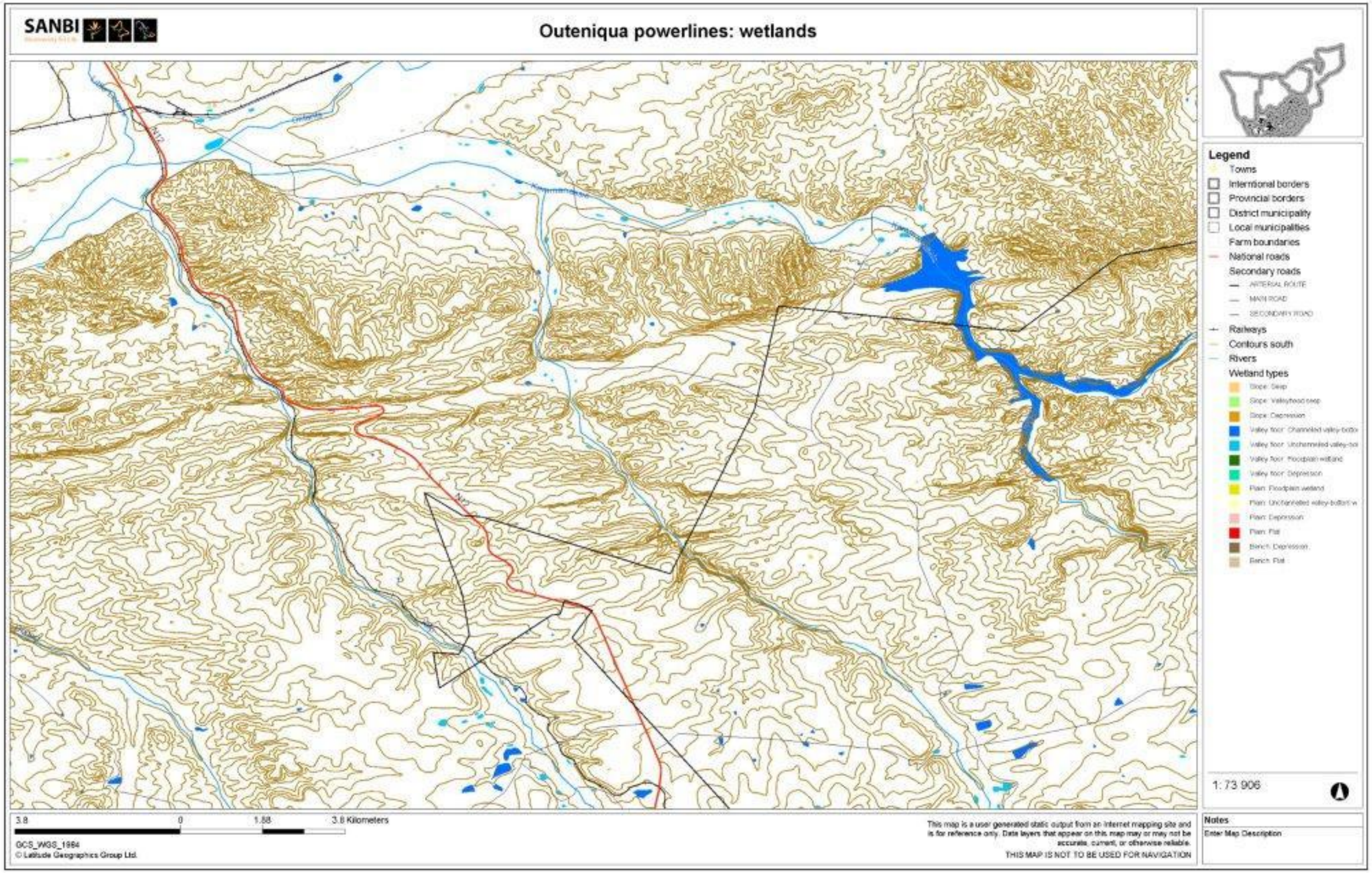


Figure 19a: SANBI wetland map

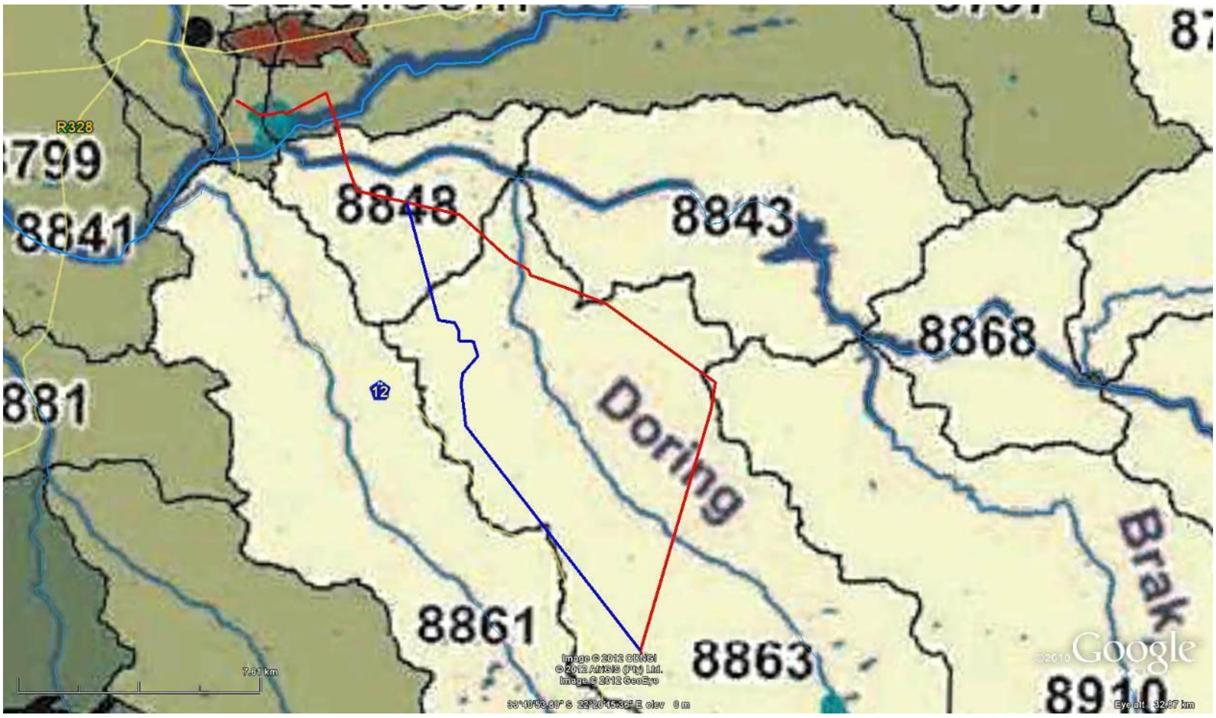


Figure 19b: River and wetland FEPA maps (SANBI)

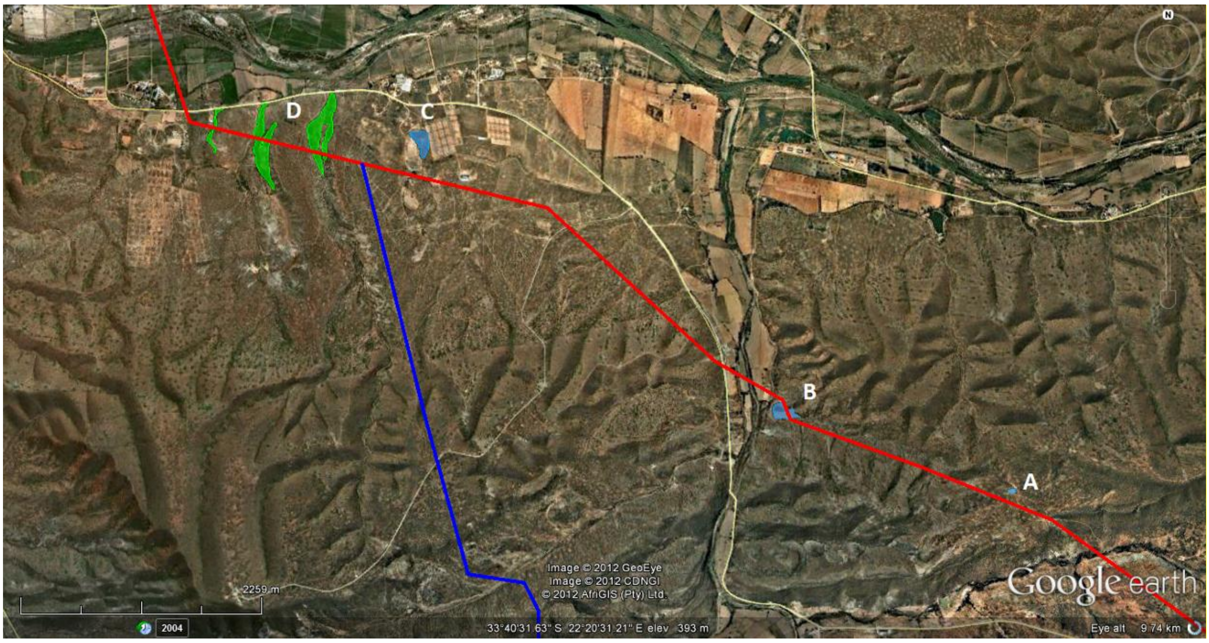
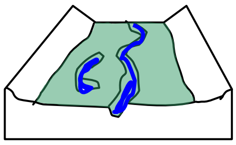
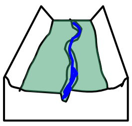
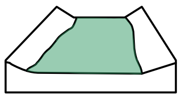
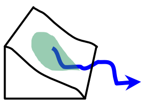
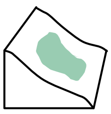
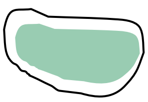


Figure 19c: The four wetland areas identified along the upper portion of the routes

Table 13: Wetland hydro-geomorphic types typically supporting inland wetlands in South Africa

Hydro-geomorphic types	Description	Source of water maintaining the wetland[1]	
		Surface	Sub-surface
Floodplain 	Valley bottom areas with a well-defined stream channel, gently sloped and characterized by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*
Valley bottom with a channel 	Valley bottom areas with well-defined stream channel but lacking characteristic floodplain features. May be gently sloped, characterized by net accumulation of alluvial deposits or may have steeper slopes, characterized by net loss of sediment. Water inputs from main channel (overspill) and from adjacent slopes.	***	*/ ***
Valley bottom without a channel 	Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterized by alluvial sediment deposition, generally leading to net accumulation of sediment. Water inputs mainly from channel entering wetland and also from adjacent slopes.	***	*/ ***
Hill slope seepage linked to a stream channel 	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well-defined stream channel connecting the area directly to a stream channel.	*	***
Isolated Hill slope seepage 	Slopes on hillsides, which are characterized by colluvial (transported by gravity) movement of materials. Water inputs mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface connection.	*	***
Depression (includes Pans) 	A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e.is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.	*/ ***	*/ ***

[1] Precipitation is an important water source and evapotranspiration an important output

Wetland

Water source:

Water source:	*	Contribution usually small
	***	Contribution usually large
	*/ ***	Contribution may be small or important depending on local circumstances

During field verification the possible wetlands identified from the SANBI maps (wetlands and FEPA layers) and satellite images could not be categorized according to the wetland types described in Table 13. They can be described as follows (Figure 20A, B, C and D):

- A: a highly modified farm dam,
- B: an instream dam in one of the Doring River's tributaries forming a large depression,
- C: an isolated depression with abandoned farm dam wall, and
- D: a collection of drainage channels in which dams were constructed with well-defined channels.

These drainage channels which constitute ephemeral rivers only receive sporadic small contributions of surface water runoff and possibly a minor, if any contribution of groundwater.

A

B

Figure 20A and B Farm dams that are incorrectly identified as possible wetlands

C

D

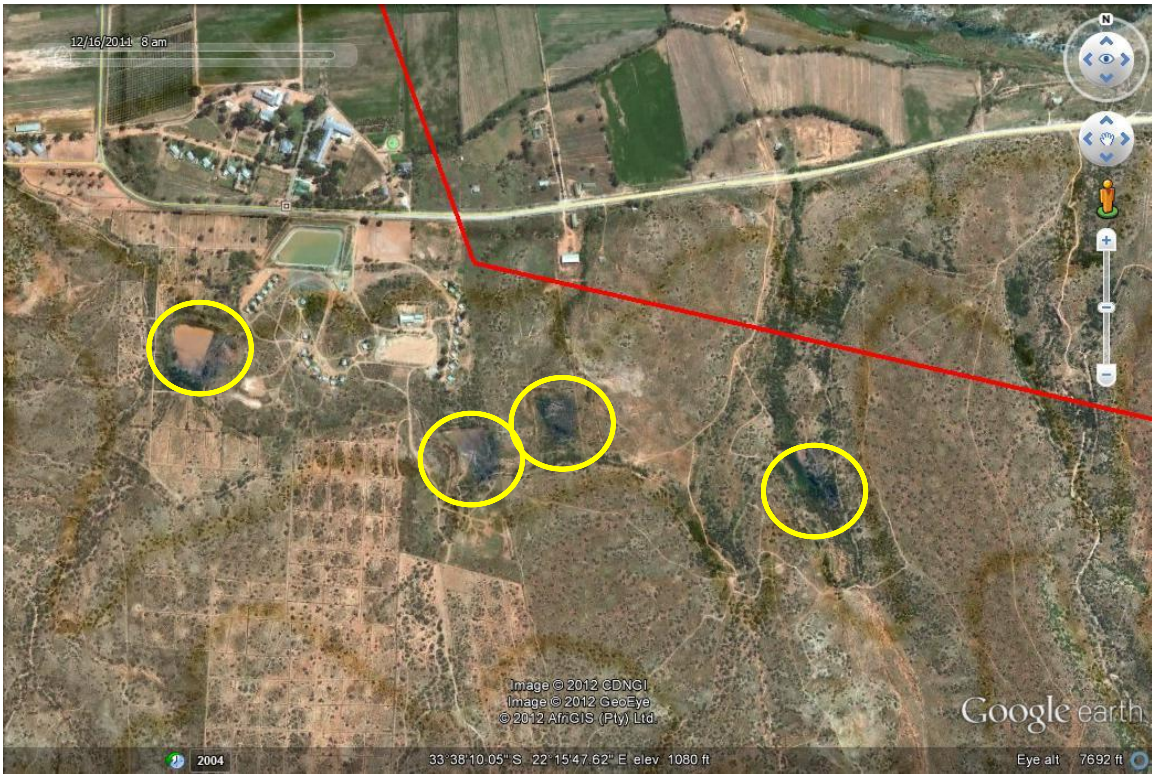


Figure 20C and D: Farm dams that are incorrectly identified as possible wetlands

6.3 EVALUATION OF POSSIBLY IMPACTED FRESHWATER FEATURES

Freshwater features possibly impacted on by the preferred (red) and alternative (blue) routes as shown in Figures 21 – 24, will further be discussed in Table 16.

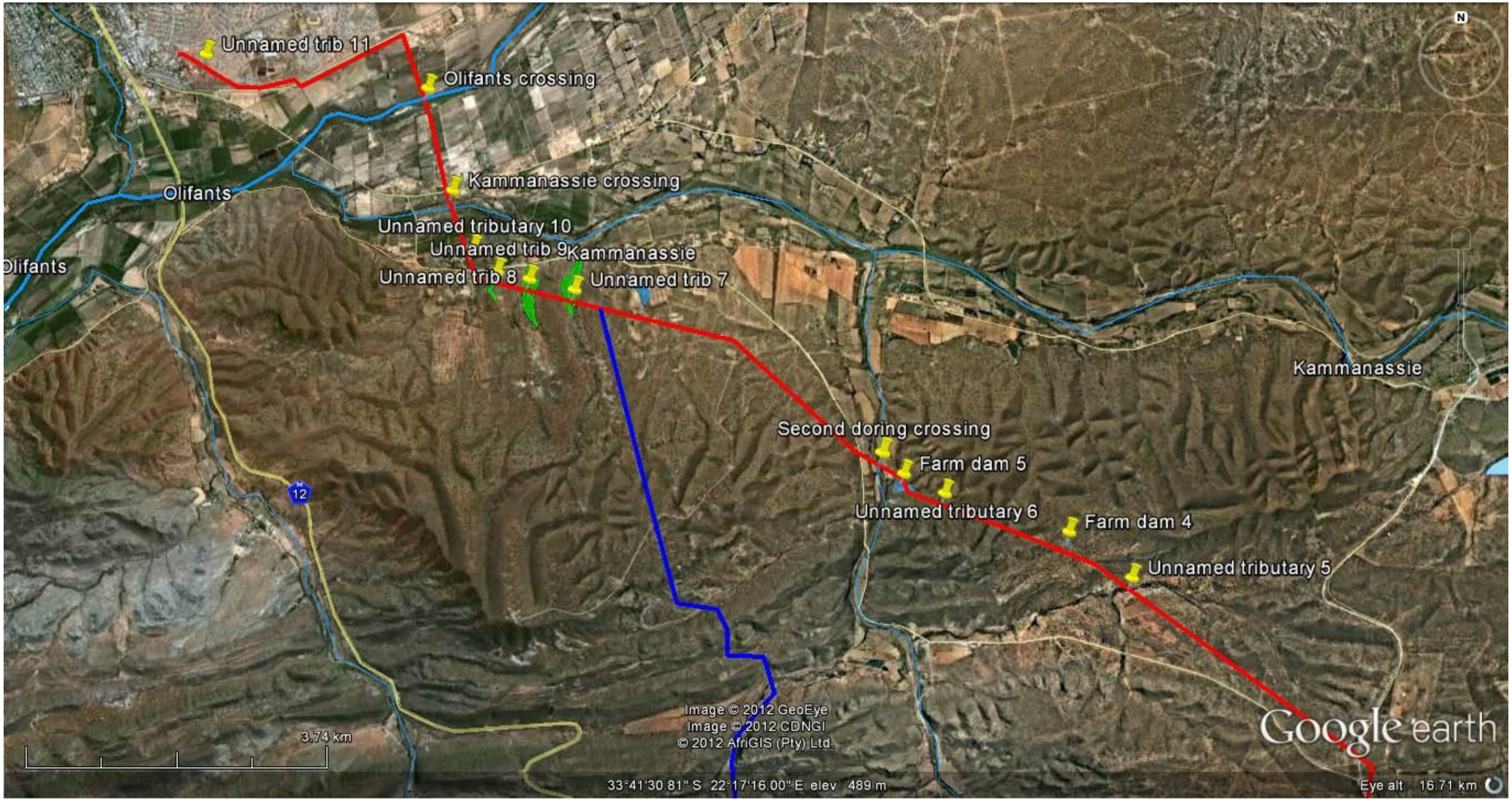


Figure 21: Freshwater constraints map for the northern part of the preferred route (red line) of the proposed new power line

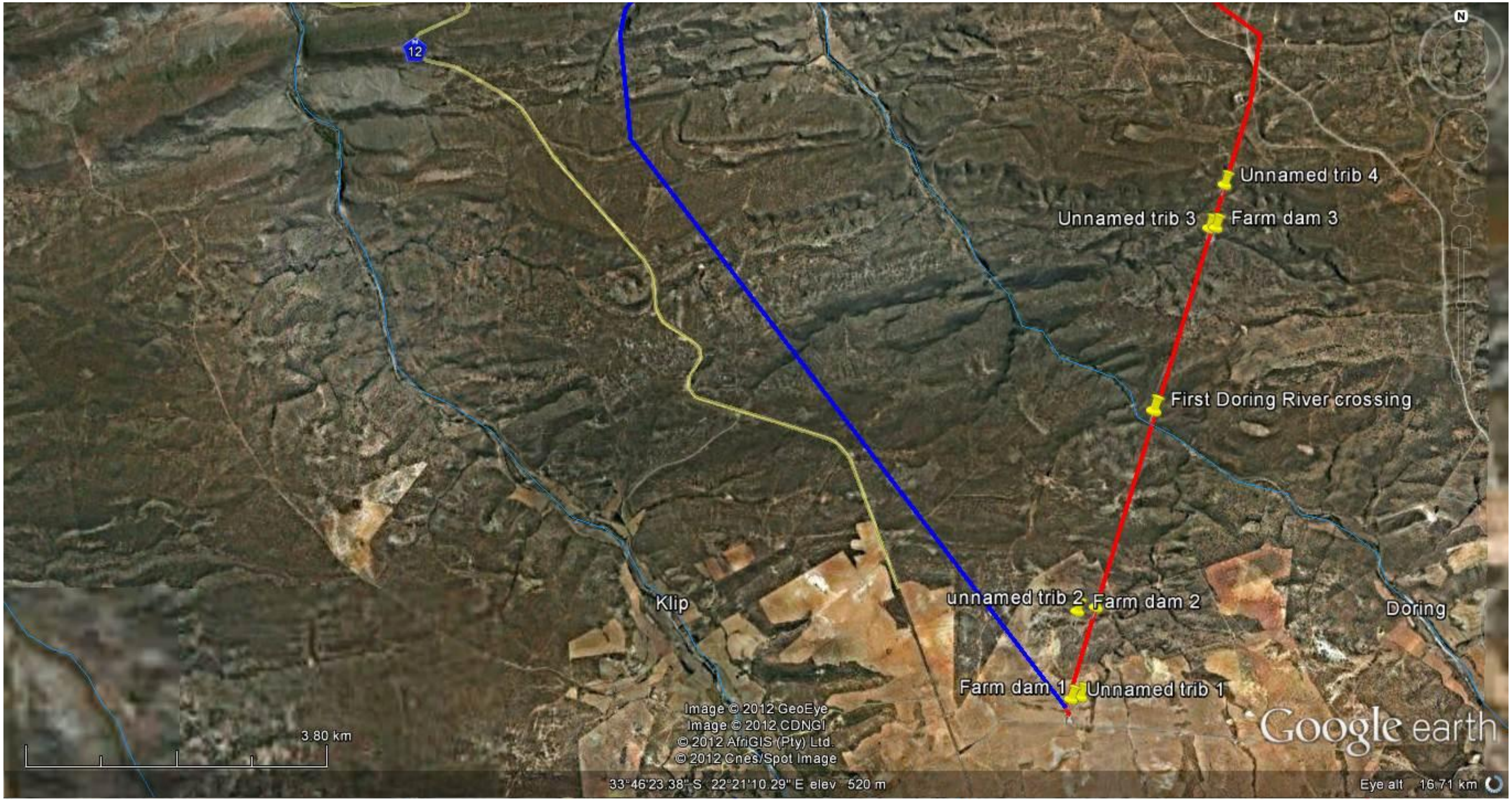


Figure 22: Freshwater constraints map for the southern part of the preferred route (red line) of the proposed new power line

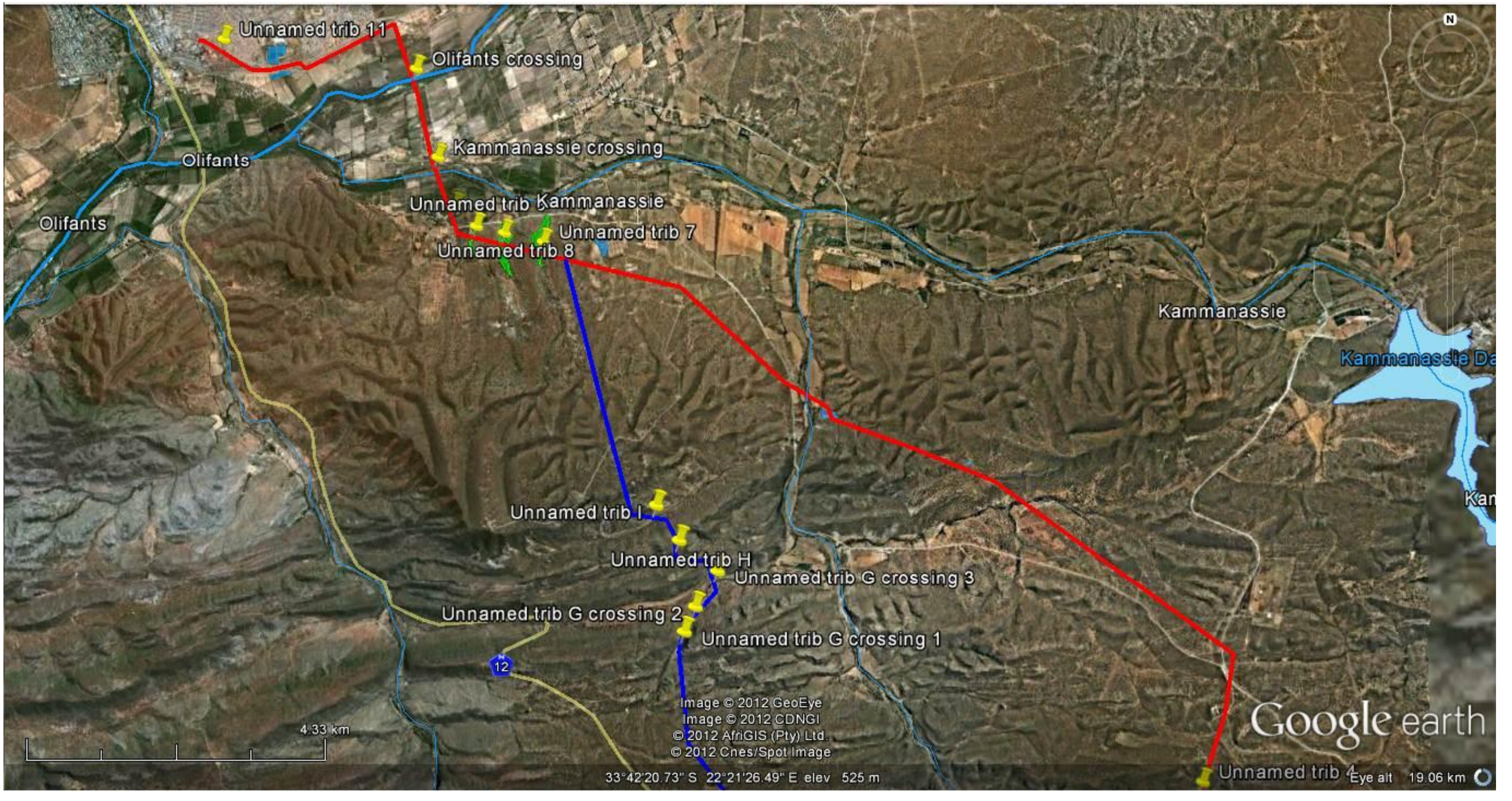


Figure 23 Freshwater constraints map for the northern part of the alternative route (blue line) of the proposed new power line

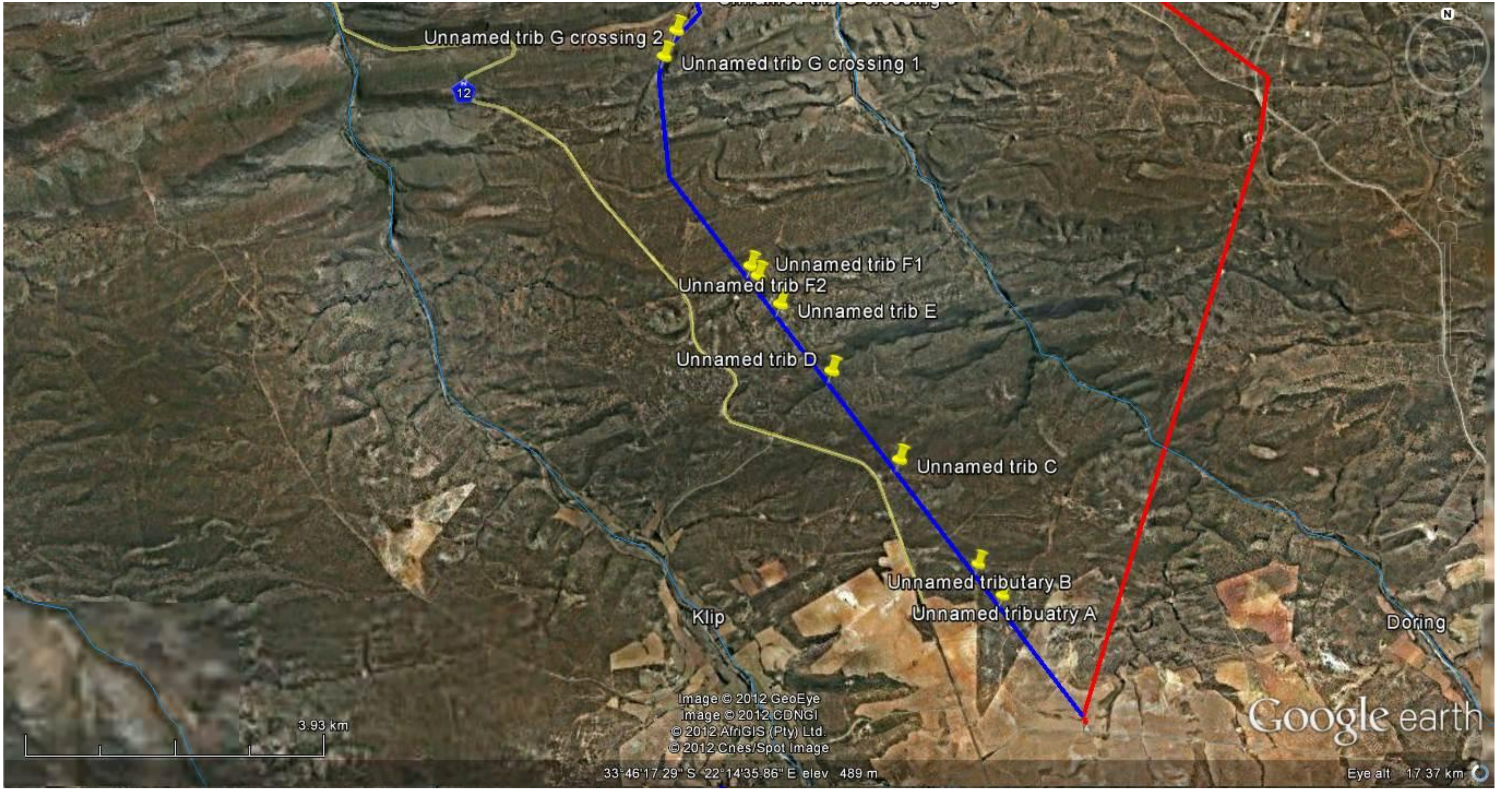


Figure 24: Freshwater constraints map for the southern part of the alternative route (blue line) of the proposed new power line

Table 16: Project Constraints related to freshwater features on the preferred route of the power line (Figures 21 -24)

No.	Google Earth image	Comment
1	**Crossings over the Doring river**  **Figure 25:** First crossing over the Doring River  **Figure 26:** Second crossing over the Doring River	The Doring River and longitudinal riparian areas associated with the river (Figures 25 and 26): the flood zone adjacent to the river are sometimes wide and flat but also significantly disturbed by farming activities. A 30 m buffer from top of bank on both sides of the river is recommended.

2	**Crossing tributaries of the Doring River**  **Figure 27:** Tributary 1  **Figure 28:** Tributary 2	Tributaries of the Doring River, adjacent dams and associated drainage channels (Figures 27 – 32). None of the ephemeral tributaries and drainage channels appears to have any ecological importance or sensitivity, and most of the surrounding land is seriously disturbed by farming activities. Therefore as a mitigation measure a buffer area of 15m from top of bank should be maintained on both sides of each tributary.

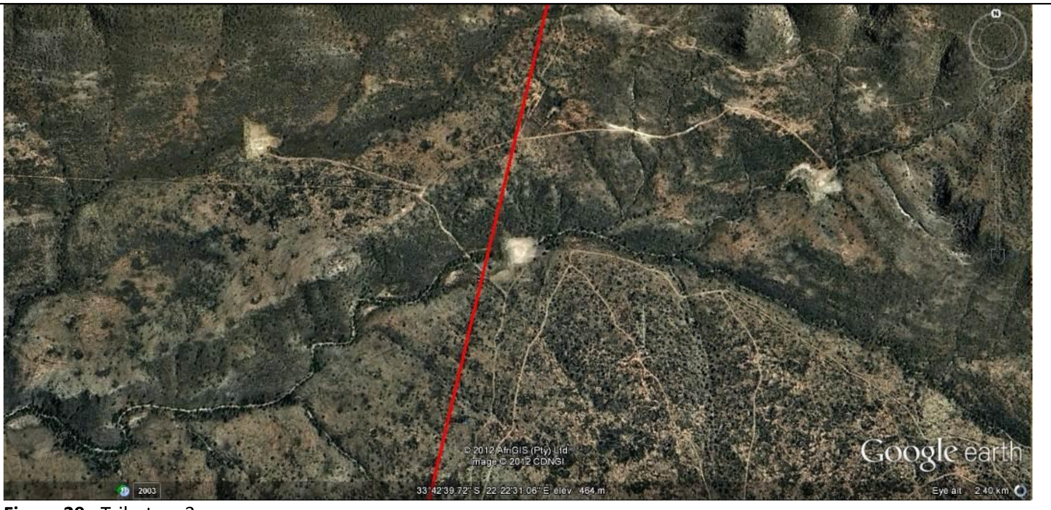


Figure 29: Tributary 3

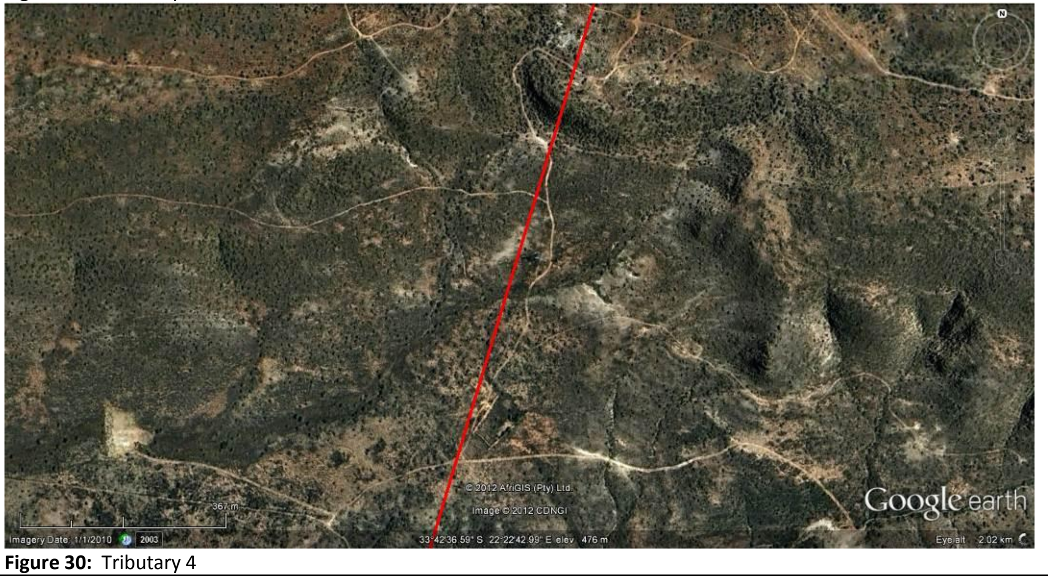


Figure 30: Tributary 4

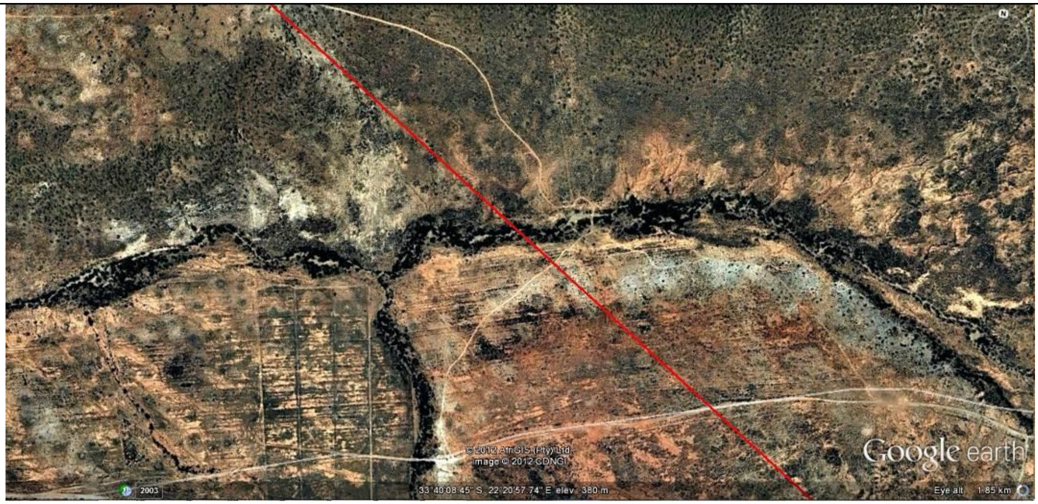
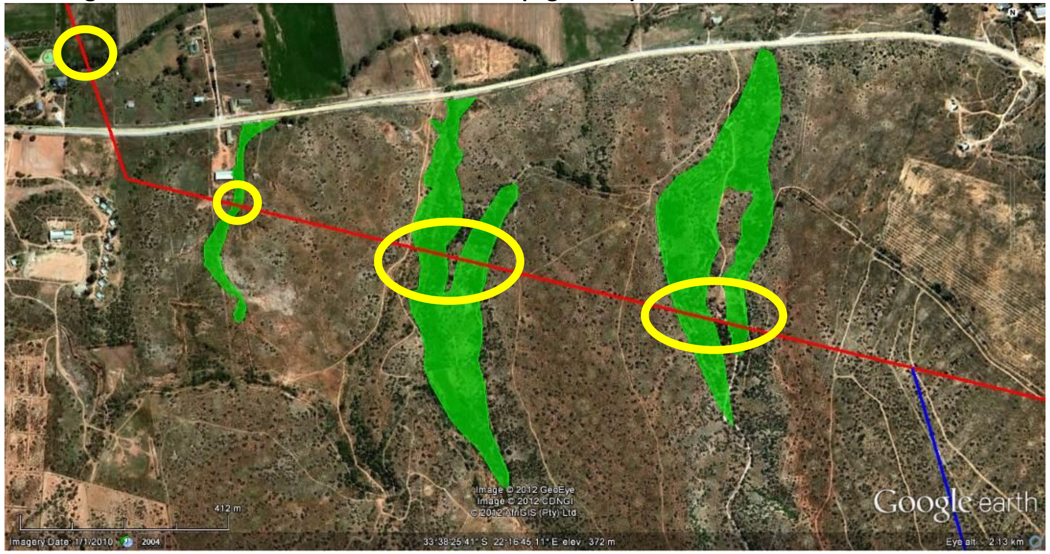


Figure 31: Tributary 5

Figure 32: Tributary 6

3	**Crossing the Kammanassie River (Figure 33)** 	The Kammanassie River with associated longitudinal wetland areas with the flood zone adjacent to the river being wide and flat (Figure 33). A 30 m buffer from top of bank on both sides of the river is recommended with poles being placed on already severely degraded adjacent farming land. It is also proposed that the existing road crossing be used for the purpose of a service road.
4	**Crossing tributaries of the Kammanassie River (Figure 34)** 	Tributaries of the Kammanassie River and associated drainage channels (Figure 34). These tributaries are still in a largely natural state but do not appear to have a high ecological importance or sensitivity. Most of the surrounding has been seriously disturbed by farming activities. A buffer area of 30 m should be maintained on both sides of each tributary, and pole placing should take place on already disturbed farm land in order to ensure lowest impact on streams and riparian zones. It is also advised that the existing road running alongside the line as well as farm roads inward towards the line be used as service road and that no new service/construction roads cross these tributaries.

5

Wet areas:

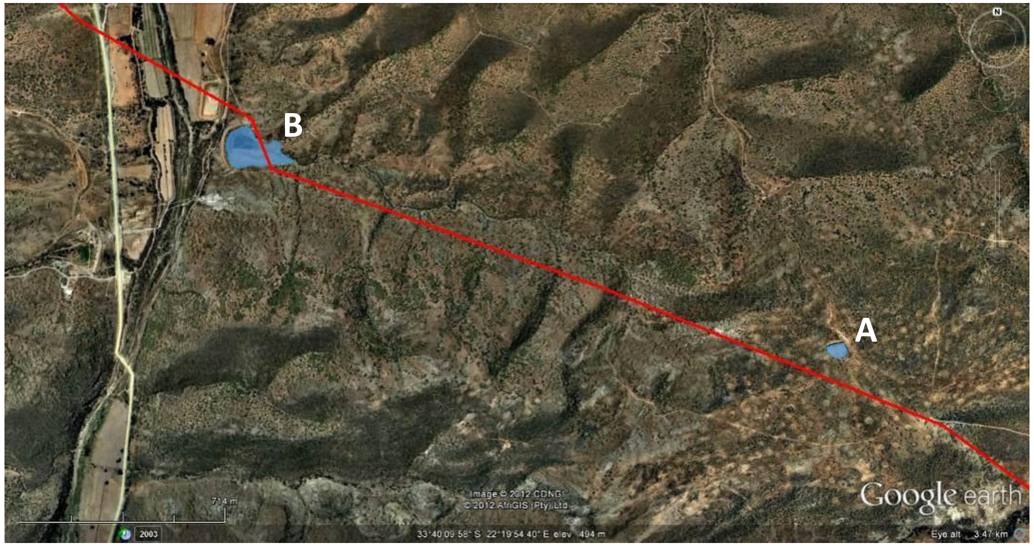


Figure 35: Showing wet areas A and B as mentioned in the report

Figure 36: Showing wet areas C as mentioned in the report

Point A in Figure 35: Small farm dam/depression adjacent to road. This shallow depression is in reality only seasonally inundated farm dam which is in a highly modified state and does not offer not much ecological functionality. Care should be taken that the service/construction roads are of such nature that they do not further increase erosion in this area as erosion and sediment control are of concern here.

Point B in Figure 35: The farm dam at B and the upstream tributaries are also in a highly transformed state. The dam is used as a balancing dam for irrigation water that is pumped from a river diversion further upstream. A buffer of 15 m alongside the dam and its tributaries is proposed to reduce the possibility of sedimentation occurring in the dam. The line crosses a second farm dam prior to crossing the Doring River. This farm dam is an earth filled man-made balancing dam for water taken from the Doring River. Poles should be placed 15 m away from each of these dams.

Point C in Figure 36: The farm dam situated north of the proposed power line displays some wetland plants in the part of the dam that stores water during the driest part of the year. The associated riparian zones shown as C are in a largely modified state offering low ecological service. As the line passes about 270m south from the remaining part of this wetland, it can be assumed that the impact would be negligible.

6

Unnamed tribuatries impacted by the alternative route

Figure 37: Tributary A

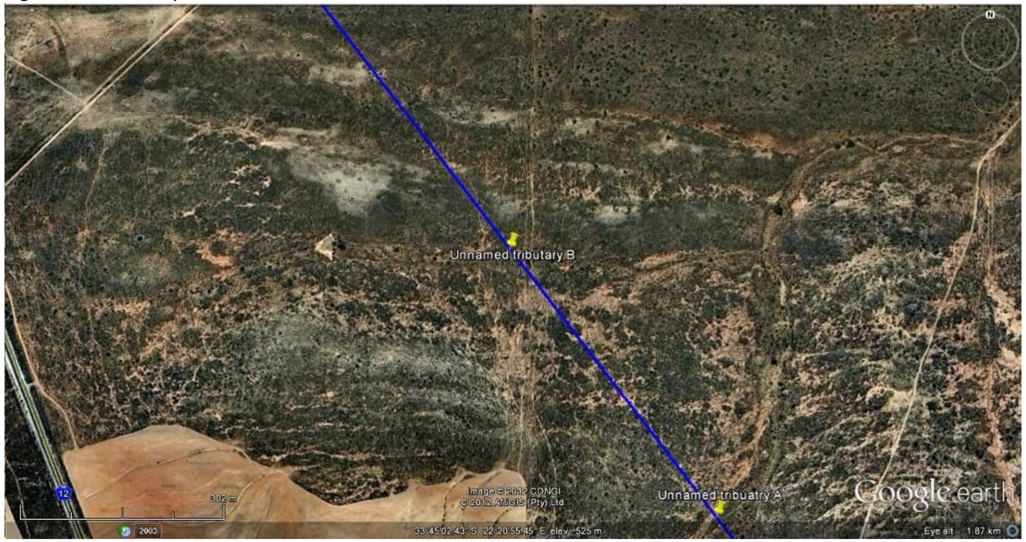


Figure 38: Tributary B

The alternative route is located over several small ephemeral tributaries of the Doring River (Figures 37 to 44) . These tributaries are very similar to thoseimpacted by the preferred route as dicussed on the previous pages. All these tributaries have a low ecological importance and any potential impact on them would be minimal, A 15 m buffer from top of bank should be allowed for on both sides of each tributary.

Figure 39: Tributary C

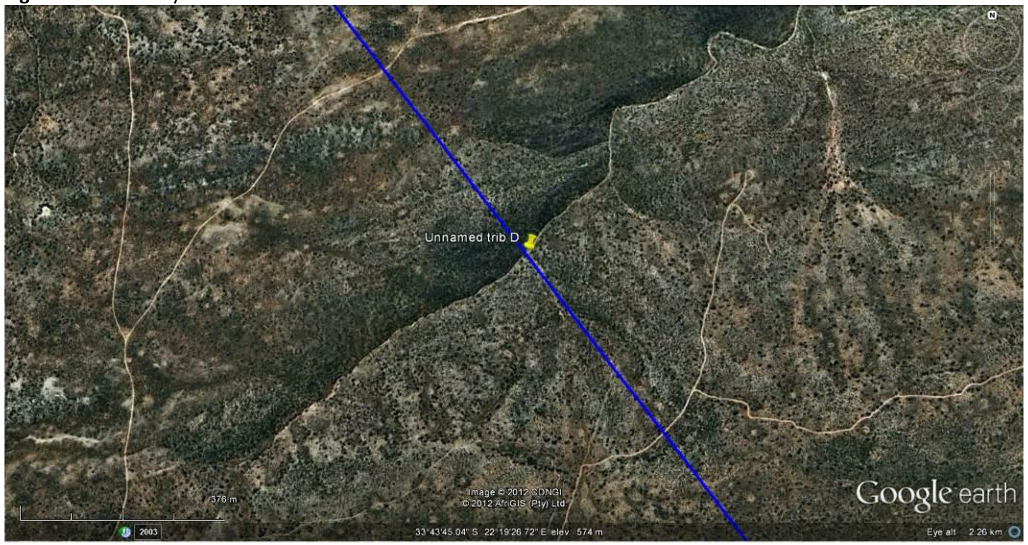


Figure 40: Tributary D

Figure 41: Tributary F

Figure 42: Tributary G

Figure 43: Tributary H

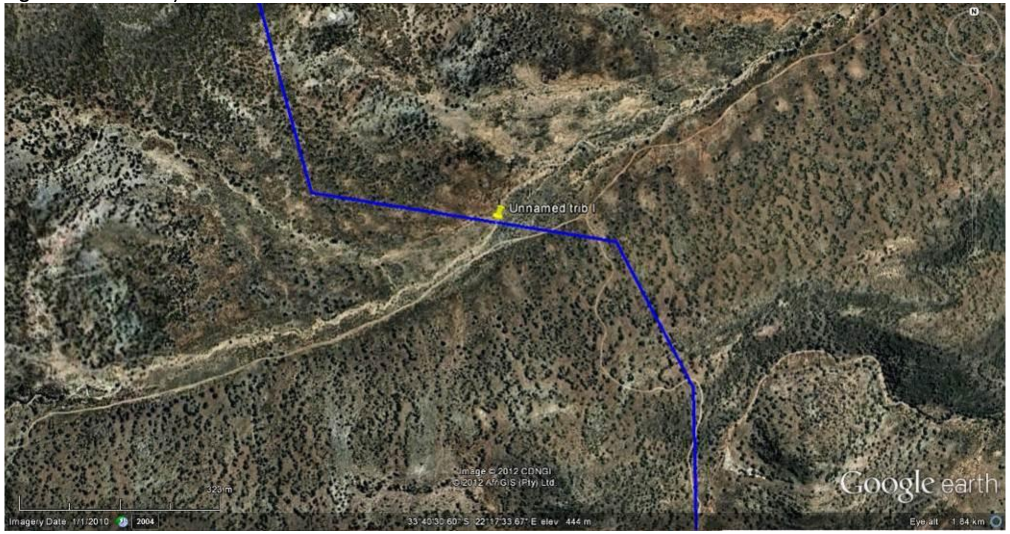


Figure 44: Tributary I

7. ASSESSMENT OF IMPACTS

This section provides an assessment of the overall potential impacts to freshwater ecosystems that are likely to be associated with the proposed activities. More detailed impacts for specific aspects of the project for both alternatives are dealt with in the next section. The impact assessment and recommended mitigation measures are grouped according to the various proposed activities, that is, the proposed overhead power lines and their access routes.

7.1 IMPACT OF PROPOSED OVERHEAD POWER LINE FOR BOTH ALTERNATIVES

A. DESCRIPTION AND ASSESSMENT OF IMPACTS OF PROPOSED ACTIVITIES

IMPACT OF OVERHEAD POWER LINES.

Construction Phase Activities

Nature of Impact: Construction activities would include the construction of concrete foundations for each monopole structure as well as gravel surface access roads alongside the line. The power line comprises of a 132 kV line traversing from the Outeniqua to the Oudtshoorn substation.

Activities during the construction phase of the project could thus be expected to result in ***some disturbance of vegetation cover*** and where access routes need to cross freshwater features, ***some disturbance to the bed and banks*** of the drainage features.

Significance of impacts without mitigation: A localized shorter term impact of moderate intensity (depending on the distance between the construction activities and the freshwater features) that is expected to have a low overall significance in terms of its impact on the identified aquatic ecosystems in the area.

Proposed mitigation: Construction activities should as far as possible be limited to the identified sites for the proposed monopole placings. A buffer of 15m, from top of bank on both sides and alongside the ephemeral tributaries and 30m from top of bank on both sides and alongside the Doring, Kammanassie and Olifants Rivers should be maintained. Neither the monopoles nor the anchors should be constructed within the proposed buffer zones of 15m and 30m on either side of the rivers. It is important that any of the cleared areas that are not hardened surfaces are rehabilitated after construction is completed by revegetating the areas disturbed by the construction activities with suitable indigenous plants. Invasive alien plants that currently exist within the immediate area of the construction activities should also be removed and any regrowth managed.

The servitude roads and two track roads that are already in place along the existing power lines on the preferred route must be used during the construction phase and no new roads must be established along this component during or after the construction of the new additional power line.

To reduce the risk of erosion, all service/ access roads should be contoured along any steep slope. 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 and drainage lines. Contaminated runoff from the construction sites should be prevented from entering the rivers/streams. 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 30m 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: An impact of very limited significance is expected on ***the drainage characteristics*** of minor tributaries of the Doring, Kammanassie and Olifants Rivers after the construction phase.

  Significance of impacts without mitigation: A localized longer term impact of low intensity 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: All crossings over drainage channels or stream beds after the construction phase should be rehabilitated such that the flow within the drainage channel is not impeded. Maintenance of transmission lines should only take place via the designated access routes. The establishment of alien vegetation in the riparian zones 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: An impact of limited significance is expected at the access route river crossings of ephemeral streams during the construction phase. The major impacts associated with the access roads relate to loss of habitat within streams, riparian areas and wetland/pan habitats, loss of indigenous vegetation within riparian zones and potential invasive alien plant growth as well as the potential for flow and water quality impacts and the direct impacts on the soil (erosion of drainage channels).

  Significance of impacts without mitigation: 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. For new access roads to the monopole structures, these should rather be along the ridges of the hills than in the drainage/stream beds. Where access routes need to be constructed through ephemeral streams, disturbance of the channel should be limited and multiple crossings should not be created. Riparian and wetland areas should be avoided and any road adjacent to the riparian zone should also remain outside of the 30m buffer zone as far as possible. 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: An impact of limited significance is expected at the access route river crossings of ephemeral streams after the construction phase. 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: 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.

Cumulative impact of the activities on freshwater ecosystems:

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. These impacts are likely to be of a low significance and can be monitored and easily mitigated.

B. SUMMARY OF ASSESSMENT OF POTENTIAL IMPACTS OF THE PROPOSED ACTIVITIES:

Construction Phase Activities:

Potential impact on freshwater features	**Proposed transmission lines**
Nature of impact:	Disturbance of habitat and possibly impedance/diversion of flow at river crossings
Extent and duration of impact:	Localised short term impacts
Intensity of Impact	Low
Probability of occurrence:	Probable depending on the extent of construction activities within stream bed
Degree to which impact can be reversed:	High
Irreplaceability of resources:	Medium to Low
Significance of impact pre-mitigation	Very low
Cumulative impact prior to mitigation:	Low

Degree of mitigation possible:	Very low
Proposed mitigation:	➢ Minimise duration and extent of construction activities in the river – construction should also preferably take place in the low flow season. ➢ Clearing of debris, sediment and hard rubble associated with the construction activities should be undertaken post construction to ensure that flow within the drainage channels are not impeded or diverted. ➢ Rehabilitate disturbed stream bed and banks and revegetate with suitable indigenous vegetation. ➢ Neither the monopoles nor the anchors should be constructed within the proposed buffer zones of 15m and 30m on either side of the rivers.
Significance after mitigation	Very Low
Cumulative impact post mitigation:	Very Low impact

Potential impact on freshwater features	**Proposed access routes**
Nature of impact:	Disturbance of habitat and possibly impedance/diversion of flow at river crossings
Extent and duration of impact:	Localised short term impacts
Intensity of Impact	Moderate to Low
Probability of occurrence:	Probable
Degree to which impact can be reversed:	High
Irreplaceability of resources:	Medium to Low
Significance of impact pre-mitigation	Low to very low
Cumulative impact prior to mitigation:	Low
Degree of mitigation possible:	Very low
Proposed mitigation:	➢ The existing road infrastructure should be utilized as far as possible to minimize the overall disturbance created by the proposed project. For new access roads to the pole structures, these should not be routed along the drainage/stream beds. ➢ The servitude roads and two track roads that are already in place along the existing power lines on the preferred route must be used during the construction phase and no new roads must be established along this component during or after the construction of the new additional power line. ➢ Where access routes need to be constructed through ephemeral streams, disturbance of the channel should be limited. ➢ Wetland areas should be avoided and any road adjacent to a wetland feature should also remain outside of the 30m buffer zone as far as possible. ➢ 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 after mitigation	Very Low
Cumulative impact post mitigation:	Very Low

Operation Phase Activities:

Potential impact on freshwater features	**Proposed transmission lines**
Nature of impact:	Disturbance of habitat and possibly impedance/diversion of flow at river crossings
Extent and duration of impact:	Localised longer term impacts

Intensity of Impact	Low
Probability of occurrence:	Probable to unlikely
Degree to which impact can be reversed:	High
Irreplaceability of resources:	Medium to Low
Significance of impact pre-mitigation	Very low
Cumulative impact prior to mitigation:	Low
Degree of mitigation possible:	Very low
Proposed mitigation:	➢ All crossings over drainage channels or stream beds after the construction phase should be rehabilitated such that the flow within the drainage channel is not impeded. ➢ Maintenance of power lines should only take place via the designated access routes and multiple crossings over streams and rivers should not be established.
Significance after mitigation	Very Low
Cumulative impact post mitigation:	Very Low impact

Potential impact on freshwater features	**Proposed access routes**
Nature of impact:	Disturbance of habitat and possibly impedance/diversion of flow at river crossings
Extent and duration of impact:	Localised longer term impacts
Intensity of Impact	Low
Probability of occurrence:	Probable to unlikely
Degree to which impact can be reversed:	High
Irreplaceability of resources:	Medium to Low
Significance of impact pre-mitigation	Very Low
Cumulative impact prior to mitigation:	Low
Degree of mitigation possible:	Very low
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 after mitigation	Very Low
Cumulative impact post mitigation:	Very Low

8. CONCLUSIONS AND RECOMMENDATIONS

The proposed power line between the Outeniqua and Oudtshoorn substations will potentially impact on the following freshwater features:

- The Doring River, and some of its tributaries (Moderately (upstream) to Seriously (downstream) modified present ecological state with a low ecological importance),
- The Kammanassie River, and four of its tributaries (Moderately to seriously modified state with a low ecological importance), and

- The Olifants River, and one of its tributaries (Moderately to largely modified state with a low ecological importance).

Overall, the expected impacts of the proposed activities are likely to be of a low significance and mostly limited to the proposed monopole placings, associated anchors and access roads. These potential impacts on the identified freshwater features are likely to mostly occur while construction activities are taking place. The primary negative impacts are the result of direct and indirect factors. Direct impacts include loss of natural vegetation adjacent to and within the freshwater features as a result of construction activities. Indirect factors include flow and water quality modification as a result of increased erosion and invasive plant growth within disturbed areas. All of these impact can however be mitigated.

The expected significance of the impact for both the two alternative routes on the aquatic ecosystems is similar and very low. The existing powerlines along the preferred route (red route) will minimise the additional impacts along this section of the proposed new power lines route and therefore this should be the preferred route.

Thus, provided that the recommended mitigation measures are implemented (adherence to the proposed buffers along rivers, and the utilisation of the existing access roads where possible) the significance of the impact is expected very low. A water use authorization may need to be obtained from the Department of Water Affairs Western Cape Regional Office for approval of the water use aspects of the proposed activities.

9. REFERENCES

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Skowno, A.L., Holness, S.D. and P.G. Desmet (2010) Biodiversity Assessment of the Kannaland and Oudtshoorn Local Municipalities, and Eden District Management Area (Uniondale). DEADP Report LB07/2008a, 65 pages.

ANNEXURE A– COORDINATES OF ALL FRESHWATER FEATURES AND THEIR DRAINAGE CHANNELS

Aquatic features impacted - Preferred route (red):

- Unnamed tributary 1: 33°45'49.29"S , 22°21'21.12"E to 33°45'48.72"S , 22°21'20.72"E
- Unnamed tributary 2: 33°45'14.05"S , 22°21'32.60"E to 33°45'12.30"S , 22°21'33.26"E
- Slight flow path into trib 2 : 33°44'44.51"S , 22°21'43.41"E and 33°44'41.69"S , 22°21'44.40"E
- Eerste Doring River crossing: 33°43'54.77"S , 22°22'1.30"E to 33°43'53.19"S , 22°22'1.82"E
- Slight flowpath 2 into trib 3: 33°42'57.53"S , 22°22'22.21"E
- Slight flowpath 3 into trib 3: 33°42'49.53"S , 22°22'25.15"E
- Unnamed tributary 3: 33°42'40.33"S , 22°22'28.04"E to 33°42'39.47"S , 22°22'28.31"E
- Unnamed tributary 4: 33°42'22.62"S , 22°22'35.17"E
- Slight flow path 4: 33°40'53.97"S , 22°22'14.28"E
- Slight flow path 5: 33°40'30.27"S , 22°21'35.06"E
- Unnamed tributary 5: 33°40'7.44"S , 22°20'57.56"E
- Slight flow path 6: 33°39'43.32"S , 22°19'59.01"E
- Slight flow path 7: 33°39'40.29"S , 22°19'49.67"E
- Slight flow path 8: 33°39'37.52"S , 22°19'39.72"E
- Slight flow path 9: 33°39'34.62"S , 22°19'30.72"E
- Unnamed tributary 6: 33°39'33.42"S , 22°19'26.54"E
- Slight flow path 10: 33°39'29.69"S , 22°19'14.04"E
- Farm dam 5: 33°39'28.35"S , 22°19'10.09"E tot 33°39'25.04"S , 22°19'8.52"E
- Farm dam 6: 33°39'20.61"S , 22°19'3.22"E tot 33°39'19.42"S , 22°19'0.49"E
- Second Doring River Crossing: 33°39'18.08"S, 22°18'57.48"E to 33°39'17.03"S , 22°18'55.31"E
- Slight flow path 11: 33°39'10.55"S , 22°18'42.43"E
- Slight flow path 12: 33°39'1.19"S , 22°18'30.32"E
- Slight flow path 13: 33°38'56.15"S , 22°18'23.54"E
- Slight flow path 14: 33°38'48.99"S , 22°18'14.08"E
- Slight flow path 15: 33°38'41.92"S, 22°18'4.69"E
- Slight flow path 16: 33°38'20.48"S, 22°17'12.83"E
- Unnamed tributary 7: 33°38'11.51"S, 22°16'28.11"E to 33°38'10.40"S , 22°16'22.58"E
- Unnamed tributary 8: 33°38'7.45"S , 22°16'7.75"E to 33°38'6.21"S , 22°16'1.59"E
- Unnamed tributary 9: 33°38'3.50"S , 22°15'48.10"E
- Slight flow path 17: 33°38'1.90"S , 22°15'40.17"E
- Unnamed tributary 10: 33°37'54.13"S , 22°15'36.21"E
- Kammanassie crossing: 33°37'35.50"S, 22°15'28.34"E to 33°37'29.76"S , 22°15'25.93"E
- Olifants crossing: 33°36'54.36"S , 22°15'15.95"E to 33°36'46.95"S , 22°15'13.15"E
- Unnamed trib 11: 33°36'35.28"S , 22°13'25.75"E

Aquatic features impacted - Alternative route (blue):

- Unnamed tributary A: 33°45'1.46"S , 22°20'37.44"E
- Unnamed tributary B: 33°44'48.17"S , 22°20'25.06"E
- Slight flowpath A: 33°44'20.14"S , 22°19'59.18"E
- Unnamed tributary C: 33°44'4.57"S , 22°19'44.93"E
- Unnamed tributary D: 33°43'27.25"S , 22°19'10.56"E
- Slight flowpath B: 33°43'19.88"S , 22°19'3.62"E

- Unnamed tributary E: 33°42'58.97"S , 22°18'44.43"E
- Unnamed tributary F1: 33°42'47.01"S , 22°18'33.13"E
- Unnamed tributary F2: 33°42'42.83"S , 22°18'29.34"E
- Unnamed tributary G crossing 1: 33°41'13.88"S , 22°17'45.24"E
- Unnamed tributary G crossing 2: 33°41'2.46"S , 22°17'51.38"E
- Unnamed tributary G crossing 3: 33°40'45.41"S , 22°18'3.76"E
- Unnamed tributary H: 33°40'30.90"S , 22°17'42.32"E
- Unnamed tributary I: 33°40'14.58"S , 22°17'29.49"E
- Slight flowpath C: 33°39'25.14"S , 22°17'2.73"E

ANNEXURE B: DECLARATION OF INDEPENDENCE BY THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

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, 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;
- 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 favorable 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 must be attached.

Signature of the specialist:

Date: 28 August 2012

APPENDIX C: ABBREVIATED CURRICULUM VITAE:

Full Name Antonia Belcher

Profession Aquatic Ecologist and Environmental Sciences (P. Sci. Nat. 400040/10)

Contact details 60 Dummer Street, Somerset West, 7139; Telephone: 082 883 8055

Relevant work experience:

Due to my involvement in the development and implementation of the River Health Program in the Western Cape, I 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 for the Western Cape.

Relevant work experience follows:

Belcher, A. 2007. Freshwater Assessment Input into The Storm water Master Plan for the Upper Mosselbank River Near Durbanville, City of Cape Town.

Belcher, A. 2008. Ecological Assessment of the Vlermuiskelderskloof Spruit. Proposed construction of an instream dam, Farm 143 Portion 4, Napier.

Belcher, A. 2008. Freshwater Ecological Screening Study: Helderberg Integrated Waste Management Facility.

Belcher, A. 2009. Freshwater Assessment: Proposed Upgrading of the Grabouw Wastewater Treatment Works.

Belcher, A. 2009. Freshwater Assessment input into the Environmental Management Plan for Moorreesburg and Malmesbury.

Belcher, A. 2009. Freshwater Assessment for the Proposed Improvement of Structures along the R27, Section 10 and 11 between Kenhardt and Keimoes.

Belcher, A. 2010. Freshwater Assessment for the Proposed Improvement of National Route 7 Section 1 between the Melkbos and Atlantis Intersections

Belcher, A. 2011. Freshwater Assessment for the Proposed Ibhubesi Power Project

Belcher, A. 2012. Freshwater Screening Assessment for the proposed solar energy facility on Portion 3 of Farm 18 (Onder Rietvlei) in the District of Aurora