

Wetland Delineation and Functional Assessment

Riverwalk Electrical



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Miss L. Delpont



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Indemnity

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1. INTRODUCTION

The delineation method documented by the Department of Water affairs and Forestry in their document “Updated manual for identification and delineation of wetlands and riparian areas” (DWAF, 2008), and the Minimum Requirements for Biodiversity Assessments (GDACE, 2009) as well as the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems (Ollis et al, 2013) was followed throughout the field survey. These guidelines describe the use of indicators to determine the outer edge of the wetland and riparian areas such as soil and vegetation forms as well as the terrain unit indicator.

1.1 Terms of reference

A wetland soil assessment (hydropedology) was required for the proposed development located on Solomon Mahlangu Drive (M10), Pretoria East. The proposed development site and therefore study site is located at the following coordinates: -25.746497, 28.372095. The assessment focused on the delineation of the wetland according to soil forms and wetness indicators, as well as the use of vegetation indicators for confirmation of wetland zones. The site consists of a bridge crossing over the Pienaars River.

1.2 Definitions and Legal Framework

This section outlines the definitions, key legislative requirements and guiding principles of the wetland study and the Water Use Authorisation process.

The National Water Act, 1998 (Act No. 36 of 1998) [NWA] provides for Constitutional water demands including pollution prevention, ecological and resource conservation, and sustainable utilisation. In terms of this Act, all water resources are the property of the State and are regulated by the Department of Water Affairs (DWA). The NWA sets out a range of water use related principles that are to be applied by DWA when taking decisions that significantly affect a water resource. The NWA defines a water resource as including a watercourse, surface water, estuary or aquifer. A watercourse includes a river or spring; a natural channel in which water flows regularly or intermittently; a wetland, lake, pan or dam, into which or from which water flows; any collection of water that the Minister may declare to be a watercourse; and were relevant its beds and banks.

The NWA defines a wetland as “land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is periodically

covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.” In addition to water at or near the surface, other distinguishing indicators of wetlands include hydromorphic soils and vegetation adapted to or tolerant of saturated soils (DWA, 2005).

Riparian habitat often perform important ecological and hydrological functions, some similar to those performed by wetlands (DWA, 2005). Riparian habitat is also the accepted indicator used to delineate the extent of a river’s footprint (DWA, 2005). It is defined by the NWA as follows: “Riparian habitat includes the physical structure and associated vegetation of the areas associated with a watercourse, which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas”.

Water uses for which authorisation must be obtained from DWA are indicated in Section 21 of the NWA. Section 21 (c) and (i) is applicable to any activity related to a wetland:

Section 21(c): Impeding or diverting the flow of water in a watercourse; and

Section 21(i): Altering the bed, banks, course or characteristics of a watercourse.

Authorisations related to wetlands are regulated by Government Notices R.267 of 24 March 2017. GN R.267 of 2017 grants General Authorisation (GA) for the above water uses on certain conditions:

- Any activity in a wetland for the rehabilitation of a wetland for conservation purposes.
- Any activity more than 500 m from the boundary of a wetland.

These regulations also stipulate that these water uses must be registered with the responsible authority. Any activity that is not related to the rehabilitation of a wetland and which takes place within 500 m of a wetland are excluded from a GA under either of these regulations. Wetlands situated within 500 m of proposed activities should be regarded as sensitive features potentially affected by the proposed development (GN 1199). Such an activity requires a Water Use Licence (WUL) from the relevant authority.

In addition to the above, the proponent must also comply with the provisions of the following relevant national legislation, conventions and regulations applicable to wetlands and riparian zones:

- Convention on Wetlands of International Importance - the Ramsar Convention and the South African Wetlands Conservation Programme (SAWCP).
- National Environmental Management Act, 1998 (Act No. 107 of 1998) [NEMA].
- National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004).
- National Environment Management Protected Areas Act, 2003 (Act No. 57 of 2003).
- Regulations GN R.982, R.983, R. 984 and R.985 of 2014, promulgated under NEMA
- Conservation of Agriculture Resources Act, 1983 (Act 43 of 1983).
- Regulations and Guidelines on Water Use under the NWA.
- South African Water Quality Guidelines under the NWA.
- Mineral and Petroleum Resources Development Act, 2002 (Act No. 287 of 2002).

2. METHODOLOGY

The wetland assessment was based on the Department of Water Affairs and Forestry “A practical field procedure for identification and delineation of wetlands and riparian areas” (DWAF, 2005). In brief, the method uses a combination of indicators to delineate the wetland:

- Terrain unit and topographical maps to determine where wetlands are most likely to occur using GIS software
- Identification of hydromorphic (wetland) soils
- Soil form and wetness indicators to establish permanent, seasonal, and temporary wetland zones. Assessed with the use of an auger, GPS, soil classification manual, and information available about the area.
- Identification of hydrophytes (wetland plants)
- Historic and current satellite imagery (e.g. Google Earth)

A more detailed description of the methods used in the identification of soils are provided below.

2.1 Definition of Wetlands

Wetlands as described by the National Water Act:

“Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.”

According to DWAF (2005), Wetlands must have one or more of the following attributes:

- Wetland (hydromorphic) soils that display characteristics resulting from prolonged saturation.
- The presence, at least occasionally, of water loving plants (hydrophytes).
- A high water table that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50cm of the soil.

2.2 Soil Indicators

According to DWAF (2005), the soil form indicator states that:

The permanent zone will always have either Champagne, Katspruit, Willowbrook or Rensburg soil forms present, as defined by the Soil Classification Working Group (1991).

The seasonal and temporary zones will have one or more of the following soil forms present (signs of wetness incorporated at the form level): Kroonstad, Longlands, Wasbank, Lamotte, Estcourt, Klapmuts, Vilafontes, Kinkelbos, Cartref, Fernwood, Westleigh, Dresden, Avalon, Glencoe, Pinedene, Bainsvlei, Bloemdal, Witfontein, Sepane, Tukulu, Montagu.

OR

The seasonal and temporary zones will have one or more of the following soil forms present (signs of wetness incorporated at the family level): Inhoek, Tsitsikamma, Houwhoek, Molopo, Kimberley, Jonkersberg, Groenkop, Etosha, Addo, Brandvlei, Glenrosa, Dundee.

The following is extracted from DWAF (2005) and is an explanation of hydromorphic soils:

“A hydromorphic soil displays unique characteristics resulting from its prolonged and repeated saturation. Once a soil becomes saturated for an extended time, roots and microorganisms gradually consume the oxygen present in pore spaces in the soil. In an unsaturated soil, oxygen consumed in this way would be replenished by diffusion from the air at the soil surface.

However, since oxygen diffuses 10 000 times more slowly through water than through air, the process of replenishing depleted soil oxygen in a saturated soil is significantly slower. Thus, once the oxygen in a saturated soil has been depleted, the soil effectively remains anaerobic. These anaerobic conditions make wetlands highly efficient in removing many pollutants from water, since the chemical mechanisms by which this is done need to take place in the absence of oxygen.

Prolonged anaerobic soil conditions result in a change in the chemical characteristics of the soil. Certain soil components, such as iron and manganese, which are insoluble under aerobic conditions, become soluble when the soil becomes anaerobic, and can thus be leached out of the soil profile.

Iron is one of the most abundant elements in soils, and is responsible for the red and brown colours of many soils. Once most of the iron has been dissolved out of a soil as a result of prolonged anaerobic conditions, the soil matrix is left a greyish, greenish or bluish colour, and is said to be gleyed.

A fluctuating water table, common in wetlands that are seasonally or temporarily saturated, results in alternation between aerobic and anaerobic conditions in the soil. Lowering of the water table results in a switch from anaerobic to aerobic soil conditions, causing dissolved iron to return to an insoluble state and be deposited in the form of patches, or mottles, in the soil. Recurrence of this cycle of wetting and drying over many decades concentrates these bright, insoluble iron compounds. Thus, soil that is gleyed but has many mottles may be interpreted as indicating a zone that is seasonally or temporarily saturated.”

2.3 Terrain Unit Indicator

The terrain unit indicator (Figure 1) is an important guide for identifying the parts of the landscape where wetlands might possibly occur. Some wetlands occur on slopes higher up in the catchment where groundwater discharge is taking place through seeps. An area with soil wetness and/or vegetation indicators, but not displaying any of the topographical indicators should therefore not be excluded from being classified as a wetland. The type of wetland which occurs on a specific topographical area in the landscape is described using the Hydrogeomorphic classification which separates wetlands into ‘HGM’ units. The classification of Ollis, et al. (2013) is used, where wetlands are classified on Level 4 as either Rivers, Floodplain wetlands, Valley-bottom wetlands, Depressions, Seeps, or Flats (Figure 2).

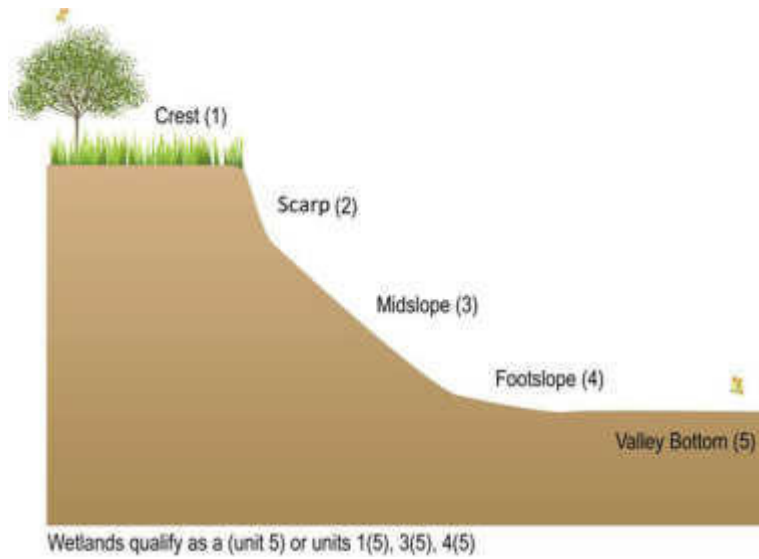


Figure 1. Terrain units (DWAF, 2005).

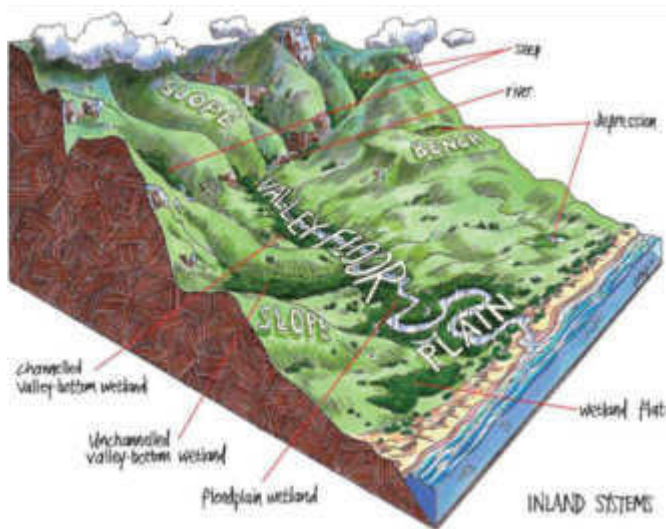


Figure 2: Wetland Units based on hydrogeomorphic types (Ollis et al. 2013)

2.4 Wetland Delineation and Classification


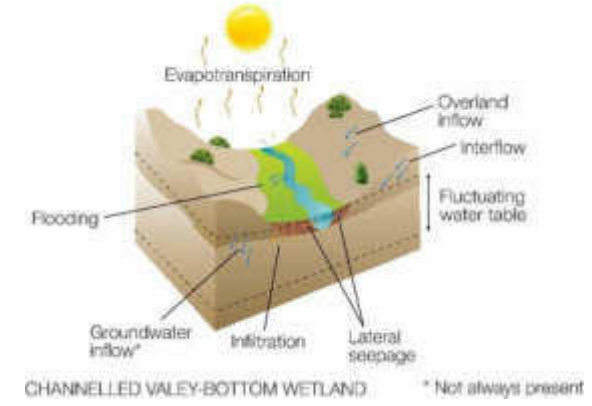
The classification system developed for the National Wetlands Inventory is based on the principles of the hydro-geomorphic (HGM) approach to wetland classification (SANBI, 2009). The current wetland study follows the same approach by classifying wetlands in terms of a functional unit in line with a level three category recognised in the classification system

proposed in SANBI (2009). HGM units take into consideration factors that determine the nature of water movement into, through and out of the wetland system. In general HGM units encompass three key elements (Kotze *et al*, 2005):

- Geomorphic setting - This refers to the landform, its position in the landscape and how it evolved (e.g. through the deposition of river borne sediment);
- Water source - There are usually several sources, although their relative contributions will vary amongst wetlands, including precipitation, groundwater flow, stream flow, etc.; and
- Hydrodynamics - This refers to how water moves through the wetland.

The Classification of wetland areas found during the study (adapted from Brinson, 1993; Kotze, 1999, Marneweck and Batchelor, 2002 and DWAF, 2005) are as follows (table 1):

Table 1: Wetland Hydro-geomorphic types and descriptions.

Hydro-geomorphic types	Description
<p><i>Riparian habitat</i></p> 	<p>Linear fluvial, eroded landforms which carry channelized flow on a permanent, seasonal or ephemeral/episodic basis. The river channel flows within a confined valley (gorge) or within an incised macro-channel. The “river” includes both the active channel (the portion which carries the water) as well as the riparian zone.</p>
<p><i>Valley bottom with a channel</i></p> 	<p>Linear fluvial, net depositional valley bottom surfaces which have a straight channel with flow on a permanent or seasonal basis. Episodic flow is thought to be unlikely in this wetland setting. The straight channel tends to flow parallel with the direction of the valley (i.e. there is no meandering), and no ox-bows or cut-off meanders are present in these wetland systems. The valley floor is, however, a depositional environment such that the channel</p>

	flows through fluviially-deposited sediment. These systems tend to be found in the upper catchment areas.
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The possibility of difficult wetland area exists on study areas and is summarised below including what approach to be taken in the case of a difficult wetland area (Table 2).

Table 2: List of types of sites that are difficult to delineate (Jobs, 2009).

Type of “difficult site”	Approach
Some or all, wetland indicators are present but is a non-natural wetland (e.g some dams, road islands)	<ul style="list-style-type: none"> • Decide on the relative permanence of the change and whether the area can now be said to be functioning as a wetland. • Time field observations during the wet season, when natural hydrology is at its peak, to help to differentiate between naturally-occurring versus human-induced wetland. • Decide appropriate policy/management i.e. can certain land uses be allowed due to “low” wetland functional value, or does the wetland perform key functions despite being artificial.
Indicators of soil wetness are present but no longer a functioning wetland (e.g. wetland has been drained)	<ul style="list-style-type: none"> • Look for evidence of ditches, canals, dikes, berms, or subsurface drainage tiles. • Decide whether or not the area is currently functioning as a wetland.
Indicators of soil wetness are present but no longer a functioning wetland (e.g. relic / historical wetland)	<ul style="list-style-type: none"> • Decide whether indicators were formed in the distant past when conditions were wetter than the area today. • Obtain the assistance of an experienced soil scientist.
Some, or all, wetland indicators are absent at certain times of year (e.g. annual vegetation or seasonal saturation)	<ul style="list-style-type: none"> • Thoroughly document soil and landscape conditions, develop rationale for considering the area to be a wetland. • Recommend that the site be revisited in the wet season.
Some, or all, wetland indicators are absent due to human disturbance (e.g. vegetation has been cleared, wetland has been ploughed or filled)	<ul style="list-style-type: none"> • Thoroughly document landscape conditions and any remnant vegetation, soil, hydrology indicators, develop rationale for considering the area to be wetland. • Certain cases (illegal fill) may justify that the fill be

removed and the wetland rehabilitated.

2.5 Buffer Zones

A buffer zone is defined as a strip of land surrounding a wetland or riparian area in which activities are controlled or restricted (DWAF, 2005). A development has several impacts on the surrounding environment and on a wetland. The development changes habitats, the ecological environment, infiltration rate, amount of runoff and runoff intensity of the site, and therefore the water regime of the entire site. An increased volume of stormwater runoff, peak discharges, and frequency and severity of flooding is therefore often characteristic of transformed catchments. The buffer zone identified in this report serves to highlight an ecologically sensitive area in which activities should be conducted with this sensitivity in mind.

2.6 Wetland Functionality, Status and Sensitivity

Wetland functionality is defined as a measure of the deviation of wetland structure and function from its natural reference condition. The natural reference condition is based on a theoretical undisturbed state extrapolated from an understanding of undisturbed regional vegetation and hydrological conditions. In the current assessment the hydrological, geomorphological and vegetation integrity was assessed for the wetland unit associated with the study site, to provide a Present Ecological Status (PES) score (Macfarlane *et al*, 2007) and an Environmental Importance and Sensitivity category (EIS) (DWAF, 1999). The impacts observed for the affected wetlands on the study site are summarised for each wetland under section 3.2. These impacts are based on evidence observed during the field survey and land-use changes visible on aerial imagery.

The allocations of scores in the functional and integrity assessment are subjective and are thus vulnerable to the interpretation of the specialist. Collection of empirical data is precluded at this level of investigation due to project constraints including time and budget. Water quality values, species richness and abundance indices, surface and groundwater volumes, amongst others, should ideally be used rather than a subjective scoring system such as is presented here.

The functional assessment methodologies presented below take into consideration subjective recorded impacts to determine the scores attributed to each functional Hydrogeomorphic (HGM) wetland unit. The aspect of wetland functionality and integrity that are predominantly addressed include hydrological and geomorphological function (subjective observations) and the integrity of the biodiversity component (mainly based on the theoretical intactness of natural vegetation) as directed by the assessment methodology.

In the current study the wetland was assessed using, WET-Health (Macfarlane *et al*, 2007) and EIS (DWAF, 1999).

2.6.1 Present Ecological Status (PES) – WET-Health

A summary of the three components of the WET-Health namely Hydrological; Geomorphological and Vegetation Health assessment for the wetlands found on site is described in Table 3. A Level 1 assessment was used in this report. Level 1 assessment is used in situations where limited time and/or resources are available.

Table 3: Health categories used by WET-Health for describing the integrity of wetlands (Macfarlane *et al*, 2007)

Description	Impact Score Range	PES Score	Summary
Unmodified, natural.	0.0-0.9	A	Very High
Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1-1.9	B	High
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact.	2-3.9	C	Moderate
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4-5.9	D	Moderate
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6-7.9	E	Low
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8-10	F	Very Low

A summary of the change class, description and symbols used to evaluate wetland health are summarised in Table 4.

Table 4: Trajectory class, change scores and symbols used to evaluate Trajectory of Change to wetland health (Macfarlane *et al*, 2007)

Change Class	Description	Symbol
Improve	Condition is likely to improve over the over the next 5 years	(↑)
Remain stable	Condition is likely to remain stable over the next 5 years	(→)
Slowly deteriorate	Condition is likely to deteriorate slightly over the next 5 years	(↓)
Rapidly deteriorate	Substantial deterioration of condition is expected over the next 5 years	(↓↓)

2.6.2 Ecological Importance and Sensitivity (EIS)

The Ecological Importance and Sensitivity (EIS) score forms part of a larger assessment called the Wetland Importance and Sensitivity scoring system which also addresses hydrological importance and direct human benefits relevant to a HGM unit. Both PES and EIS form part of a larger reserve determination process documented by the Department of Water and Sanitation.

Ecological importance is an expression of a wetland's importance to the maintenance of ecological diversity and functioning on local and wider spatial scales. Ecological sensitivity refers to the system's ability to tolerate disturbance and its capacity to recover from disturbance once it has occurred (DWAf, 1999). This classification of water resources allows for an appropriate management class to be allocated to the water resource and includes the following:

- Ecological Importance in terms of ecosystems and biodiversity such as species diversity and abundance.
- Ecological functions including groundwater recharge, provision of specialised habitat and dispersal corridors.
- Basic human needs including subsistence farming and water use.

The Ecological Importance and Sensitivity of the seepage wetland is represented are described in the results section. Explanations of the scores are given in Table 5.

Table 1: Environmental Importance and Sensitivity rating scale used for the estimation of EIS scores (DWAF, 1999)

Ecological Importance and Sensitivity Categories	Rating	Recommended Ecological Management Class
<p>Very High</p> <p>Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water in major rivers</p>	>3 and <=4	A
<p>High</p> <p>Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers</p>	>2 and <=3	B
<p>Moderate</p> <p>Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water in major rivers</p>	>1 and <=2	C
<p>Low/Marginal</p> <p>Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water in major rivers</p>	>0 and <=1	D

2.7 Assumptions and limitations

The site assessment was conducted during one season and the data obtained should be considered in conjunction with conservation authorities as well as other professionals. Furthermore, the assessment of wetlands is based on environmental indicators such as vegetation, that are subjected to seasonal variation as well as factors such as fire and drought. Although background information was gathered, the information provided in this report was mainly derived from what was observed on the study site at the time of the field survey. A Red Data scan, fauna and flora, and aquatic assessments were not included in the current study.

Description of the depth of the regional water table and geohydrological processes falls outside the scope of the current assessment.

3. RESULTS

3.1 Project Background

The 11.14 ha study site lies on the remainder of portion 6 and portion 138 of the farm Zwartkoppies 364 JR between the R104 (towards the north) and north of the N4 highway (towards the south) in Tshwane (Figure 3 and 4). Towards the west are residential areas and towards the east mixed land uses including natural vegetation. The application for Environmental Authorisation is for the proposed electrical line that will run from the Hatherly substation to the Riverwalk development. Electricity for the Riverwalk development will be supplied by means of an underground bulk 5x 11kV electrical line from the Hatherly substation in Mamelodi. The proposed electrical line will be along Solomon Mahlangu Drive and the R104/K22 road. This route for the electrical line has two watercourse crossings, one along Solomon Mahlangu Drive and the other along the R104/K22 road. The total length of the proposed powerline is 3.57km with a single river crossing. The drilling diameter for the powerline is 110mm using directional drilling below the watercourse. This method is preferred over trenches as it avoids impacts to the watercourse integrity.

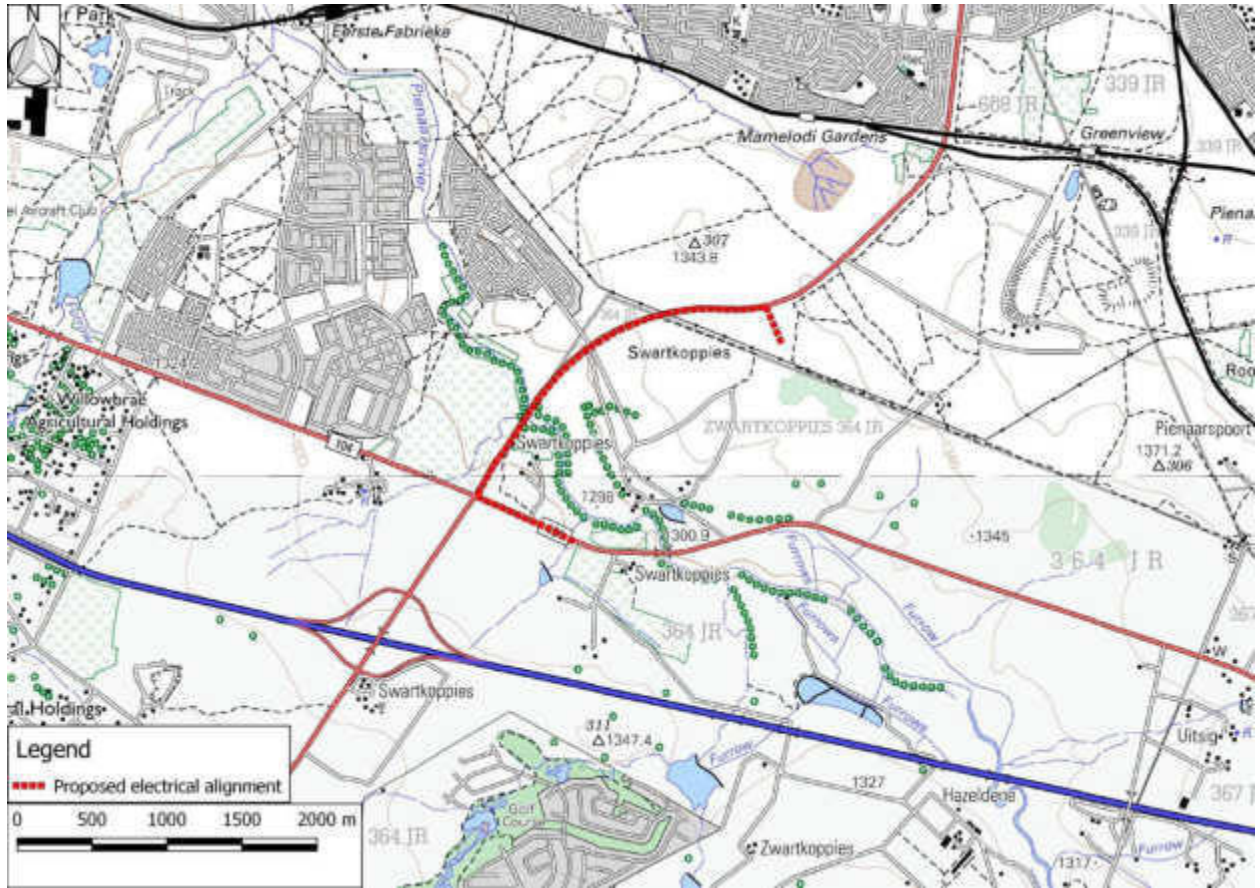


Figure 3: Locality map

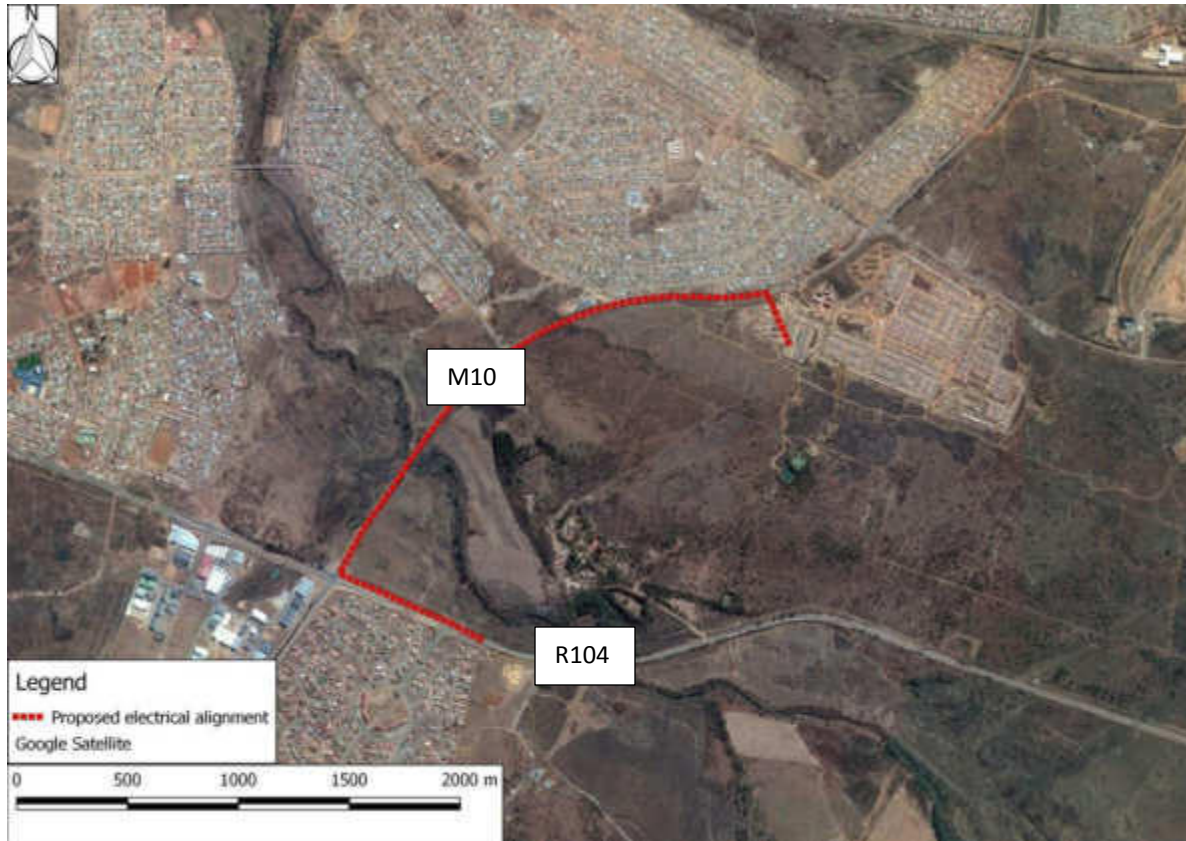


Figure 4: Aerial map of study area

3.2 Description of the Receiving Environment

Regional vegetation:

The study area occurs within the Marikana Thornveld (Mucina & Rutherford, 2006), of the Central Bushveld bioregion (figure 5). The Marikana Thornveld (SVcb 6) vegetation type is generally characterized by valleys and slightly undulating plains and some lowland hills. This region has a somewhat temperate climate with mean maximum and minimum temperatures ranging between 35.3°C (November) and -1.4°C (July). The geology of the area consists mainly of mafic intrusive rocks of the Rustenburg Layered Suite of the Bushveld Igneous Complex. Shales and quartzites of the Pretoria Group of the Transvaal Supergroup, also contribute.

The vegetation of SVcb 6 is characterized by open Acacia karroo woodland, with dense shrubby vegetation along drainage lines, on termitaria and rocky outcrops and other habitats that are

protected from fires. The important woody species that occur in this vegetation type include *Acacia karroo*, *A. nilotica* subsp. *kraussiana*, *A. tortilis* subsp. *heteracantha*, *A. caffra*, *A. gerrardii*, *Ziziphus mucronata*, *Searsia lancea*, *S. pyroides* var. *pyroides*, *Combretum molle*, *Grewia flava* and *Diospyros lycioides* subsp. *guerkei*. Significantly represented grasses include *Elionurus muticus*, *Eragrostis lehmanniana* var. *lehmanniana*, *Fingerhuthia africana*, *Setaria sphacelata*, *Heteropogon contortus* and *Themeda triandra*. Alien invasive plants occur localized in high densities, especially along drainage lines.

According to Mucina & Rutherford (2006) the conservation status of the vegetation type is endangered. Less than 1% is statutorily conserved in for example the Magaliesberg Nature Area and small portions in other reserves such as De Onderstepoort Nature Reserve. 48% of this vegetation type has been transformed, mainly in the form of cultivated lands and by urban areas.



Figure 5: Vegetation type associated with the study area (red blocks indicate river crossings)

Vegetation that was present on the study area are *Combretum erythrophyllum* and *Searsia lancea* as riverine vegetation, *Cyndodon dactylon*, *Eragrostis curvula* grassland, and *Heteropogon concertis*.

Geology and Soils:

None of the soils on the site qualify as wetland soils as described in the wetland delineation guidelines. Main soil types on the site include Glenrosa, Rensburg and Arcadia. These soils often occur in level topography with rivers that are not associated with wetlands. Although these exhibit no signs of wetness or redox morphology they are indicative of high energy erosion and deposition potential. In this sense these soils fall within the category of riparian zone soils. The soils have limited depth with high clay content, particularly close to the streams (figure 6).

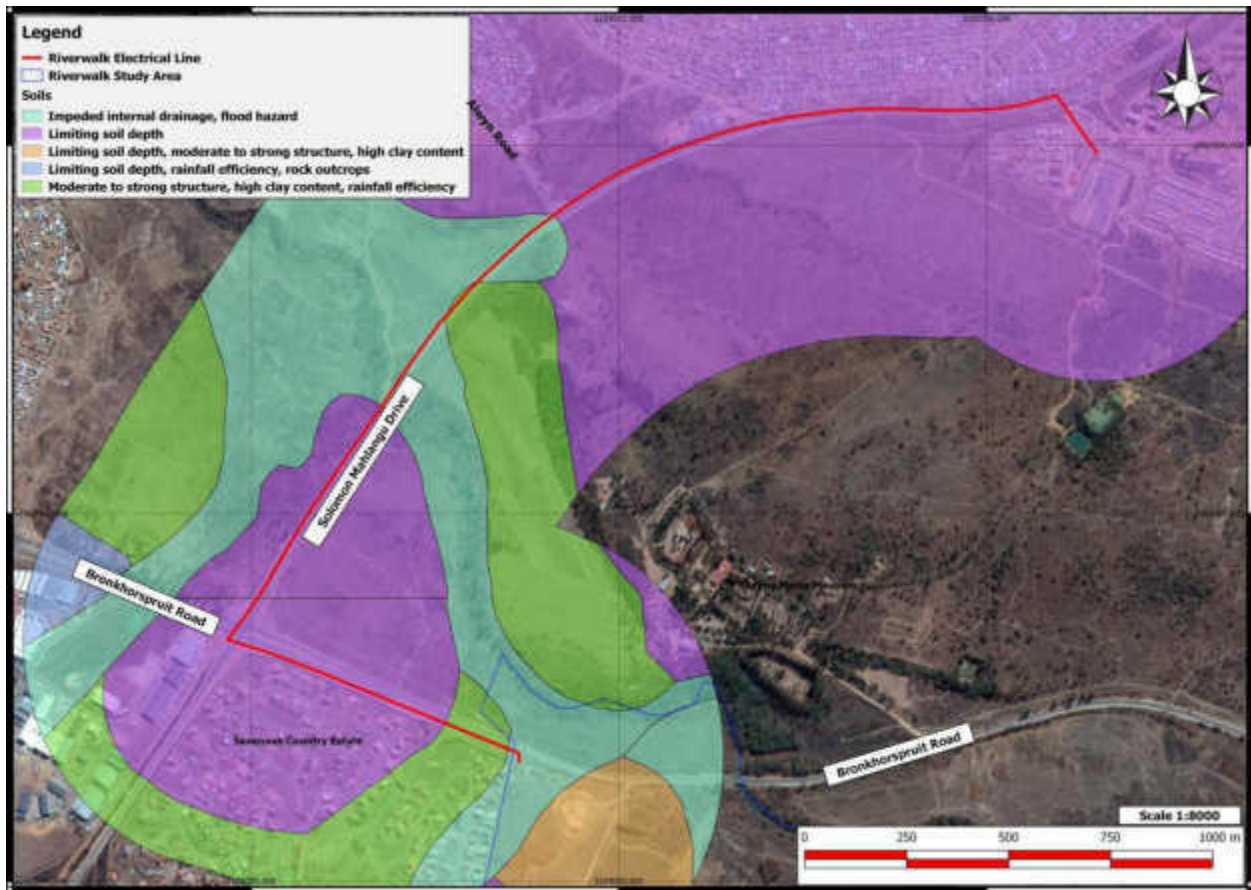


Figure 6: Geology and soils of the study site

Gauteng Conservation Plan:

The Gauteng Conservation Plan (Version 3.3) (GDARD, 2011) classified areas within the province on the basis of its contribution to reach the conservation targets within the province. Critical Biodiversity Areas (CBAs) contain irreplaceable, important and protected areas (terms used in C-Plan 2) and are areas needed to reach the conservation targets of the Province. In addition ‘Ecological Support Areas’ (ESAs), mainly around riparian areas and other movement corridors were also classified to ensure sustainability in the long term. Landscape features associated with ESAs is essential for the maintenance and generation of biodiversity in sensitive areas and requires sensitive management where incorporated into C-Plan 3. The electrical line crosses an “ecological support area” with some “important areas” surrounding the study site (figure 7).



Figure 7: Gauteng Conservation Plan relative to the river crossings

3.3 Wetland Delineation and Functional Assessment

Delineation was done by desktop, followed by a field visit on 11 July 2016. Determination of the PES and EIS values were done following a second field visit by L. Delpont on 4 April, 2017. A total

of one wetland and two streams were recorded to cross or occur within 500m of the preferred electrical line. The wetland is associated with and limited to the stream. Riparian vegetation is clearly visible and distinct form the surrounding landscape.

The Pienaars River is located in the lowest point in the local landscape. The watercourse and associated wetland can be defined as a valley bottom with a channel. The wetland is associated with the stream and a separate waterbody is found in the south eastern point of the study area. The Pienaars River is a non-perennial stream (figure 8).

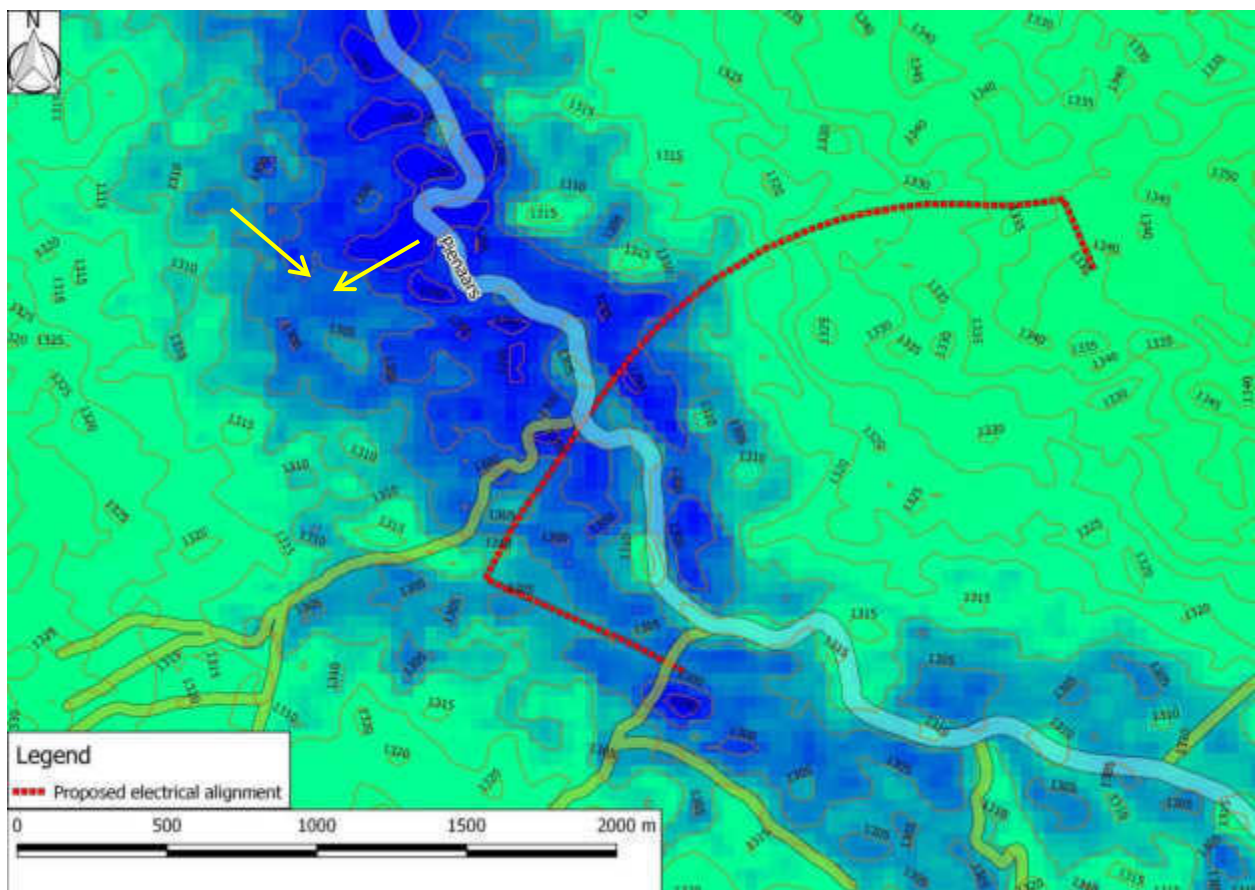


Figure 8: Elevation and topography of the study area

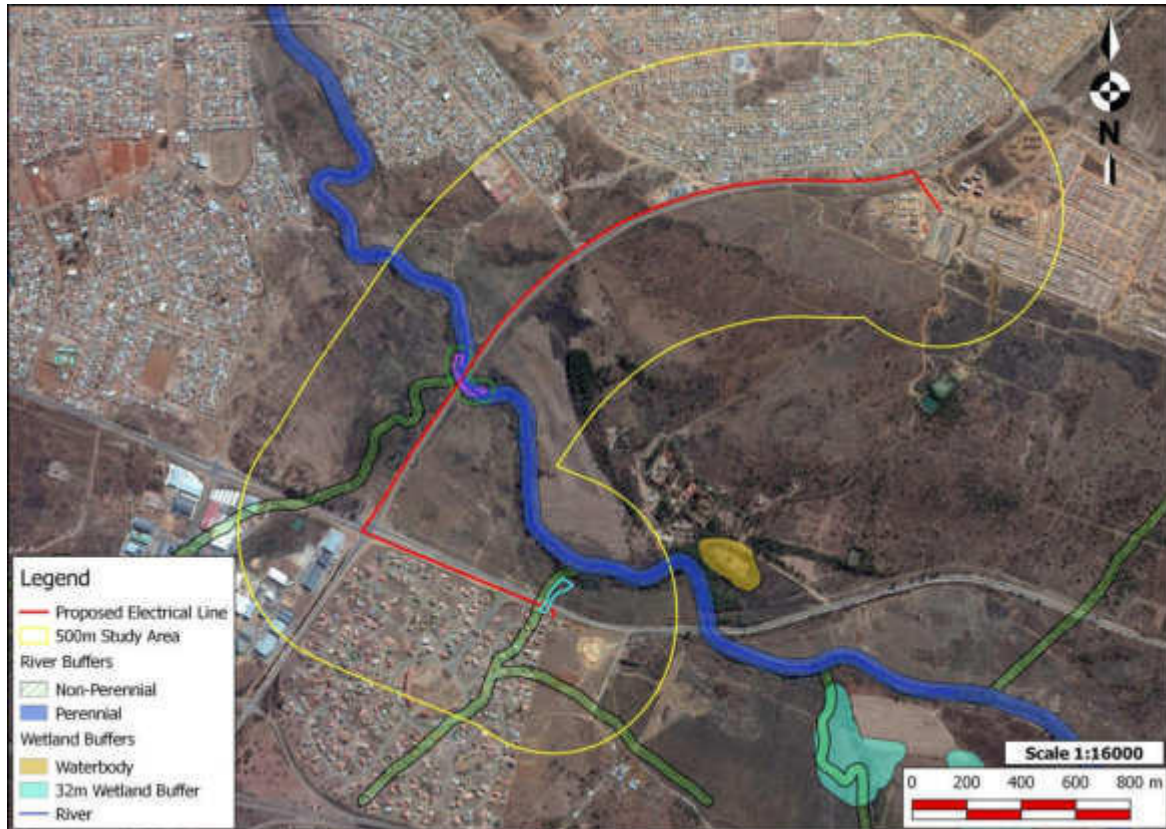


Figure 9: Wetland and river delineation

Present Ecological Status (PES) and Ecological Importance and Sensitivity (EIS):

The PES was calculated for the wetlands within 500 m which are likely to be impacted by the proposed activity.

The majority of the wetland has been impacted predominantly due to anthropogenic activities of which the main impacts include:

- Vegetation Clearing
- Soil Erosion
- Road crossings
- Urbanisation

The combined estimated **PES scores** for the wetland as well as the estimated **EIS scores** are summarised in table 8 and 9.

Table 8: Combined PES scores for the study site

		Hydrology		Geomorphology		Vegetation	
		Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
Area weighted impact scores		6,5	0,0	3,1	-2,0	4,3	-1,0
PES Category		E	↓	C	↓↓	D	↓

Table 9: EIS scores for the study site

WETLAND IMPORTANCE AND SENSITIVITY		
<i>Electrical Line</i>		
	Importance	Confidence
ECOLOGICAL IMPORTANCE & SENSITIVITY	2.3	4.2
HYDROLOGICAL/FUNCTIONAL IMPORTANCE	1.3	4.0
DIRECT HUMAN BENEFITS	0.3	3.5

The PES score of 4.63 classifies the wetland and riparian zone as class D – largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred. The EIS scores are low due to the impacts from urbanization in the surrounding area. The wetland and associated streams do not appear to have any value in terms of harvestable resources, education or recreation. Habitats are limited to the woody riparian species for bird nesting. The grassland is relatively uniform in species type with low biodiversity.

Buffers Requirements:

The buffer calculation for the proposed activity state a 15m buffer from the edge of the riparian zone.

3.4 Photographs



a) View adjacent to M10 on the east side



b) Pienaars River



c) Pienaars river flowing under M10



d) Pienaars river under the M10 bridge



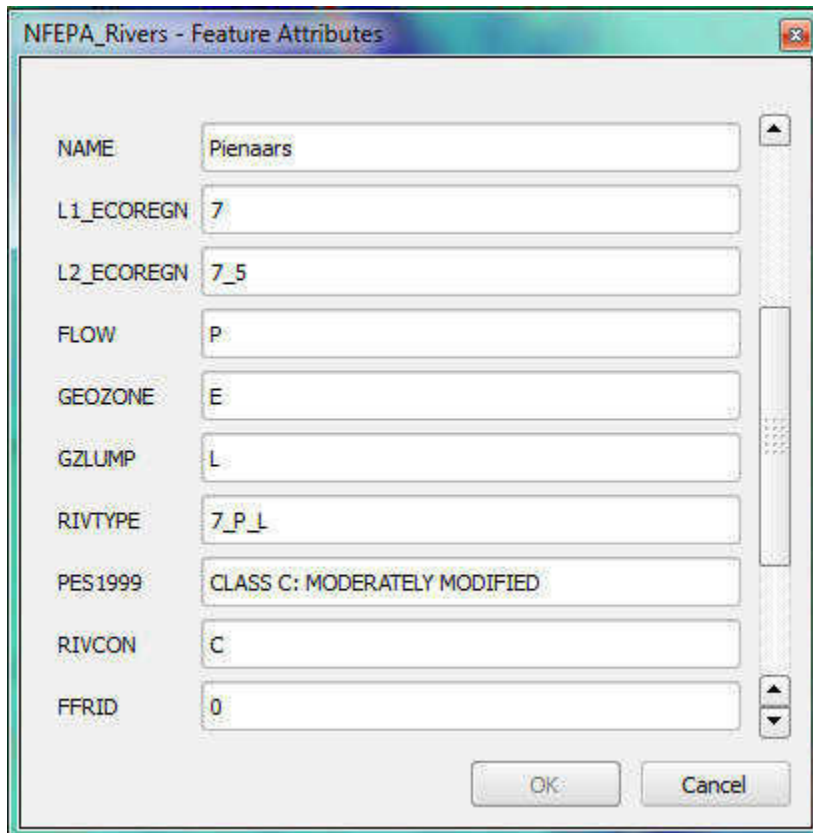
e) Bridge crossing looking south on the M10



f) Bridge crossing

4. CONCLUSIONS AND RECOMMENDATIONS

The study area contains one area of concern, which is the Pienaars River and a potential tributary. The Pienaars River is already moderately modified in terms of the present ecological state, and any development in or around the Pienaars River should have a watercourse sensitive approach. No further degradation to the Pienaars River should be allowed. According to NFEPA (National Freshwater Ecosystem Priority Areas) data, the Pienaars River has a present ecological state (PES) of Class C, which classifies it as being moderately modified (figure 10).



Attribute	Value
NAME	Pienaars
L1_ECOREGN	7
L2_ECOREGN	7_5
FLOW	P
GEOZONE	E
GZLUMP	L
RIVTYPE	7_P_L
PES1999	CLASS C: MODERATELY MODIFIED
RIVCON	C
FFRID	0

Figure 10: PES of the Pienaars River

The PES score classifies the wetland and riparian zone as class D – largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred. The EIS scores are low due to the impacts from urbanization in the surrounding area. The wetland and associated streams do not appear to have any value in terms of harvestable resources, education or recreation.

The buffer calculation for the proposed activity states a 15m buffer from the edge of the riparian zone. Due to the fact that the water that flows in and through the channel on the site emanates from upslope areas that have been impacted by human activities and infrastructure development, a large dedicated buffer on the watercourse will have a low contribution to protection of the watercourse. A storm water management plan is preferred to limit impacts from the construction of the proposed power line. The risks associated with the proposed electrical line and impacts on watercourses are not notable and do not require mitigation measures on a higher level. In terms of section 22 of the National Water Act (36 of 1998) (NWA), a section 21 (c) and (i) water use license is not required (Table 10).

Generic Storm water management:

- Lessening the threat of flooding in the area. This is the most important aspect as this could lead to a loss of biodiversity as well as the wetland/riparian zones functionality.
- Protecting the public.
- Sustainability of storm water management schemes.
- Environmental and water pollution consideration.
- Reduce the risk to the surrounding neighborhood.
- Disturbance to any wetlands during construction should be minimized. A plan for the immediate rehabilitation of damage caused to wetlands and/or watercourses should be compiled by a specialist registered in accordance with the Natural Scientific Professions Act (No. 27 of 2003) in the field of Ecological Science.

Table 10: Risk assessment matrix.

Phases	Activity	Aspects	Impacts	Risk Assessment Parameters																Control Measures	PES AND EIS OF WATERCOURSE
				Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph+Vegetation)	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence level		
P	Electrical design	Planning alignment routes and watercourse crossings	Water pollution, loss of habitat, sedimentation, erosion if route alignments not designed accordingly.	1	1	1	1	1	1	1	3	1	1	5	1	8	24	L	95	Use of geotechnical data. Manholes fro drilling should be outside of the 32m buffer or 1:100 year floodline, whichever is greatest. Where possible, electrical line to follow road servitudes.	D/E
C	Clearing of vegetation in close proximity to a watercourse	Creating construction camps and access roads	Loss of biodiversity and habitat. Pollution from sediment, vehicles and materials.	1	1	1	1	1	1	1	3	1	1	1	4	7	21	L	80	Method statement and EMP. Rehabilitation Plan and Monitoring programme. Construction activities outside of buffer and 1:100 year floodline, whichever is greatest.	D/E
C	Clearing of vegetation in close proximity to a watercourse	Creating construction area for trenches	Loss of biodiversity and habitat. Pollution from sediment, vehicles and materials.	1	1	1	1	1	1	1	3	1	1	1	4	7	21	L	80	Method statement and EMP. Rehabilitation Plan and Monitoring programme. Construction activities outside of buffer and 1:100 year floodline, whichever is greatest.	D/E
C	Construction area clearance in close proximity to a watercourse	Directional drilling below watercourse.	Loss of biodiversity and habitat. Pollution from sediment, vehicles and materials. Alteration or disruption of flow. Damage to banks. Erosion of watercourse.	1	1	1	1	1	1	1	3	1	1	1	4	7	21	L	80	Method statement and EMP. Rehabilitation Plan and Monitoring programme. Construction activities outside of buffer and 1:100 year floodline, whichever is greatest.	D/E
O	Electrical line maintenance	Vegetation removal for construction activities. Digging trenches/ manholes for cable access.	Loss of biodiversity and habitat. Alteration, impedece or disruption of flow from rubble. Damage to banks and erosion. Water quality changes.	1	1	1	1	1	1	1	3	3	2	1	4	10	30	L	80	Method statement and EMP. Rehabilitation Plan and Monitoring programme. Construction activities outside of buffer and 1:100 year floodline, whichever is greatest.	D/E

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Heritage Letter

Appendix G3



Leonie Marais-Botes
Heritage Practitioner
868 Endeman Street
Wonderboom South
PRETORIA
0084
22 March 2017

**The Chairperson
Heritage Impact Assessment Adjudication Committee
Provincial Heritage Authority of Gauteng
Private Bag X 33
JOHANNESBURG
2000**

**Dear Sir/Madam
APPLICATION FOR EXEMPTION FROM PREPARING A HERITAGE IMPACT ASSESSMENT
(HIA): PROPOSED RIVERWALK ELECTRICAL LINE**

Project and property description:

The proposed electrical line will run from the Hatherly substation to the Riverwalk development within the road reserves of Solomon Mahlangu Drive and the R104/K22. The proposed line will cross along the R104/K22 (Bronkhorstspuit Road) and the Solomon Mahlangu Drive. The Solomon Mahlangu Drive crossing is approximately 600m north of the R104 and M10 intersection and the Bronkhorstspuit crossing is approximately 650m east of the R104 and M10 intersection.

Project location:

The proposed electrical line is situated within the Bronkhorstspuit area situated east of Pretoria. The Pienaars River bisects the proposed electrical line. The Silver Lakes Golf Estate is situated to the south of the site (just to the south of the N4 Freeway).



Figure 1: Project location

The proposed Riverwalk Electrical Line will run from the Hatherly substation to the Riverwalk development within the road reserves of Solomon Mahlangu Drive and the R104/K22. The proposed electrical line was studied by means of Google images (Figures 1-5). As the development is planned in the road reserve we can assume an almost completely disturbed landscape and therefore it was felt that an exemption application from preparing a Heritage Impact Assessment (HIA) should be submitted as there are likely to be no heritage resources along the route.

As mentioned in the above the proposed route will follow the road reserve and therefore there will most likely not impact on any possible heritage resources. Chances of identifying heritage resources are extremely unlikely as anything that may have existed before, would not have survived.

It is therefore believed that a Heritage Impact Assessment (HIA) is not needed for this project. The chances of identifying heritage sites are extremely slim as the area is already disturbed. Resultantly all possible signs of heritage resources would have been demolished. It is very unlikely that any archaeological or cultural historical sites or occurrences will be disturbed.

It is therefore recommended that a Heritage Impact Assessment (HIA) would not be necessary for the area and that exemption should be granted by the Provincial Heritage Resources Authority of Gauteng (PHRA-G).

The developer should however note that due to the nature of archaeological material, such sites, objects or features, as well as graves and burials may be uncovered during construction activities on site. In such a case work should cease immediately and an archaeologist should be contacted as a matter of urgency in order to assess such occurrences.



Figure 1: Section near Hatherly substation



Figure 2: Section from Hatherly substation to Alwyn Road

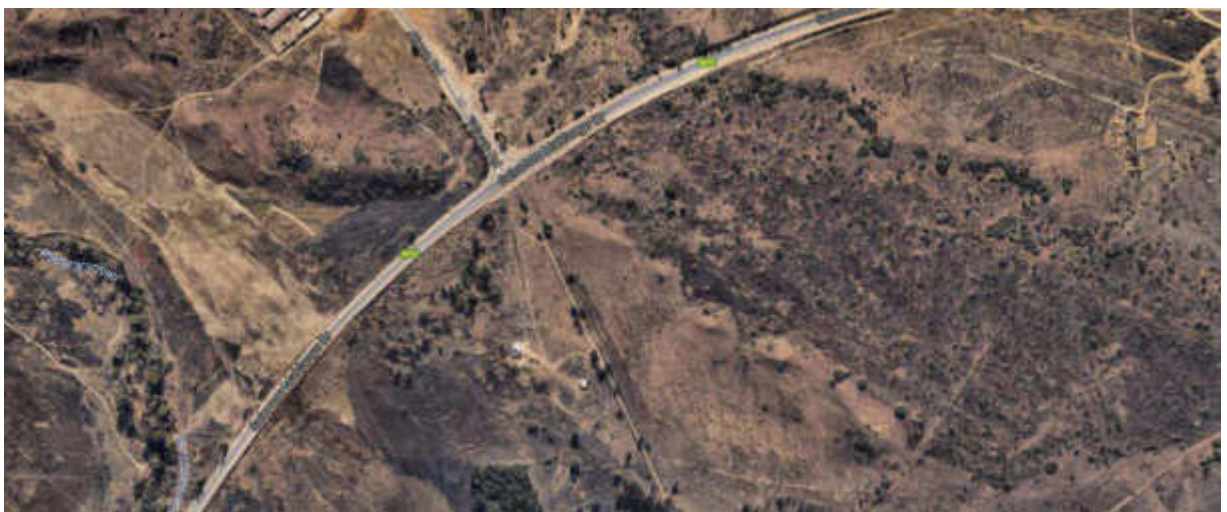


Figure 3: Section from Alwyn Road to Pienaars River



Figure 4: Section between Pienaars River and Bronkhorstspruit Road

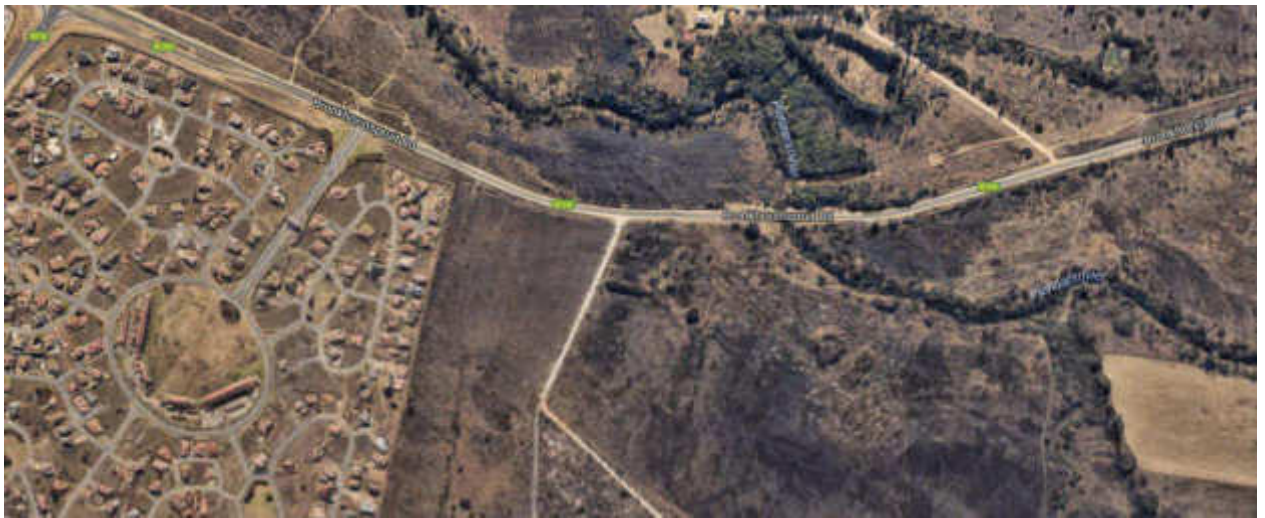


Figure 5: Section between Bronkhorstspruit Road/Solomon Mahlangu crossing and proposed Riverwalk development



Figure 6: Site notice

NOTICE OF BASIC ASSESSMENT PROCESS AND WATER USE LICENCE (WULA)

Notice is given for applications in terms of the **Basic Assessment (BA) Process** to be submitted to the Gauteng Department of Agricultural and Rural Development (GDARD), in terms of Regulation No. R982 published in the Government Notice No. 38282 of 4 December 2014 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) governing **Basic Assessment Procedures (Listing Notice: 1 and 3 – Government Notice R983 & R985)** and a **Water Use License Application (WULA)** in terms of the National Water Act, 1998 (Act No. 36 of 1998) for the following proposed activity:

Project & Property Description: The proposed electrical line will run from the Hatherly substation to the Riverwalk development within the road reserves of Solomon Mahlangu Drive and the R104/R22. The proposed line will cross along the R104/R22 (Bronkhorstspuit Road) and the Solomon Mahlangu Drive. The Solomon Mahlangu Drive crossing is approximately 600m north of the R104 and M10 intersection and the Bronkhorstspuit crossing is approximately 650m east of the R104 and M10 intersection.



Project Location:

The proposed electrical line is situated within the Bronkhorstspuit area situated east of Pretoria. The Ploosars River bisects the proposed electrical line. The Silver Lakes Golf Estate is situated to the south of the site (just to the south of the N4 Freeway).

Applicant: Batain Properties Limited

Listing Activities Applied for in terms of NEMA Regulations, 4 December 2014:

In terms of the NEMA EIA Regulations, 4 December 2014:
GNR 983 (Listing Notice 1) – Activity 12, 18 & 48;
GNR 985 (Listing Notice 3) – Activity 12, 14 & 23.

The aforementioned proposed activity requires an application in terms Section 21 of the National Water Act, 1998 (Act 36 of 1998) (NWA) for the following water uses:

- Section 21 (a): Impeding or diverting the flow of water in a watercourse
- Section 21 (c): Altering the bed, banks, course or characteristics of a watercourse

Date of Notice: 26 January 2017 – 27 February 2017

In order to ensure that you are identified as an interested and/or Affected Party (I&AP) please submit your name, contact information and interest in the matter, in writing, to the contact person given below **within 30 days from start date of this Notice**.

The aforementioned proposed electrical line requires applications subject a WULA and BA and all registered I&APs will be allowed 60 working days to comment on the WULA and 30 days to comment on the EIA upon release of the documentation.

Queries regarding this matter should be referred to:

Bokamoso Landscape Architects and Environmental Consultants CC

Public Participation registration and Enquiries: Juanita De Beer

Project Enquiries: Mary-Lee van Zyl

WULA Enquiries: Rosell Kuppen

P.O. Box 11379

Marcelana 0161

www.bokamoso.net

Tel: (012) 346 3810

Fax: (085) 570 6659

E-mail: rosell@bokamoso.net

Figure 7: Basic Assessment Process Advertisement

Yours sincerely

Electrical Engineering Information

Appendix G4



Date: 14 February 2017

RIVERWALK DEVELOPMENT
METHOD STATEMENT: ELECTRICAL WORKS DESCRIPTION FOR WULA

1. INTRODUCTION

- 1.1 This statement is a preliminary electrical method statement and entails current information available for the provision of electrical engineering services for the abovementioned development.
- 1.2 This statement is based on information of standards and existing services as received from City of Tshwane Energy & Electricity Department.

2. LOCATION

The site is situated on a part of the Remainder of portion 6, of the farm Zwartkoppies 364-JR.

3. EXTENT OF DEVELOPMENT

The abovementioned development first phase shall consist of:

- 1360 x Residential Units,
- Clubhouse
- Gatehouse

4. AVAILABILITY OF BULK ELECTRICAL SUPPLY

The City of Tshwane Energy & Electricity Department has confirmed that capacity can be made available for the abovementioned development.

5. EXISTING INFRASTRUCTURE

There are existing overhead 11kV lines on the property. The existing electrical overhead lines shall be relocated or removed as construction of the development progresses.

6. ELECTRICAL INFRASTRUCTURE

SCOPE OF WORK

Phase 1: Main Feeder Cables and Riverwalk temporary T3 (11kV SF6 type 3-Way Switch)

- a) The Riverwalk Development will be supplied with a new 11kV network and the supply and installation of the main feeder cables will be cut in from the Hatherly 132kV/11kV substation to the Riverwalk Development within a registered servitude provided for the external services.
- b) The supply and installation of fibre optic cable between Hatherly 132/11kV substation and temporary Riverwalk T3.

- c) The approval of the cable route and road crossings by the Council.
- d) The Supply and installation of temporary Riverwalk T3

Construction for the electrical cable will entail 1.0m x 1.5m cable trenching that will be back-filled as per Tshwane specification from the Hatherly 132kV/11kV substation to the Riverwalk Development.

5x 150mm² 11kV armoured 3-Core, PILC, stranded copper cable as per Tshwane specification will be supplied from the Hatherly 132kV/11kV substation to the Riverwalk Development. The 11kV cables will be terminated within an 11kV SF6 type 3-Way Switch (T3) complete with enclosure and all accessories as per Tshwane specification situated on the Erf boundary for the first phase.

A 11kV SF6 type Metering RMU for a Bulk Electrical supply will be provided on the Erf boundary next to the 3-Way Switch within a registered servitude allocated for electrical services.

Miniature substations will be installed inside the development to transfer the voltage from 11kV to 400V, and will supply the kiosks at the units. Miniature substations will be placed within the development as per the electrical design.

12.2m Street light poles with a 1m single overhang and with luminaries at 10.5 mounting height will be installed alongside new constructed roads and existing roads where lighting standards are not met.

7. **METHOD STATEMENT: STATEMENT DIRECTIONAL DRILLING**

The following procedure for the 11kV network which consists of 5x 150mm² 11kV armoured 3-Core, PILC, stranded copper cables will be conducted at the river crossing alongside the bridge situated on Solomon Mahlangu between Hatherly 132kV/11kV substation and the Riverwalk Development.

7.1 **ELECTRICAL CONTRACTOR** - Prepare entry & exit drill pit.

7.2 **PLANNING - SURVEYOR RESPONSIBILITIES**

- Mark entry and exit point in the drill pit. Confirm length and depth of drill path. No drilling will be done under any electrical mast post.

7.3 **DRILLING CONTRACTOR - SITE INVESTIGATION**

- Utility scanning - Using GSSI GPR scanner - scan the route for services.
- Plan drill path - 2.5 meter to 3 meter below the river crossing.

7.4 **DRILLING CONTRACTOR - DRILLING OPERATIONS**

- Site establishment.
- Setup drill machine.
- Start the pilot hole drilling process.
- Size of pilot holes 110mm.
- Trace drill head every 3 meter to check the depth & path of drill head. Using DCI F5 locating equipment.
- Drill the pilot holes.
- Complete the pilot drills and verify the exit point.
- Remove the drill head and connect reamers.
- Ream the holes in various stages to the correct size.
- 1st stage reamers 200mm
- 2nd stage reamers 300mm
- 3rd stage reamers 400mm
- Prepare & weld pipes.
- Connect the welded pipes to the reamer and start installing the pipes.
- Complete the reaming process.
- Fill voids if necessary.
- Clean site

8. **DESIGN STANDARDS AND SPECIFICATIONS**

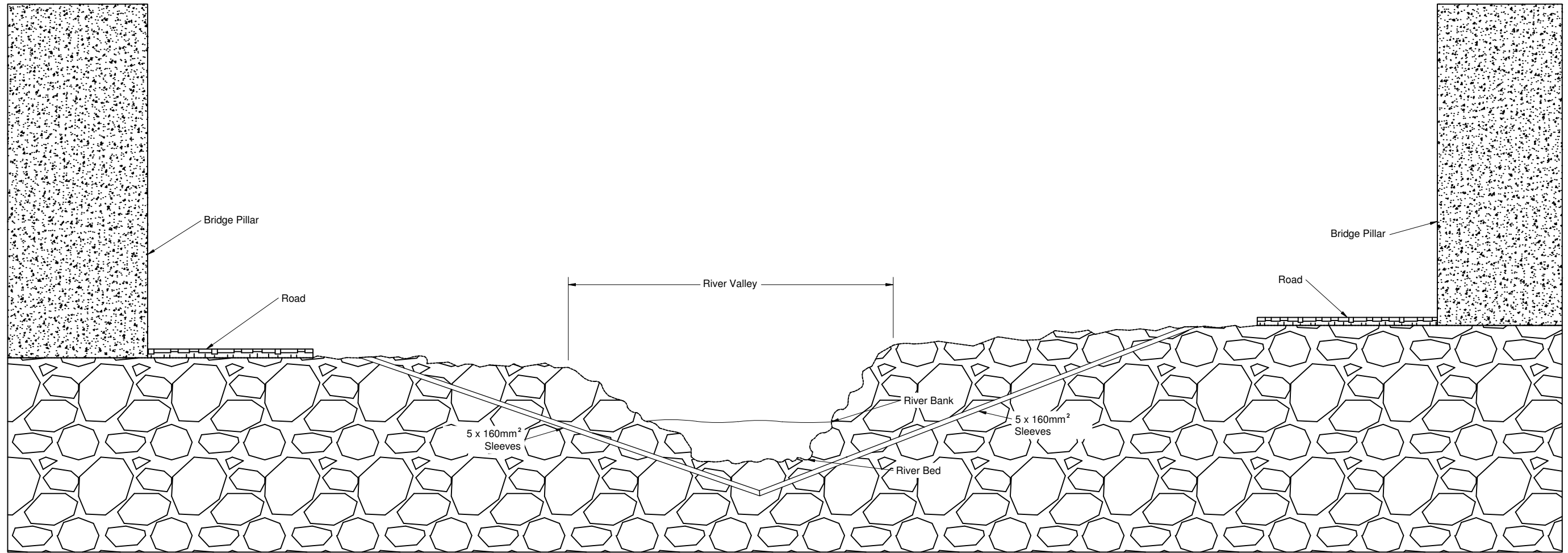
The following Tshwane Energy and Electricity's specifications are relevant:

Number	Description
ESSS0013	Specification for the secondary power distribution system: General
ESSS0006	Specification for the secondary power distribution system for the installation of mini-substations
ESSS0007	Specification for the secondary power distribution system for excavations, installation of sleeves, laying of cables and backfilling of cable trenches
ESSS0008	Specification for the secondary power distribution system for the jointing and connection of cables
ESSS0009	Specification for the secondary power distribution system for the installation of low tension meter- and distribution boxes
ESSS0010	Specification for the secondary power distribution system for the installation of streetlight poles, streetlight fittings, photo cells and the connection of streetlight cables
ESSS0011	Specification for the secondary power distribution system for inspection and testing
ESSS0014	Specification for the secondary power distribution system for the installation of an 11kV ring main unit for outdoor use(T3/T4)
ESSS0015	Specification for the secondary power distribution system for the installation of an 11kV satellite substation.
ESSS0016	Specification for the secondary power distribution system for the installation of an earthing installation
ESSS0017	Specification for the Erection of an 11kV overhead line

Regards,

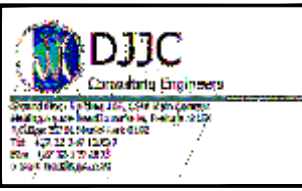


DJJC CONSULTING ENGINEERS



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 ALL DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE SPECIFICATION.

No.	Date	Description	By
A	28/09/2016	ISSUED FOR INFORMATION	C.B.



PROJECT:
**RIVERWALK
 11KV DESIGN**

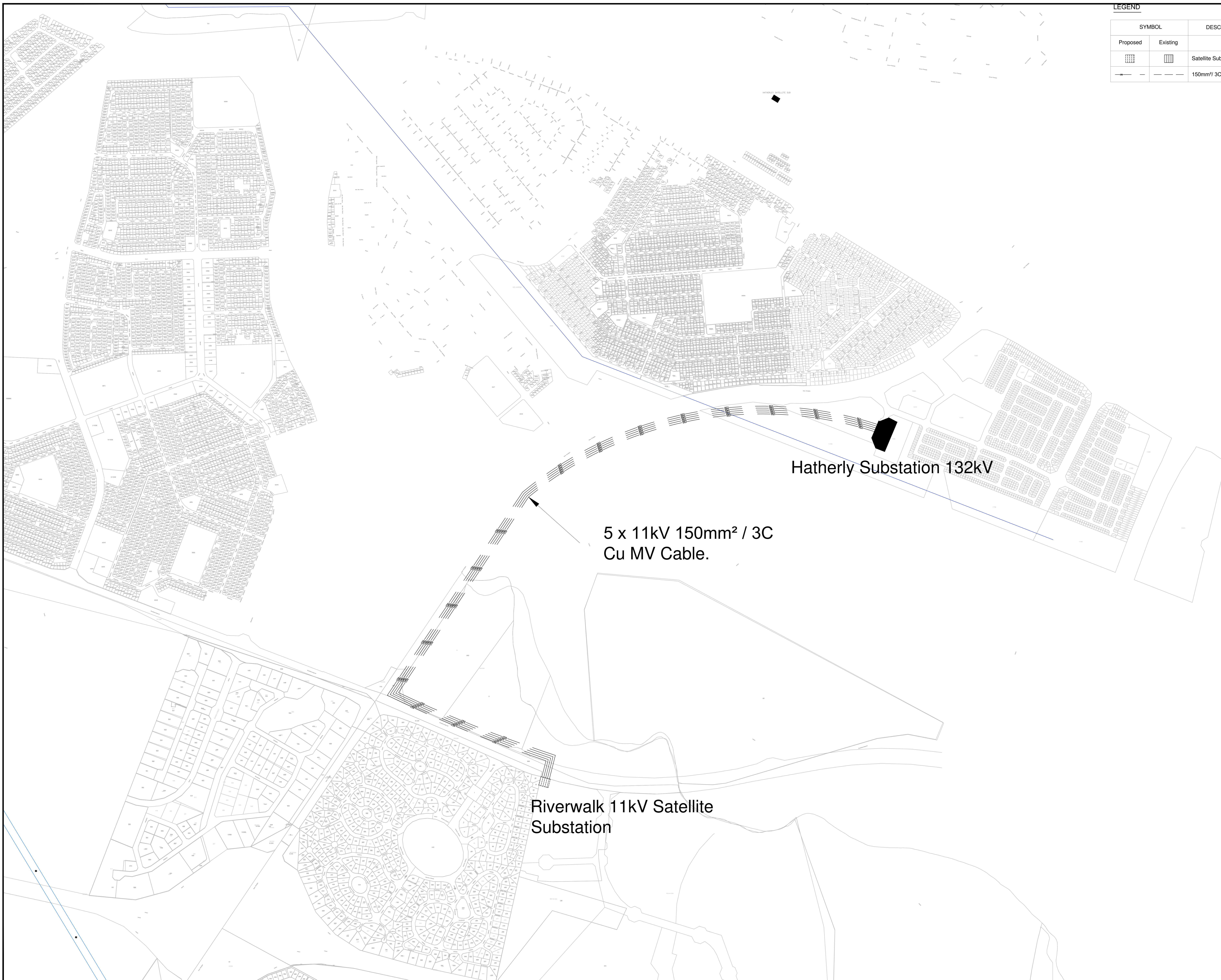
DRAWING TITLE:
**RIVERWALK
 11KV DESIGN
 DETAIL CROSS SECTION
 RIVER SLEEVE LAYOUT**

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DESIGNED BY:	F.H.	DATE:	29/09/2016
DRAWN BY:	J.P.G.	DATE:	29/09/2016
CHECKED BY:		DATE:	29/09/2016

This drawing is based on the Architects Drawing Number: -

PROJECT NUMBER:	A14-1
DRAWING STATUS:	INFORMATION
DRAWING NUMBER:	A14-1-CS
REVISION:	A
SCALE:	NTS



SYMBOL		DESCRIPTION
Proposed	Existing	Satellite Substation
		150mm² / 3C Cu 11kV Cable

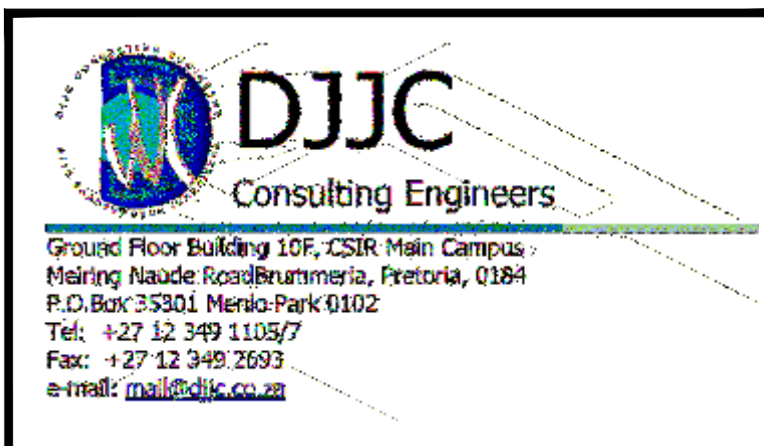
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REVISIONS		
No.	Description	By
A	INFORMATION ONLY	C.B.

Hatherly Substation 132kV

5 x 11kV 150mm² / 3C
Cu MV Cable.

Riverwalk 11kV Satellite
Substation



PROJECT:

**RIVERWALK
ELECTRICAL SUPPLY
DESIGN**

DRAWING TITLE:

**PROPOSED 11kV
RIVERWALK
SUBSTATION NETWORK**

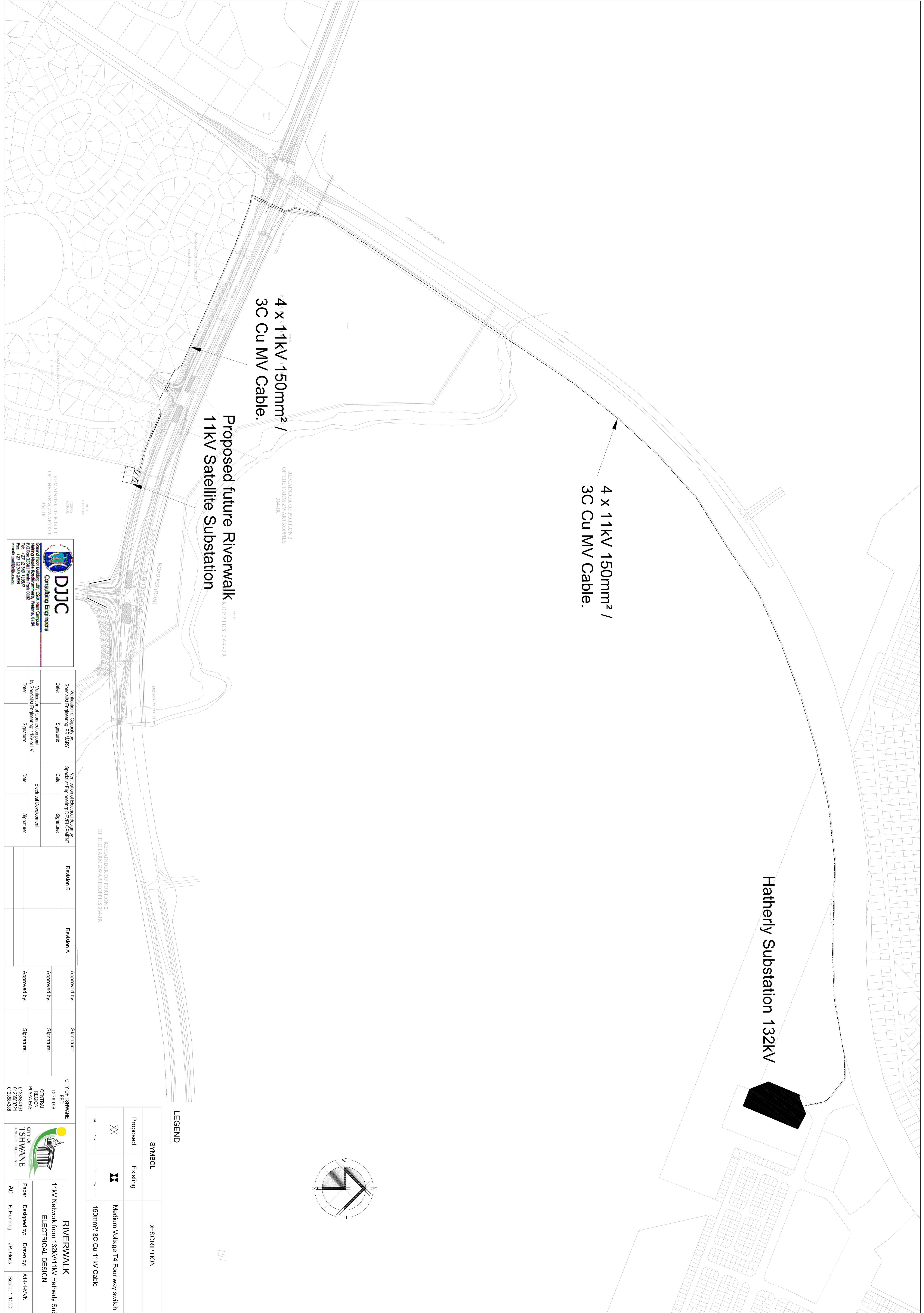
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This drawing was based on the Architects Drawing Number:

DESIGNED BY: F.H	DATE: 26/04/2016
DRAWN BY: J.P.G	DATE: 26/04/2016
CHECKED BY:	DATE: 26/04/2016

PROJECT NUMBER:	A14/1
DRAWING STATUS:	INFORMATION ONLY
DRAWING NUMBER:	A14-1-RSN
REVISION:	A
SCALE:	1:5000 @ A0

F:\A14-1\TECHNICAL\WasteWatering\A14-1 11kV Network_Hatherly.dwg



4 x 11kV 150mm² /
3C Cu MV Cable.

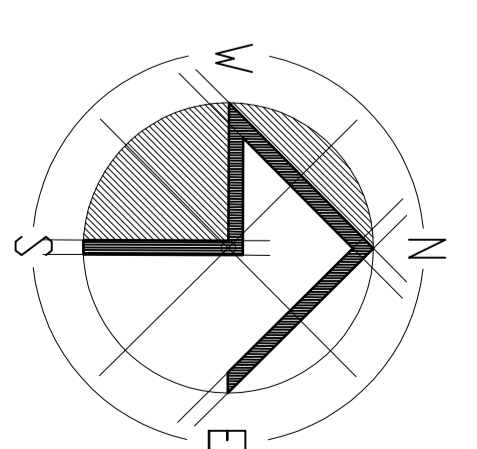
4 x 11kV 150mm² /
3C Cu MV Cable.

Proposed future Riverwalk
11kV Satellite Substation

Hatherly Substation 132kV

LEGEND

SYMBOL	DESCRIPTION
	Proposed
	Existing
	Medium Voltage T4 Four way switch
	150mm ² 3C Cu 11kV Cable



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Consulting Engineers

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Verification of Concept by Specialist Engineering: Preliminary	Signature:	Date:	Verification of Electrical Design by Specialist Engineering: ELEC/PUBLIC/T	Signature:	Date:	Revision B	Revision A	Approved by:	Signature:
Verification of Connection point by Specialist Engineering: 11kV or LV	Signature:	Date:	Electrical Development	Signature:	Date:			Approved by:	Signature:

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EED
DO & SIS
CENTRAL
REGISTRATION
PUBLIC/EST
0123594193
0123594444
0123594858

CITY OF TSHWANE
MUNICIPALITY OF TSHWANE

RIVERWALK
11kV Network from 132kV/11kV Hatherly Sub
ELECTRICAL DESIGN

Paper: A0
Designed by: F. Henning
Drawn by: JP Cass
Scale: 1:1000



Date: 28 November 2016

RIVERWALK DEVELOPMENT
METHOD STATEMENT: STATEMENT DIRECTIONAL DRILLING

1. **ELECTRICAL CONTRACTOR** - Prepare entry & exit drill pit.
2. **PLANNING - SURVEYOR RESPONSIBILITIES**
 - Mark entry and exit point in the drill pit. Confirm length and depth of drill path. No drilling will be done under any electrical mast post.
3. **DRILLING CONTRACTOR - SITE INVESTIGATION**
 - Utility scanning - Using GSSI GPR scanner - scan the route for services.
 - Plan drill path - 2.5 meter to 3 meter below the river crossing.
4. **DRILLING CONTRACTOR - DRILLING OPERATIONS**
 - Site establishment.
 - Setup drill machine.
 - Start the pilot hole drilling process.
 - Size of pilot hole 110mm.
 - Trace drill head every 3 meter to check the depth & path of drill head. Using DCI F5 locating equipment.
 - Drill the pilot hole.
 - Complete the pilot drill and verify the exit point.
 - Remove the drill head and connect reamer.
 - Ream the hole in various stages to the correct size.
 - 1st stage reamer 200mm
 - 2nd stage reamer 300mm
 - 3rd stage reamer 400mm
 - Prepare & weld pipe.
 - Connect the welded pipe to the reamer and start installing the pipe.
 - Complete the reaming process.
 - Fill voids if necessary.
 - Clean site

Regards,

DJJC CONSULTING ENGINEERS

Environmental Management Programme (EMPr)

Appendix H

**Environmental Management Programme
(EMPr)**

for the Proposed Riverwalk Electrical Line

in the R104/K22 and Solomon Mahlangu Drive road reserves.

City of Tshwane Metropolitan Municipality, Gauteng Province.

August 2017

BOKAMOSO

LANDSCAPE ARCHITECTS AND ENVIRONMENTAL CONSULTANTS CC

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Maroelana
0161



1 Project Outline

1.1 **Background**

Bokamoso Landscape Architects and Environmental Consultants CC were appointed by Balwin Properties Limited to conduct a Basic Assessment Application to obtain Environmental Authorisation for the proposed electrical line.

1.2 **Project description**

The proposed electrical line will be in the R104/K22 and Solomon Mahlangu Drive road reserves within a registered services servitude, in the jurisdiction of the City of Tshwane Metropolitan Municipality, Gauteng Province.

Electricity for the Riverwalk development will be supplied by means of an underground bulk 11kV electrical line from the Hatherly substation in Mamelodi. The proposed electrical line will be along Solomon Mahlangu Drive and the R104/K22 road. This route for the electrical line has two watercourse crossings, one along Solomon Mahlangu Drive and the other along the R104/K22 road. The capacity of the electrical line is below the threshold that will trigger a listed activity under the Amended 2014 NEMA EIA Regulations. However, this application is for the locations where the electrical line crosses a wetland/stream and the activities associated with such impacts. In order for an electrical line to trigger an activity it should have a capacity of more than 33kV outside urban areas and more than 250kV inside urban areas. This proposed electrical line is only 11kV and thus it does not trigger Activity 11 in Listing Notice 1 (R.983). This underground electrical line will be within a registered servitude provided for external services. The area where the cable will be in trenches, the trench will be 1.0m deep and 1.5m wide. These trenches will be back-filled as per Tshwane specifications. At the crossings, a route will be drilled underneath the river in order to impact as little as possible on the river/watercourse.

Timeframe for construction:

Will be provided when Environmental Authorisation is received. Therefore the timeframe for construction is still unknown but it is expected that construction will commence soon after authorisation is received.

The developer will be responsible for the activities. The EMPr will be a binding document for purposes of compliance.

1.3 Receiving Environment**Biodiversity:**

- The proposed study area falls within the Marikana Thornveld vegetation unit according to Mucina and Rutherford (2006).
- Majority of the study area is regarded as degraded as it is within the road reserve.

Hydrology:

- A perennial river and wetland occurs within the study area as the electrical line route will cross these.

Cultural /Historical:

- No cultural heritage resources are expected to be present on the proposed electrical alignment.

Visual:

- The proposed electrical line will be visible during construction but afterwards it will not be visible as the line is underground.

2 EMPr objectives and context

Objectives

The objectives of this plan are to:

- Identify the possible environmental impacts of the proposed activity;
- Develop measures to minimise, mitigate and manage these impacts;
- Meet the requirements of the Environmental Authorisation of GDARD and requirements of other Authorities; and
- Monitor the project.

EMPr context

This EMPr fits into the overall planning process of the project by carrying out the conditions of consent set out by the Gauteng Department of Agriculture and Rural Development (GDARD).

This EMPr addresses the following three phases of the development:

- Pre-construction planning phase;
- Construction phase; and
- Operational phase.

3 Monitoring

In order for the EMPr to be successfully implemented all the role players involved must have a clear understanding of their roles and responsibilities in the project.

These role players may include the authorities (A), other authorities (OA), developer/ proponent (D), environmental control officer (ECO), construction

manager (CM), contractors (principal)(C), environmental assessment practitioner (EAP) and environmental site officer (ESO). landowners, interested and affected parties (I&APs) and the relevant environmental and project specialists are also important role players.

3.1 Roles and responsibilities

Developer (D)

The developer is ultimately accountable for ensuring compliance with the EMPr and conditions contained in the Environmental Authorisation. The developer must appoint an independent environmental control officer (ECO), for the duration of the pre-construction and construction phases, to ensure compliance with the requirements of this EMPr. The developer must ensure that the ECO is integrated as part of the project team.

Construction Manager (CM)

The construction manager is responsible for the coordination of various activities and ensures compliance with this EMPr through delegation of the EMPr to the contractors and monitoring of performance as per the ECO's monthly reports.

Environmental Control Officer (ECO)

An independent ECO shall be appointed, for the duration of the pre-construction and construction phases of the development, by the developer to ensure compliance with the requirements of this EMPr.

- The ECO shall ensure that the contractor is aware of all the specifications pertaining to the project.
- Any damage to the environment must be repaired as soon as possible after consultation between the ECO, consulting engineer and contractor.

- The ECO shall ensure that the developer staff and/or contractor are adhering to all stipulations of the EMPr.
- The ECO shall be responsible for monitoring the EMP throughout the project by means of site visits and meetings. This should be documented as part of the site meeting minutes.
- The ECO shall be responsible for the environmental training program.
- The ECO shall ensure that all clean up and rehabilitation or any remedial action required, are completed prior to the transfer of properties.
- A post construction environmental audit is to be conducted to ensure that all conditions in the EMPr have been adhered to.

Principal Contractor (C):

The principal contractor shall be responsible for ensuring that all activities on site are undertaken in accordance with the environmental provisions detailed in this document and that sub-contractors and laborers are duly informed of their roles and responsibilities in this regard.

The principal contractor will be required, where specified to provide method statements setting out in detail how the management actions contained in the EMPr will be implemented. The principal contractors will be responsible for the cost of rehabilitation of any environmental damage that may result from non-compliance with the environmental regulations.

Environmental Site Officer (ESO):

The ESO is appointed by the developer and then finally the home owner as his/her environmental representative to monitor, review and verify compliance with the EMPr by the contractor. The ESO is not an independent appointment but must be a member of the contractor's management team. The ESO must ensure that he/she is involved at all phases of the construction (from site clearance to rehabilitation). For this project, the health and safety officer on site will also take

the responsibility of the ESO. This individual should convey any queries or concerns to the ECO.

Authority (A):

The authorities are the relevant environmental department that has issued the Environmental Authorisation. The authorities are responsible for ensuring that the monitoring of the EMPr and other authorisation documentation is carried out by means of reviewing audit reports submitted by the ECO and conducting regular site visits.

Other Authorities (OA):

Other authorities are those that may be involved in the approval process of the EMPr.

Environmental Assessment Practitioner (EAP):

According to Section 1 of NEMA the definition of an environmental assessment practitioner is "the individual responsible for the planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management programmes or any other appropriate environmental instruments through regulations".

3.2 Lines of Communication

The ECO in writing should immediately report any breach of the EMPr to the principal contractor. The project manager should then be responsible for rectifying the problem on-site after discussion with the contractor. Should this require additional cost, then the developer should be notified immediately before any additional steps are taken.

3.3 Reporting Procedures to the Developer

Any pollution incidents must be reported to the ECO immediately (within 12 hours). The ECO shall report to the developer on a regular basis (site meetings).

3.4 Site Instruction Entries

The site instruction book entries will be used for the recording of general site instructions as they relate to the works on site. With this project they will issue a non conformance report if there is any activities of the contractor that may pose environmental risk.

3.5 ESA/ESO (Environmental Site Officer) Diary Entries

Each of these books must be available in duplicate, with copies for the engineer and ESO. These books should be available to the authorities for inspection or on request. All spills are to be recorded in the Balwin electronic incident management system.

3.6 Methods Statements

Methods statements from the contractor will be required for specific sensitive actions on request of the authorities or ESA/ESO. All method statements will form part of the EMPr documentation and are subject to all terms and conditions contained within the EMPr document. For each instance wherein it is requested that the contractor submit a method statement to the satisfaction of ESA/ESO, the format should clearly indicate the following:

- What – a brief description of the work to be undertaken;
- How – a detailed description of the process of work, methods and materials;

- Where – a description / sketch map of the locality of work; and
- When – the sequencing of actions with due commencement dates and completion date estimate.

The contractor must submit the method statement before any particular construction activity is due to start. Work may not commence until the method statement has been approved by the ESA/ESO.

3.7 Record Keeping

All records related to the implementation of this management programme (e.g. site instruction book, ESA/ESO dairy, methods statements etc.) must be kept together in an office where it is safe and can be retrieved easily. These records should be kept for two years at any time be available for scrutiny by any relevant authorities.

3.8 Acts

3.8.1. The National Water Act (Act No. 36 of 1998)

The purpose of this act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways that take into account, amongst other factors, the following:

- ❑ Meeting the basic human needs of present and future generations;
- ❑ Promoting equitable access to water;
- ❑ Promoting the efficient, sustainable and beneficial use of water in the public interest;
- ❑ Reducing and preventing pollution and degradation of water resources;
- ❑ Facilitating social and economic development; and
- ❑ Providing for the growing demand for water use.

Impact on proposed activity:

The proposed electrical line crosses the Pienaars River and a culvert where a wetland area formed. A Section 21 (c) and (i) Water Use License will be required by the Department of Water and Sanitation and such applications are in the process of being submitted.

3.8.2. Atmospheric Pollution Prevention Act (Act No. 45 of 1965)

The NEM: AQA serves to repeal the Atmospheric Pollution Prevention Act (45 of 1965) and various other laws dealing with air pollution and it provides a more comprehensive framework within which the critical question of air quality can be addressed.

The purpose of the act is to set norms and standards that relate to:

- ❑ Institutional frameworks, roles and responsibilities
- ❑ Air quality management planning
- ❑ Air quality monitoring and information management
- ❑ Air quality management measures
- ❑ General compliance and enforcement

Amongst other things, it is intended that the setting of norms and standards will achieve the following:

- The protection, restoration and enhancement of air quality in South Africa;
- Increased public participation in the protection of air quality and improved public access to relevant and meaningful information about air quality;
- The reduction of risks to human health and the prevention of the degradation of air quality.

The act describes various regulatory tools that should be developed to ensure the implementation and enforcement of air quality management plans. These include:

- Priority areas, which are air pollution 'hot spots';
- Listed activities, which are 'problem' processes that require an atmospheric emission license;
- Controlled emitters, which includes the setting of emission standards for 'classes' of emitters, such as motor vehicles, incinerators, etc.;
- Control of noise;
- Control of odours.

Impact on proposed activity:

The act has relevance to the proposed electrical line installation during the construction phase. Dust pollution could be a concern primarily during the construction phase of the proposed project. Dust control would be adequately minimised during this phase by way of water spraying and possible dust-nets, if necessary. It should be noted, that the time period from excavating to installation and closing the excavations will be kept to a minimum. The proposed electrical line would not contribute to pollution during its operational phase.

3.8.3 National Environmental Management Act (Act No. 107 of 1998)

The NEMA is primarily an enabling act in that it provides for the development of environmental implementation plans and environmental management plans. The principles listed in the act serve as a general framework within which environmental management and implementation plans must be formulated.

The principles in essence state that environmental management must place people and their needs at the forefront of its concern and that development must be socially, environmentally and economically sustainable.

Impact on proposed activity:

Section 28 (1) of NEMA stated that every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring,

continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment. The EMPr is compiled in terms of Section 28 of NEMA. A Basic Assessment application has been lodged with the relevant authority in terms of the Amended 2014 NEMA EIA Regulations in order to obtain Environmental Authorisation.

3.8.4. The National Environmental Management: Waste Act (Act No. 59 of 2008)

This act came into effect on 11 June 2009. It aims to consolidate waste management in South Africa, and contains a number of commendable provisions, including:

- The establishment of a national waste management strategy, and national and provincial norms and standards for, amongst others, the classification of waste, waste service delivery, and tariffs for such waste services;
- Addressing reduction, reuse, recycling and recovery of waste;
- The requirement for industry and local government to prepare integrated waste management plans;
- The establishment of control over contaminated land;
- Identifying waste management activities that requires a licence, which currently include facilities for the storage, transfer, recycling, recovery, treatment and disposal of waste on land;
- Co-operative governance in issuing licenses for waste management facilities, by means of which a licensing authority can issue an integrated or consolidated license jointly with other organs of state that has legislative control over the activity; and
- The establishment of a national waste information system.

On 3 July 2009 the Minister of Environmental Affairs and Tourism promulgated a list of waste management activities that might have a detrimental effect on the environment. These listed activities provide the activities that require a waste management license. Two categories is specified: Category A and Category B. As

part of a Category A waste management license application, a Basic Assessment in terms of Section 24(5) of the National Environmental Management Act (Act No. 107 of 1998) must be submitted to the relevant authority. As part of a Category B: waste management license application, a Scoping and EIA process in terms of Section 24(5) of the National Environmental Management Act (Act No. 107 of 1998) must be followed and submitted to the relevant authority.

On 29 November 2013 the Minister of Environmental Affairs and Tourism amended the list of waste activities that might be detrimental to the environment and this was published under Government Notice 921.

Impact on proposed activity:

No waste management license is expected to be required during the construction or operational phase of the proposed electrical line that will cross the river and wetland.

3.8.5. The Municipal Systems Act (Act No. 32 of 2000)

This act was introduced to provide for the core principles, mechanisms and processes that are necessary to enable municipalities to move progressively towards the social and economic upliftment of local communities, and ensure universal access to essential services that are affordable to all.

The proposed development will support the local authority in complying with the principles of the Municipal Systems Act, by assisting in providing the community with essential services, such as water and sewage infrastructure.

Impact on proposed activity:

The proposed electrical line will contribute to the municipal services delivery.

3.8.6 National Veld and Forest Fire Act (Act No. 101, 1998)

The purpose of this act is to prevent and combat veld, forest and mountain fires throughout the Republic. Furthermore the act provides for a variety of institutions, methods and practices for achieving the prevention of fires.

Impact on proposed activity:

Fires of construction workers may only be lit in the designated site camp as indicated in assistance with the ECO.

3.8.7 National Heritage Resources Act (Act No. 25 of 1999)

The National Heritage Resources Act legislates the necessity and heritage impact assessment in areas earmarked for development, which exceed 0.5ha. The act makes provision for the potential destruction to existing sites, pending the archaeologist's recommendations through permitting procedures. Permits are administered by the South African Heritage Resources Agency (SAHRA).

Impact on proposed activity:

No features of heritage importance are expected to be found on the proposed study area. The proposed electrical line is more than 2 km from a heritage site, the Sammy Marks Museum. If any such features are discovered during construction activities and clearing of the application site, the correct "procedures for an environmental incident" (at the end of the EMPr) must be followed.

3.8.8. Conservation of Agricultural Resources Act (Act No. 43 of 1983)

This act provides for control over the utilization of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.

Impact on proposed activity:

According to the Gauteng Agriculture Potential Atlas (GAPA 3) the study area has a very low agricultural potential with some areas having high agricultural potential but most of these areas have already been developed.

3.8.9. National Environmental Management Act: Biodiversity Act (Act No. 10 of 2004)

The purpose of the Biodiversity Act is to provide for the management of South Africa's biodiversity within the framework of the NEMA and the protection of species and ecosystems that warrant national protection. As part of the implementation strategy, the National Spatial Biodiversity Assessment was developed.

Impact on proposed activity:

The study area do contain Important and Ecological Support Areas. However, it should be noted that the electrical line will be within the road reserves in registered services servitudes. At the river crossing the minimum vegetation will be lost as they will drill underneath the river.

3.8.11. National Spatial Biodiversity Assessment

The National Spatial Biodiversity Assessment (NSBA) classifies areas as worthy of protection based on its biophysical characteristics, which are ranked according to priority levels.

Impact on proposed activity:

The proposed development is situated within the Marikana Thornveld vegetation type according to Mucina and Rutherford (2006).

3.8.12. National Environmental Management: Protected Areas Act (Act No. 57 of 2003)

The purpose of this act is to provide for the protection, conservation and management of ecologically viable areas representative of South Africa's biological biodiversity and its natural landscapes.

Impact on proposed activity:

The application site is not located within any conservancy or protected area.

4 Project activities

4.1 Pre-Construction Phase

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
General	Project contract	To make the EMPr enforceable under the general conditions of the contract.	The EMPr document must be included as part of the tender documentation	The EMPr is included as part of the tender documentation	Developer	-
Design and planning	Electrical line design	To ensure successful installation	The detail design of the electrical line need to be done by the engineers.	Successful installation	Engineer	Prior to construction
Geology and Soils	Topsoil	To avoid impacts on the watercourse	Topsoil and sub-soil must be dumped above the 1:100 year flood line and outside the river and wetland buffer areas in designated soil storage areas.	No topsoil into the river and wetland	Contractor	
	Storm water design	Erosion of drainage lines	1) Appropriate flow diversion and erosion control structures i.e. earth embankments must be put in place in areas where soil may be exposed to high levels of erosion due to steep slopes etc. 2) Any damage, displacement or loss of soil resulting from unforeseen events is to be recorded and remediated immediately. Should this occur due to negligence on the contractor's behalf, the contractor shall carry remediation costs. 3) Construction on steep slopes and in soft or erodible material will require	No erosion	Engineer Contractor	

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			erosion control measures. 4) All construction areas should be suitably top-soiled as soon as it is possible after construction; and disturbed areas to be rehabilitated must be ripped and the area must be backfilled with topsoil.			
		Stream – increased sediment input	1) To prevent erosion of material that is stockpiled for long periods, the material must be retained in a bermed area. 2) All topsoil within the area to be developed must be removed and stockpiled on site. 3) The temporary storage of topsoil must be above the 100yr floodline or at least 20m from the top of any bank or drainage lines. 4) An earth bank is to be constructed around the upslope portion of any stockpile in order to direct runoff and prevent scouring of stockpiles. 5) A silt fence is to be erected around any stockpiles in order to trap sediment and prevent stockpile sediment loss.			
Light pollution		To minimise light pollution	The generation of light by night events, security lighting and other lighting shall be effectively designed so as not to spill unnecessary outward into the oncoming traffic, or into the yards of the neighbouring properties, oncoming traffic on highway or open spaces.	Lighting effectively designed	Architect/ Landscape Architect	-
Visual impact		To minimise the visual impact of the	No rubble or litter to be left at excavations or in the river and wetland areas.	No litter and rubble	Contractor	-

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
		proposed electrical line construction.				
Waste storage	Pollution	To control the temporary storage of waste.	Temporary waste storage points on site shall be determined. These storage points shall be accessible by waste removal trucks and these points should not be located in sensitive areas/areas highly visible from the properties of the surrounding land-owners/tenants/in areas where the wind direction will carry bad odours across the properties of adjacent tenants or landowners.		Contractor ESO	-
		Ensure waste storage area does not generate pollution	Build a bund around waste storage area to stop overflow into storm water.		Contractor	-

4.2 Construction Phase

It should be noted that all possible mitigation measures are included in this construction phase EMPr, however, due to the low impact and small scale of the proposed activity it might become clear during the construction phase that mitigation measures are not applicable or not required.

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
<p>Contractors Camp</p> <p>It should be noted that the site camp will not be in the road reserve but in a secure area such as the Riverwalk development. The location of the site camp will still be confirmed after authorisation has been received.</p>	<p>Surface and ground water pollution</p>	<p>To minimize pollution of surface and Groundwater resources.</p>	<p>1) Sufficient and temporary facilities including ablution facilities must be provided for construction workers operating on the site.</p> <p>2) There should be sanitary facilities for each sex for every 30 workers. The contractor shall keep the toilets in a clean, neat and hygienic condition. Toilets provided by the contractor must be easily accessible to ensure they are utilized. The contractor (who must use reputable toilet-servicing company) shall be responsible for the cleaning, maintenance and servicing of the toilets. The contractor (using reputable toilet-servicing company) shall ensure that all toilets are cleaned and emptied before the builders' or other public holidays.</p> <p>3) No person is allowed to use any other area than chemical toilets.</p> <p>4) No french drain systems may be installed.</p> <p>5) No chemical or waste water must be allowed to contaminate the run-off on site.</p> <p>6) Avoid the clearing of the site camp (of specific phase) or paved surfaces with</p>	<p>Effluents managed Effectively.</p> <p>No pollution of water resources from site.</p> <p>Workforce use toilets provided.</p>	<p>Contractor ESO</p>	<p>As and when required</p>

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			soap.			
		Minimize impacts due to topsoil storage	Topsoil and sub-soil must be dumped above the 1:100 year flood line and outside the river and wetland buffer areas in designated soil storage areas.			
		To minimize pollution of surface and groundwater resources due to spilling of materials.	1) Drip trays and/ or lined earth bunds must be provided under vehicles and equipment, to contain spills of hazardous materials such as fuel, oil and cement. 2) Repair and storage of vehicles only within the demarcated site area. 3) Spill kits must be available on site. 4) Oils and chemicals must be confined to specific secured areas within the site camp. These areas must be bunded with adequate containment (at least 110% the volume of the fuel) for potential spills or leaks. 5) All spilled hazardous substances must be contained in impermeable containers for removal to a licensed hazardous waste site. 6) No leaking vehicle shall be allowed on site. 7) No bins containing organic solvents such as paints and thinners shall be cleaned on site, unless containers for liquid waste disposal are placed for this purpose on site.	No pollution of the environment	Contractor ESO	Daily
		To minimize pollution of surface and groundwater resources by cement	The mixing of concrete shall only be done at specifically selected sites, on mortar boards or similar structures to prevent run-off into drainage lines, streams and natural vegetation.	No evidence of contaminated soil on the construction site.	Contractor ESO	Daily

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
		To minimize pollution of surface and groundwater resources due to effluent.	No effluent (including effluent from any storage areas) may be discharged into any water surface or groundwater resource.	No evidence of contaminated water resources.	Contractor ESO	Daily
Construction site	Pollution of the environment	To prevent unhygienic usage on the site and pollution of the natural assets.	1) Weather proof waste bins must be provided and emptied regularly. 2) The contractor shall provide laborers to clean up the contractor's camp and construction site on a daily basis. 3) Temporary waste storage points on the site should be determined. THESE AREAS SHALL BE PREDETERMINED AND LOCATED IN AREAS THAT IS ALREADY DISTURBED. These storage points should be accessible by waste removal trucks and these points should be located in already disturbed areas /areas not highly visible from the properties of the surrounding land-owners/ in areas where the wind direction will not carry bad odours across the properties of adjacent landowners. This site should comply with the following: <ul style="list-style-type: none"> • Skips for the containment and disposal of waste that could cause soil and water pollution, i.e. paint, lubricants, etc.; • Small lightweight waste items should be contained in skips with lids to prevent wind littering; 4) No solid waste may be disposed of on the site.	No waste bins overflowing No litter or building waste lying in or around the site	Contractor ESO	Daily Weekly

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			5) No waste materials shall at any stage be disposed of in the open veld of adjacent properties. 6) The storage of solid waste on the site, until such time as it may be disposed of, must be in a manner acceptable to the local authority and DWS. 7) Cover any wastes that are likely to wash away or contaminate storm water.			
		Recycle material where possible and correctly dispose of unusable wastes	1) Waste shall be separated into recyclable and non-recyclable waste, and shall be separated as follows: <ul style="list-style-type: none"> • General waste: including (but not limited to) construction rubble, • Reusable construction material. 2) Recyclable waste shall preferably be deposited in separate bins. 3) All solid waste including excess spoil (soil, rock, rubble etc) must be removed to a permitted waste disposal site on a weekly basis. 4) No bins containing organic solvents such as paints and thinners shall be cleaned on site, unless containers for liquid waste disposal are placed for this purpose on site. 5) Keep records of waste reuse, recycling and disposal for future reference. Provide information to ECO.	Sufficient containers available on site No visible signs of pollution	Contractor ESO	Daily Weekly
	Waste	To keep the site clean and tidy. To ensure waste enters the	1) Rubble must be removed from the construction site frequently and be disposed of at an approved dumping site. 2) Sufficient and covered containers must be available on the construction site.		Contractor	Monitor daily

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
		appropriate waste stream in order to optimize recycling opportunities.	3) Such containers are to be emptied frequently. 4) All liquid effluent is to be disposed of in a manner approved of by the local authority. 5) Material to be used as backfill during a later stage of the building construction must be covered with a layer of soil to prevent litter from being blown over the site and to prevent unhygienic conditions. 6) Chemical containers and packaging brought onto the site must be removed for disposal at a suitable site. 7) The burning of waste is prohibited. 8) Where possible, waste must be separated into clearly marked containers and subsequent recycling thereof must be a priority.			
	Increased fire risk to site and surrounding areas	To decrease fire risk.	1) Fires shall only be permitted in specifically designated areas and under controlled circumstances. 2) Food vendors shall be allowed within specified areas. 3) No wood may be collected from the site for fires. 4) Fire extinguishers to be provided in all vehicles and fire beaters must be available on site. 5) Emergency numbers/ contact details must be available on site, where applicable.	No open fires on site that have been left unattended	Contractor	Monitor daily
	Geology and soils	To protect underground services from	Underground services should be treated appropriately prior to installation.	Underground services are not being	Contractor	Monitor regularly/ as required

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
		alkaline or corrosive attack.		corroded		
		To prevent the damage of the existing soils and geology.	1) The top layer of all areas to be excavated for the purposes of construction shall be stripped and stockpiled in areas where this material will not be damaged, removed or compacted. 2) All surfaces that are susceptible to erosion, shall be protected either by cladding with biodegradable material or with the top layer of soil being seeded with grass seed/planted with a suitable groundcover.	Excavated materials correctly stockpiled No signs of erosion	Contractor	Monitor daily
		To prevent the loss of topsoil To prevent siltation & water pollution.	1) Stockpiling will only be done in designated places where it will not interfere with the natural drainage paths of the environment. 2) In order to minimize erosion and siltation and disturbance to existing vegetation, it is recommended that stockpiling be done/ equipment is stored in already disturbed/ exposed areas. 3) Cover stockpiles and surround downhill sides with a sediment fence to stop materials washing away. 4) Remove vegetation only in areas designated during the planning stage. 5) Rehabilitation/ landscaping are to be done immediately after the involved works are completed. 6) All compacted areas should be ripped prior to them being rehabilitated/ landscaped by the contractor as	Excavated materials correctly stockpiled No visible signs of erosion and sedimentation Minimal invasive weed growth Vegetation only removed in designated areas	Contractor of the Individual Developer	Monitor daily

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			<p>appointed by the developer/ individual erf owner.</p> <p>7) The top layer of all areas to be excavated must be stripped and stockpiled in areas where this material will not be damaged, removed or compacted. This stockpiled material should be used for the rehabilitation of the site and for landscaping purposes.</p> <p>8) Strip topsoil at start of works and store in stockpiles no more than 1,5 m high in designated materials storage area.</p> <p>9) During the laying of any cables, pipelines or infrastructure (on or adjacent to the site) topsoil shall be kept aside to cover the disturbed areas immediately after such activities are completed.</p> <p>10) Topsoil and sub-soil must be dumped above the 1:100 year flood line and outside the river and the wetland buffer areas in designated soil storage areas.</p>			
	Erosion and siltation	To prevent erosion and siltation	<p>1) Mark out the areas to be excavated.</p> <p>2) Unnecessary clearing of flora resulting in exposed soil prone to erosive conditions should be avoided.</p> <p>3) All embankments must be adequately compacted and planted with grass to stop any excessive soils erosion and scouring of the landscape if required.</p> <p>4) Implementation of temporary storm water management measures that will help to reduce the speed of surface water by</p>	<p>No erosion scars</p> <p>No loss of topsoil</p> <p>All damaged areas successfully rehabilitated</p>	Contractor ESO	Monitor daily

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			the individual erf owner / developer. 5) All surfaces that are susceptible to erosion shall be covered with a suitable vegetative cover as soon as construction is completed by the individual erf owner / developer.			
	Storm Water Management	Erosion	1) Appropriate flow diversion and erosion control structures i.e. earth embankments must be put in place in areas where soil may be exposed to high levels of erosion due to steep slopes etc. 2) Any damage, displacement or loss of soil resulting from unforeseen events is to be recorded and remediated immediately. Should this occur due to negligence on the contractor's behalf, the contractor shall carry remediation costs. 3) Storm water at the site camp must be managed so as to reduce/ minimise the silt loads in the stream channel. 4) Construction on steep slopes and in soft or erodible material will require erosion control measures and appropriate grassing/ hydroseeding measures. 5) All construction areas should be suitably top-soiled and vegetated as soon as it is possible after construction; and disturbed areas to be rehabilitated must be ripped and the area must be backfilled with topsoil.			
		Increased sediment	1) To prevent erosion of material that is stockpiled for long periods, the material must be retained in a bermed area.			

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			2) All topsoil within the area to be developed must be removed and stockpiled on site. 3) The temporary storage of topsoil must be above the 100yr floodline or at least 20m from the top of any bank or drainage lines. 4) An earth bank is to be constructed around the upslope portion of any stockpiles in order to direct runoff and prevent scouring of stockpiles. 5) A silt fence is to be erected around any stockpiles in order to trap sediment and prevent stockpile sediment loss.			
	Seepage of groundwater into excavations	To ensure that excavations do not become flooded	Provision should be made for the removal of groundwater from excavations.		Contractor	Monitor daily
	Hydrology	To minimise pollution of soil, surface and groundwater	1) Increased run-off during construction must be managed using berms and other suitable structures as required to ensure flow velocities are reduced. 2) The contractor shall ensure that excessive quantities of sand, silt and silted water do not enter the storm water system.	No visible signs of erosion. No visible signs of pollution	Contractor	Monitor daily
	Wetland	Preserving River and Wetland areas.	1) Construction of water control structures to prevent and control any erosion on the site. 2) Prevent contamination of wetland areas from polluted runoff/ seepage/ drainage water by utilizing relevant control measures. 3) During the construction phase, no dumping and no stockpiling of materials within the wetland areas and associated	No visible signs of pollution	Contractor	

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			buffers should take place. 4) No vehicles should be allowed to indiscriminately drive through the wetland areas. 5) The area should be prepared with sandbags or other applicable measures to avoid siltation into the wetland/ river area.			
	Fauna and flora	To protect the existing fauna and flora.	1) Trees that are intended to be retained shall be clearly marked on site. 2) Snaring and hunting of fauna by construction workers on or adjacent to the study area are strictly prohibited and the Council shall prosecute offenders. 3) All mitigation measures for impacts on the indigenous flora of the area should be implemented in order to limit habitat loss as far as possible and maintain and improve available habitat, in order to maintain and possibly increase numbers and species of indigenous fauna. 4) Wood harvesting of any trees or shrubs on the study area or adjacent areas shall be prohibited. 5) Where possible, work should be restricted to one area at a time. 6) Noise should be kept to a minimum and the development should be done in phases to allow faunal species to temporarily migrate into the conservation areas in the vicinity. 7) The integrity of remaining wildlife should be upheld, and no trapping or hunting by construction personnel should be allowed.	No measurable signs of habitat destruction	Contractor ESO	As and when required

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			Caught animals should be relocated to the conservation areas in the vicinity. 8) Entrance by vehicles, especially off-road cars and bakkies, off-road bicycles and quad bikes and construction staff into the application site should be prohibited, both during the construction phase and during the lifespan of the project.			
		To protect the existing fauna and flora.	1) Retain natural habitat elements such as tree stumps, termite mounds, etc. where possible. 2) Preserve, maintain and construct biological corridors where possible, as well as retaining green belts interconnected with these corridors.	No measurable signs of habitat destruction	Contractor ESO	As and when required
Social	Noise impact	To maintain noise levels below "disturbing" as defined in the national noise regulations.	1) Site workers must comply with the provincial noise requirements as outlined in Provincial Notice No. 5479 of 1999: Gauteng Noise Control Regulations. 2) Noise activities shall only take place during working hours.	No complaints from surrounding residents and I & APs	Contractor	Monitored daily
	Dust impact	Minimise dust from the site	1) Dust pollution could occur during the construction works, especially during the dry months. Regular and effective damping down of working areas (especially during the dry and windy periods) must be carried out to avoid dust pollution that will have a negative impact on the surrounding environment. 2) When necessary, these working areas should be damped down in the mornings and afternoons.	No visible signs of dust pollution No complaints from surrounding residents and I & APs	Contractor	Monitored daily
	Safety and	To ensure the	1) Although regarded as a normal	No	Contractor	Monitored

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
	security	safety and security of the public.	practice, it is important to erect proper signs indicating the operations of heavy vehicles in the vicinity of dangerous crossings and access roads or even in the development site if necessary. 2) Construction vehicles and activities to avoid peak hour traffic times 3) Presence of security guards at strategic places must be ensured 4) Following actions would assist in management of safety along the road <ul style="list-style-type: none"> ▪ Adequate road marking ▪ Adequate roadside recovery areas ▪ Allowance for pedestrians and cyclists where necessary ▪ Although regarded as a normal practice, it is important to erect proper signs indicating the danger of the excavation in and around the development site. Putting temporary fencing around excavations where possible. 	incidences reported	ESO	daily
	Blasting	To ensure safety during blasting operations.	1) Surrounding residents must be informed of blasting exercises at least one week in advance. 2) Blasting operations should be carefully controlled and the necessary safety precautions must be implemented.	Surrounding residents informed. Safety precautions in place.	Engineer Project Manager	
	Infrastructure and services	Installation of services	Discuss possible disruptions with affected parties to determine most convenient times for service disruptions and warn affected parties well in advance of dates that service disruptions will take place.	No complaints from I & AP	Contractor ESO	When required

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
		Do not allow any materials to be on the road causing difficulty for road users	Remove erosion and sediment controls only if all bare soil is sealed, covered or re-vegetate. Sweep roadways clean and remove all debris from kerb and gutter areas. Do not wash into drains.	No cars damaged or road users injured.	Contractor	
	Cultural Resources		If any graves or archaeological sites are exposed during construction work it should immediately be reported to a museum. The report from the archaeologist must be provided to GDARD if any graves are recovered.	No destruction of or damage to graves or known archaeological sites	Contractor ESO	Monitor daily
	Vegetation	Spread of weeds	Ensure that materials used for mulching and topsoil/ fertilisers are certified weed free. Collect certifications where available. Control weed growth that appears during construction.	Weed growth controlled	Landscape architect Contractor	When required

4.3 Operational Phase – all operation phase monitoring and management will be the responsibility of the local authority

<i>TYPE</i>	<i>Environment al risk or issue</i>	<i>Objective or requirement</i>	<i>Mitigation measure</i>	<i>Responsibility</i>	<i>Frequency of Action</i>
Hydrology & water quantity	Altering flow pattern or volume of water	Prevent altering the flow in the Pienaars River and its tributaries negatively	Ensure rehabilitation of the watercourse in accordance with the plans approved by DWS as part of the WULA.	Continuous flow within watercourse during rainy season following installation	When required
<p>There are no further mitigation measures for the operational phase as no negative impacts are anticipated for the operational phase. It should also be noted that the local municipality will be responsible for the electrical line and its maintenance after the construction phase.</p>					

5 Procedures for environmental incidents

5.1 Leakages & spills

- Identify source of problem.
- Stop goods leaking, if safe to do so.
- Contain spilt material, using spills kit or sand.
- Notify ECO
- Remove spilt material and place in sealed container for disposal (if possible).
- ECO to follow incident management plan.

5.2 Failure of erosion/sediment control devices

- Prevent further escape of sediment.
- Contain escaped material using silt fence, hay bales, pipes, etc.
- Notify ECO.
- Repair or replace failed device as appropriate.
- Dig/scrape up escaped material; take care not to damage vegetation.
- Remove escaped material from site.
- ECO to follow incident management plan.
- Monitor for effectiveness until re-establishment.

5.3 Bank/slope failure

- Stabilize toe of slope to prevent sediment escape using aggregate bags, silt fence, logs, hay bales, pipes, etc.
- Notify ECO.
- ECO to follow incident management plan.
- Divert water upslope from failed fence.
- Protect area from further collapse as appropriate.
- Restore as advised by ECO.
- Monitor for effectiveness until stabilized.

5.4 Discovery of rare or endangered species

- Stop work.
- Notify ECO.
- If a plant is found, mark location of plants.
- If an animal, mark location where sighted.
- ECO to identify or arrange for identification of species and or the relocation of the species if possible.
- If confirmed significant, ECO to liaise with Endangered Wildlife Trust.
- Recommence work when cleared by ECO.

5.5 Discovery of archeological or heritage items

- Stop work.
- Do not further disturb the area.
- Notify ECO.
- ECO to arrange appraisal of specimen.
- If confirmed significant, ECO to liaise with National, Cultural and History Museum
P.O. Box 28088
SUNNYSIDE
0132
Contact Mr. J. van Schalkwyk
or
Mr. Naude
- Recommence work when cleared by ECO.

6 EMPr review

1. The site supervisor for every sub-contractor is responsible for ensuring the work crew is complying with procedures, and for informing the work crew of any changes. The site supervisor is responsible for ensuring the work crew is aware of changes that may have been implemented by GDARD before starting any works.
2. If the contractor cannot comply with any of the activities as described above, they should inform the ECO with reasons within 7 working days.

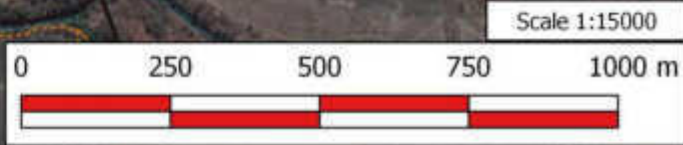
Enlarged Figures

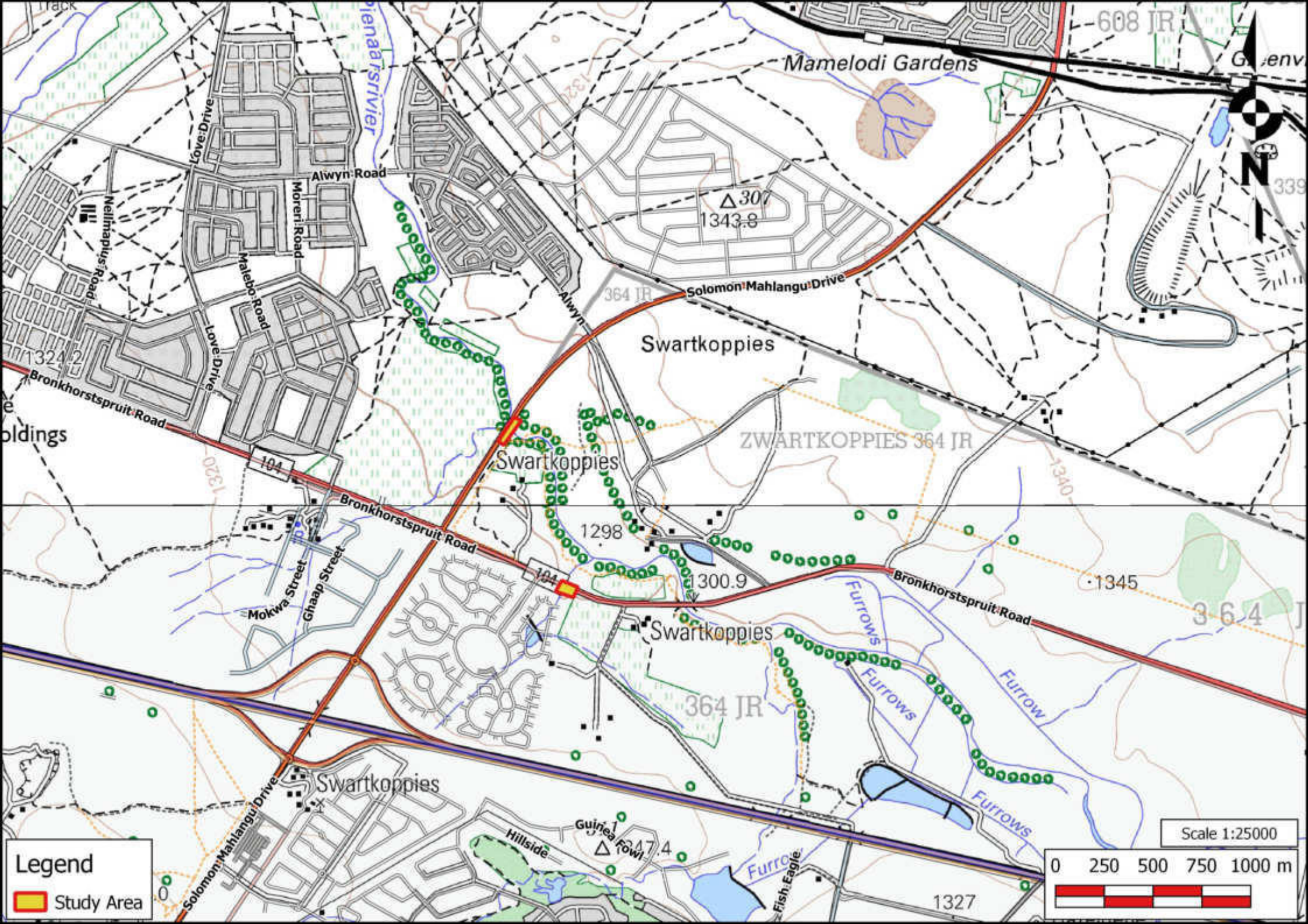
Appendix I



The red line indicating the alignment of the electrical line has been added for ease of reference (a holistic view) but the entire line does not trigger any NEMA EIA listed activities, only the areas where the line traverses the river/stream do trigger listed activities. The Basic Assessment Report will only concentrate and discuss these river/ stream crossings as they trigger an environmental authorisation application.

- Legend**
- Riverwalk - Proposed Electrical Power Line
 - ▭ Wetland Stream Crossings
 - ▭ Riverwalk Study Area





Legend
Study Area

Scale 1:25000
0 250 500 750 1000 m






Scale 1:15000



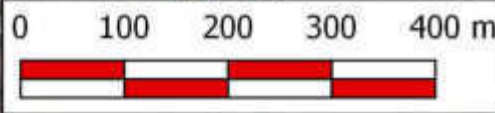
Legend
[Red Box] Study Area



Legend

-  Storm Water Channel Signature
-  32m Buffer
-  River

Scale 1:8000





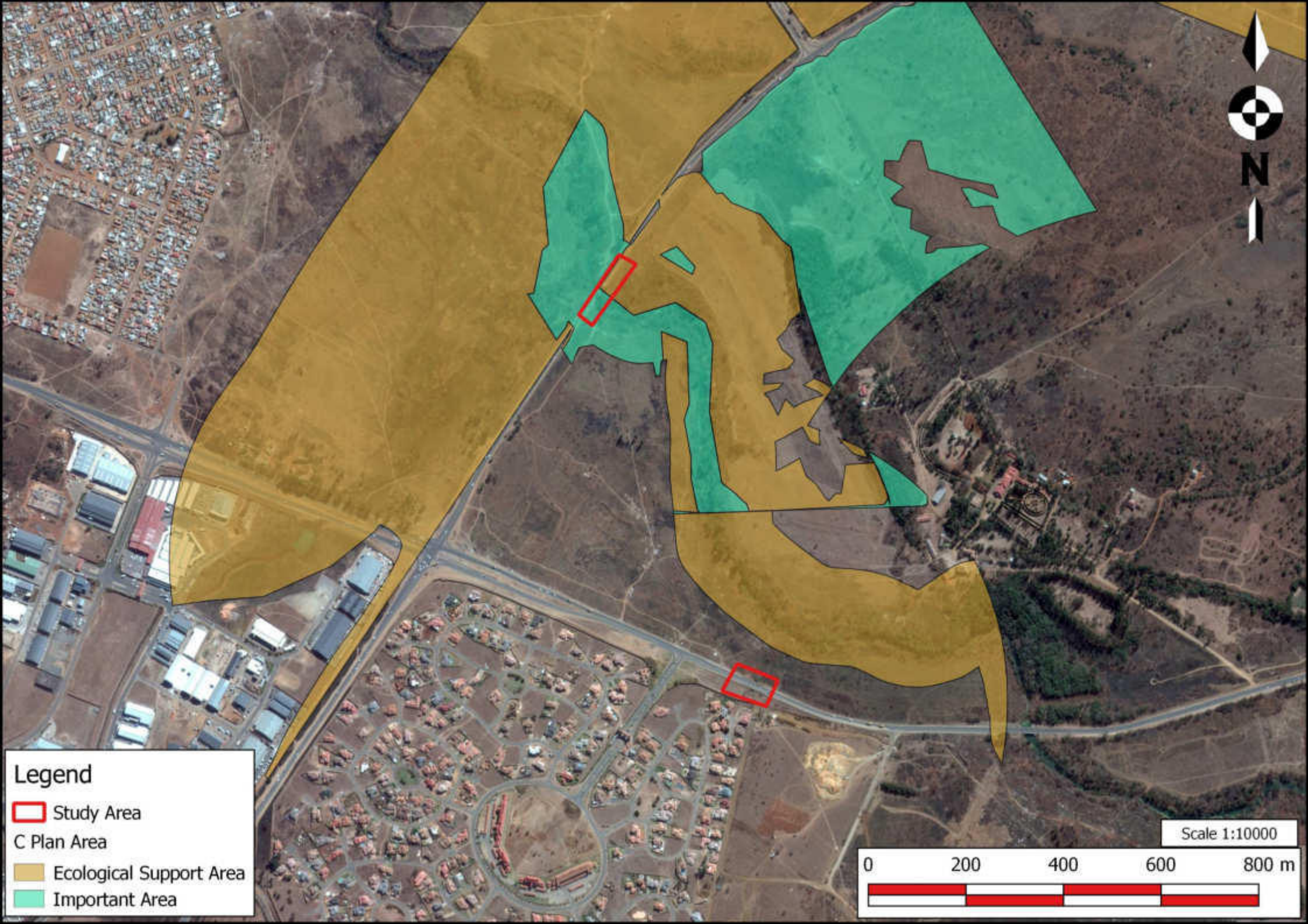
Legend

-  Study Site
-  Protected Areas
-  Municipal Nature Reserve
-  National Botanical Garden

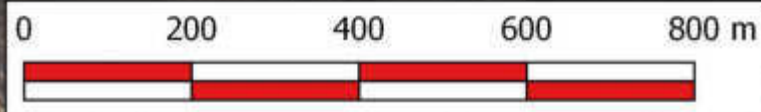
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0 500 1000 1500 2000 m








Scale 1:10000






Legend

-  Study Area
-  Ecological Support Area
-  Important Area

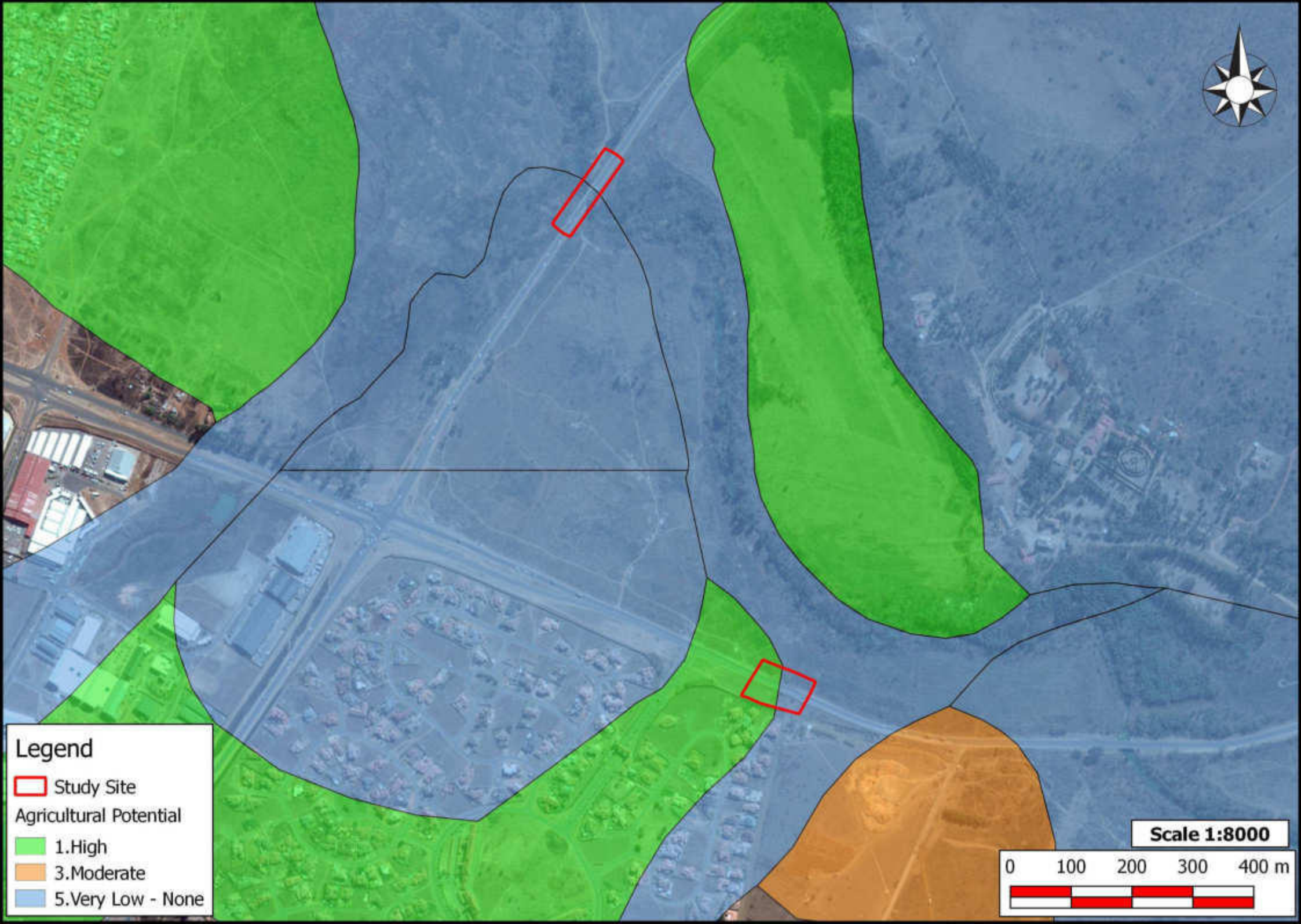


Legend

-  Study Area
-  OL plant hab, RL mammal hab, RL bird hab, Prim veg
-  RL plant hab, OL plant hab, RL mammal hab, RL bird hab, Prim veg

Scale 1:10000

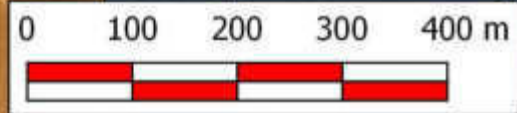




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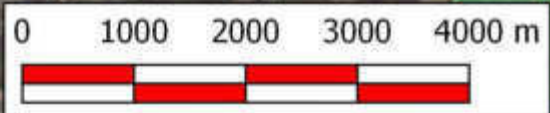
-  Study Site
- Agricultural Potential**
-  1.High
-  3.Moderate
-  5.Very Low - None

Scale 1:8000





Scale 1:75000






Legend

-  Study Site
-  Nokeng

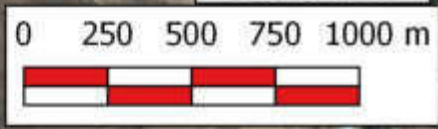
Agricultural Hubs



Legend

-  Study Area
-  RIDGE
-  TRANSFORMED RIDGES

Scale 1:25000



Gauteng Provincial Environmental Management Framework

MAP LEGEND:

ENVIRONMENTAL MANAGEMENT ZONES

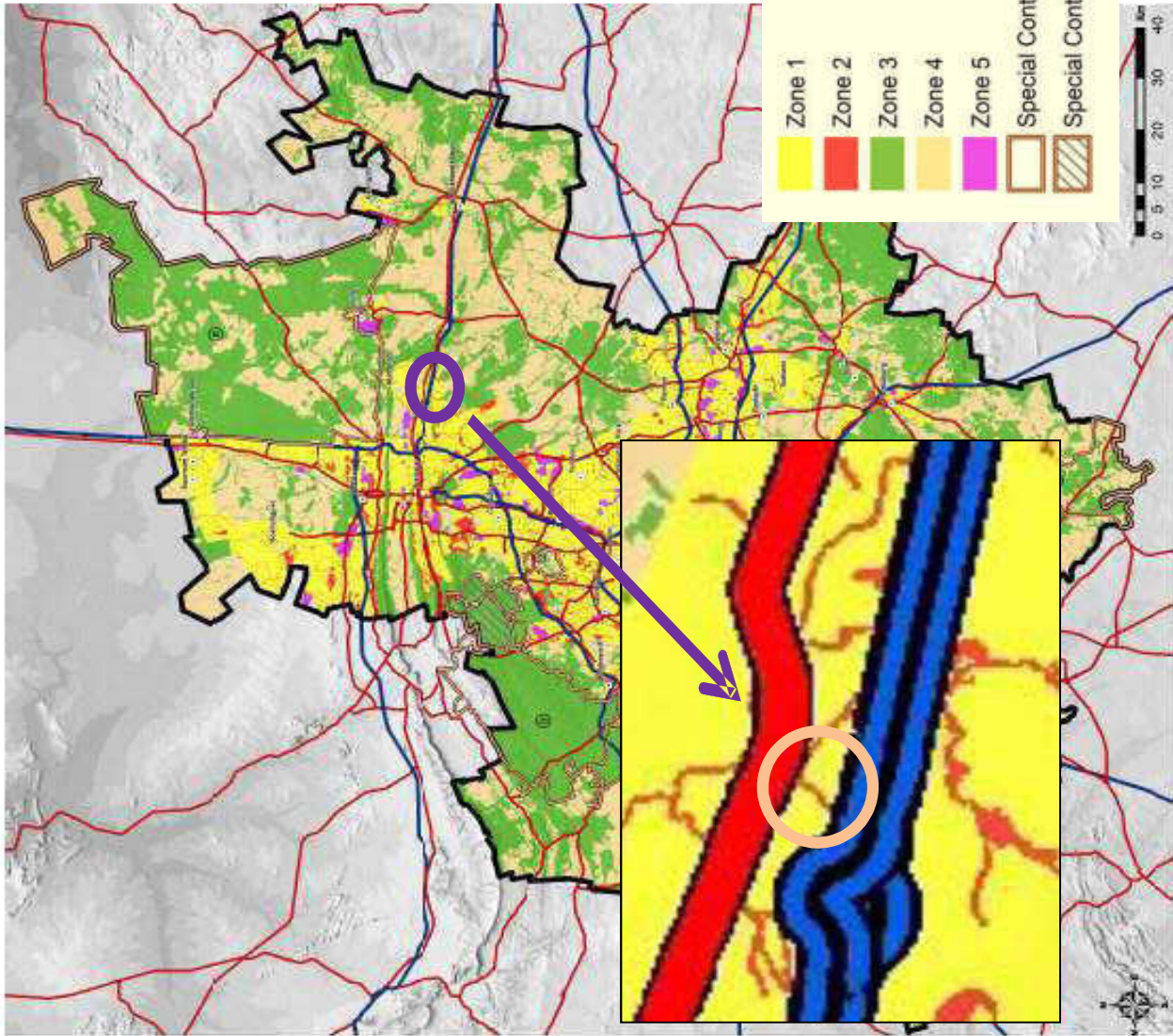
- Zone 1
- Zone 2
- Zone 3
- Zone 4
- Zone 5
- Special Control Zones
- Special Control Zone for Conservation, Recreation and Tourism

Roads

- National Road
- Arterial Road

Special Control Zones:

- (A) Drinking
- (B) Corridors
- (C) Water
- (D) Job South
- (E) Job North



Special Control Zone (SCZ) 1: Urban Development Zone

Zone 1: Urban Development Zone

Identifies areas with high potential for urban development and concentration of urban development, in order to establish a more effective and efficient city region that will promote urban spread into rural areas.

Zone 2: High control zone within the urban development zone

Identifies the zone is sensitive to development activities. Only construction should be allowed in this zone. Related transport and recreation activities must be accompanied by measures to manage the zone.

Zone 3: High control zone outside the urban development zone

Identifies areas with high potential for urban development and concentration of urban development, in order to establish a more effective and efficient city region that will promote urban spread into rural areas.

Zone 4: High control zone within the urban development zone

Identifies the zone is sensitive to development activities. Only construction should be allowed in this zone. Related transport and recreation activities must be accompanied by measures to manage the zone.

Zone 5: High control zone outside the urban development zone

Identifies areas with high potential for urban development and concentration of urban development, in order to establish a more effective and efficient city region that will promote urban spread into rural areas.

Special Control Zone (SCZ) 2: Industrial and Commercial Zone

The SCZ 2 is a zone that is used to identify areas with high potential for industrial and commercial development. It is used to identify areas that are suitable for industrial and commercial development.

Special Control Zone (SCZ) 3: Agricultural Zone

The SCZ 3 is a zone that is used to identify areas with high potential for agricultural development. It is used to identify areas that are suitable for agricultural development.

Special Control Zone (SCZ) 4: Conservation, Recreation and Tourism Zone

The SCZ 4 is a zone that is used to identify areas with high potential for conservation, recreation and tourism development. It is used to identify areas that are suitable for conservation, recreation and tourism development.

Special Control Zone (SCZ) 5: Water Resource Zone

The SCZ 5 is a zone that is used to identify areas with high potential for water resource development. It is used to identify areas that are suitable for water resource development.

Special Control Zone for Conservation, Recreation and Tourism

Zone 1

Identifies areas with high potential for urban development and concentration of urban development, in order to establish a more effective and efficient city region that will promote urban spread into rural areas.

Zone 2

Identifies the zone is sensitive to development activities. Only construction should be allowed in this zone. Related transport and recreation activities must be accompanied by measures to manage the zone.

Zone 3

Identifies areas with high potential for urban development and concentration of urban development, in order to establish a more effective and efficient city region that will promote urban spread into rural areas.

Zone 4

Identifies the zone is sensitive to development activities. Only construction should be allowed in this zone. Related transport and recreation activities must be accompanied by measures to manage the zone.

Zone 5

Identifies areas with high potential for urban development and concentration of urban development, in order to establish a more effective and efficient city region that will promote urban spread into rural areas.

Special Control Zones

Special Control Zone for Conservation, Recreation and Tourism

Identifies areas with high potential for conservation, recreation and tourism development. It is used to identify areas that are suitable for conservation, recreation and tourism development.



Together, Moving Gauteng City Region Forward



GAUTENG PROVINCE
AGRICULTURE AND RURAL DEVELOPMENT
REPUBLIC OF SOUTH AFRICA



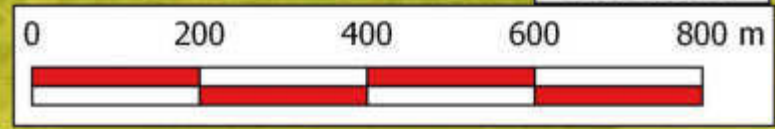
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AGRICULTURE AND RURAL DEVELOPMENT
REPUBLIC OF SOUTH AFRICA

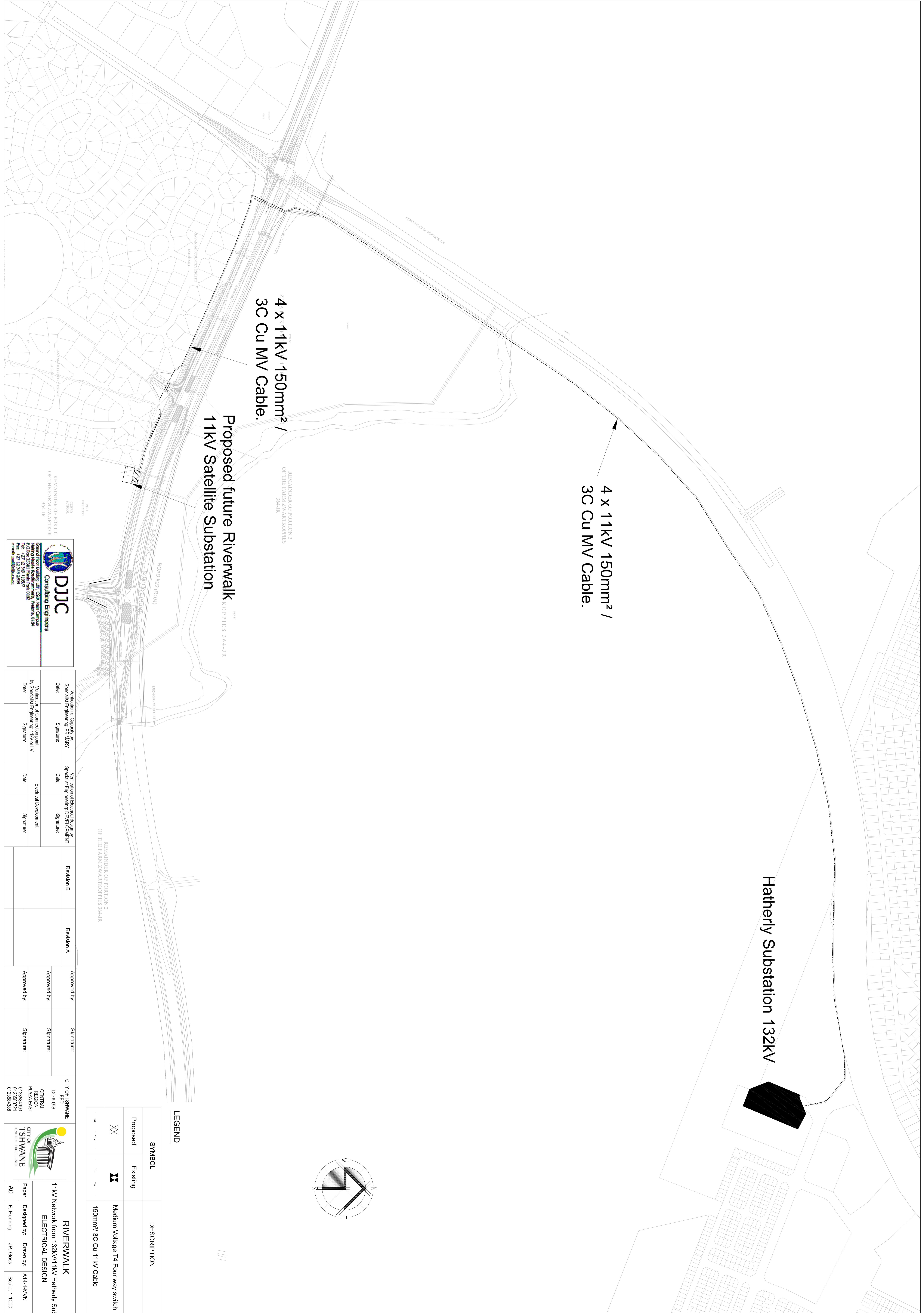


Legend

-  Study Area
-  URBAN EDGE

Scale 1:10000



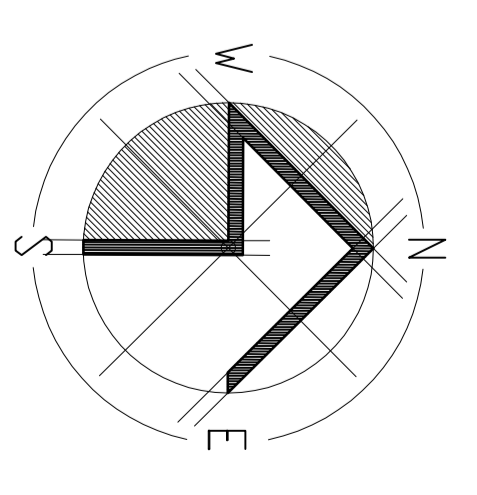


4 x 11kV 150mm² /
3C Cu MV Cable.

4 x 11kV 150mm² /
3C Cu MV Cable.

Proposed future Riverwalk
11kV Satellite Substation

Hatherly Substation 132kV



LEGEND

SYMBOL	DESCRIPTION
	Proposed
	Existing
	Medium Voltage T4 Four way switch
	150mm ² 3C Cu 11kV Cable

DJJC
Consulting Engineers

Grand East Builders Ltd, CSR Near Central
101 Old 153rd Street, Pretoria, 0182
Tel: +27 12 362 2893
e-mail: info@djjc.co.za

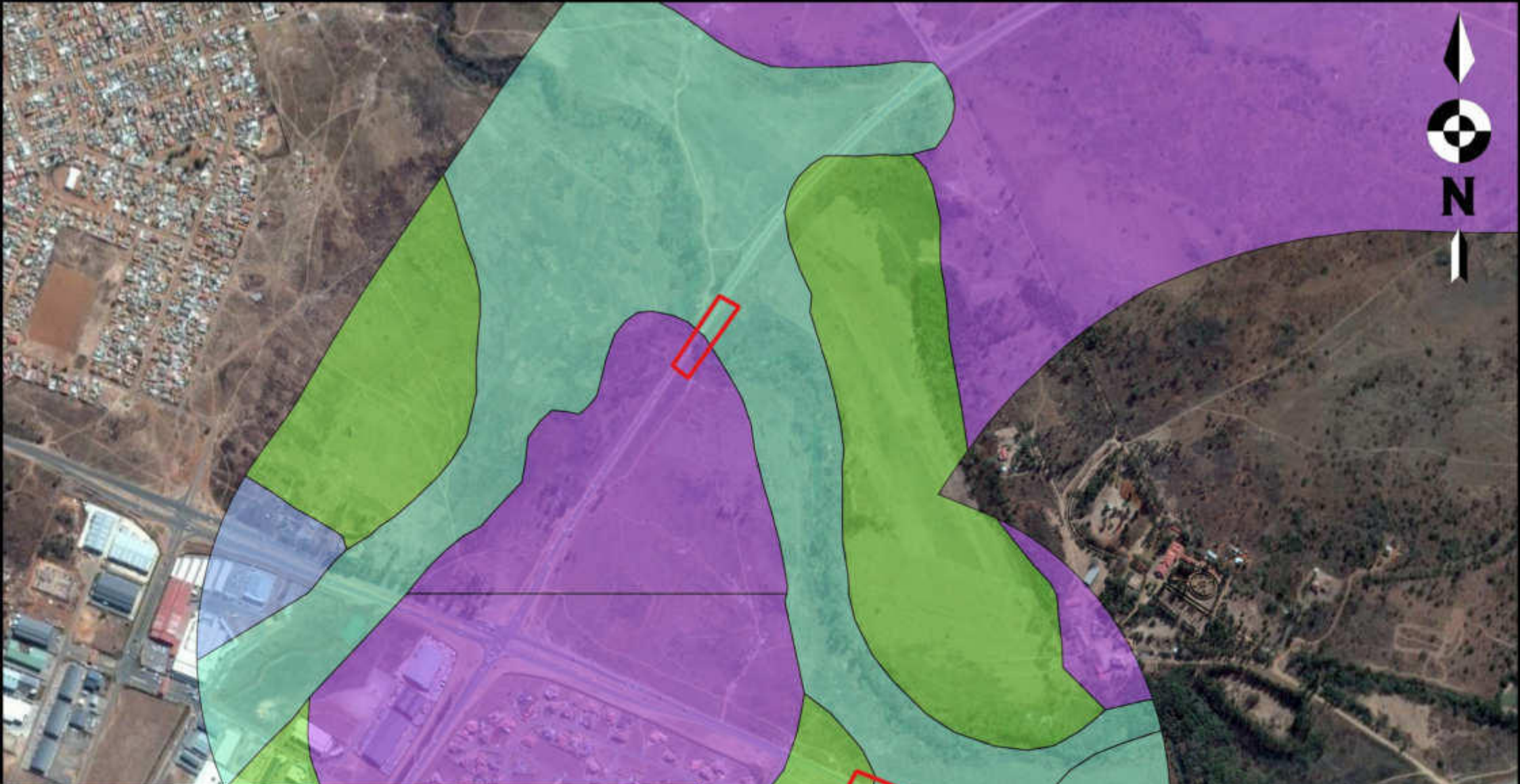
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Verification of Connection point by Specialist Engineering: 11kV or LV Date: _____ Signature: _____	Electrical Development Date: _____ Signature: _____				

CITY OF TSHWANE
EED
DO & SIS
CENTRAL
REGISTRATION
PUBLICIST
0123594193
0123594444
0123594858


CITY OF TSHWANE
MUNICIPALITY OF TSHWANE

RIVERWALK
11kV Network from 132kV/11kV Hatherly Sub
ELECTRICAL DESIGN






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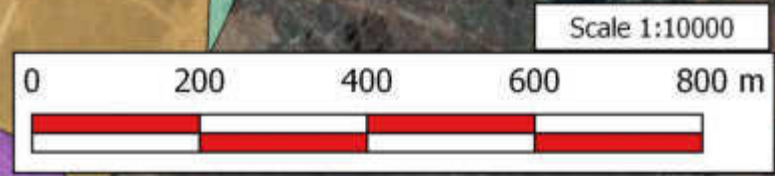


Legend

 Study Area

Soils

-  Impeded internal drainage, flood hazard
-  Limiting soil depth
-  Limiting soil depth, moderate to strong structure, high clay content
-  Limiting soil depth, rainfall efficiency, rock outcrops
-  Moderate to strong structure, high clay content, rainfall efficiency



Company Profile & CV of Lizelle Gregory (Environmental Assessment Practitioner)

Appendix J

The logo for Bokamoso features the word "Bokamoso" in a stylized, cursive font with a white outline and a black shadow. To the right of the word is a large, intricate piece of Arabic calligraphy, also with a white outline and black shadow. The background of the logo is a dark red silhouette of a tree with many bare branches, set against a light green background with horizontal stripes.

Bokamoso

**Landscape Architects &
Environmental consultants**

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Maroelana
0161**

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Fax: (086) 570 5559**

**E-mail: lizelle@bokamoso.net
reception@bokamoso.net
Website: www.bokamoso.net**

- 01** Executive Summary
- 02** Vision, Mission & Values
- 03** Human Resources
- 04** Services
- 05** Landscape Projects
- 06** Corporate Highlights
- 07** Environmental Projects
- 08** Indicative Clients
- 09** Tools

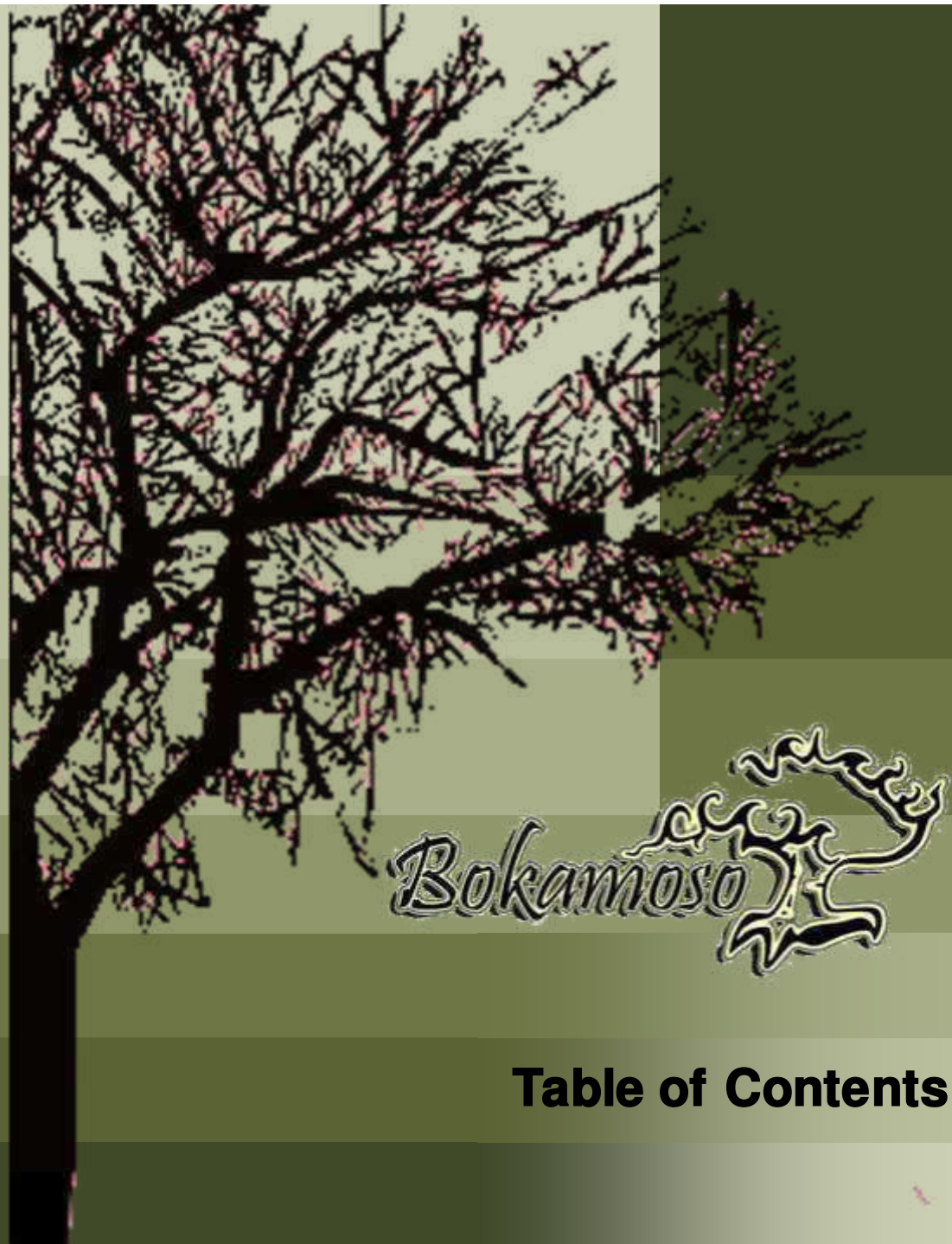


Table of Contents

Bokamoso specialises in the fields of Landscape Architecture and all aspects of Environmental Management and Planning. Bokamoso was founded in 1992 and has shown growth by continually meeting the needs of our clients. Our area of expertise stretches throughout the whole of South Africa. Our projects reflect the competence of our well compiled team. The diversity of our members enables us to tend to a variety of needs. Our integrated approach establishes a basis for outstanding quality. We are well known to clients in the private, commercial as well as governmental sector.

At Bokamoso we stand on a firm basis of environmental investigation in order to find unique solutions to the requirements of our clients and add value to their operations.



01 Executive Summary

011 Company Overview



Vision:

At Bokamoso we strive to find the best planning solutions by taking into account the functions of a healthy ecosystem. Man and nature should be in balance with each other.

Mission:

We design according to our ethical responsibility, take responsibility for successful completion of projects and constitute a landscape that contributes to a sustainable environment. We add value to the operations of our clients and build long term relationships that are mutually beneficial.

Values:

Integrity

Respect



Bokamoso stands on the basis of fairness. This include respect within our multicultural team and equal opportunities in terms of gender, nationality and race.

We have a wide variety of projects to tend to, from complicated reports to landscape installation. This wide range of projects enables us to combine a variety of professionals and skilled employees in our team.

Bokamoso further aids in the development of proficiency within the working environment. Each project, whether in need of skilled or unskilled tasks has its own variety of facets to bring to the table.

We are currently in the process of receiving our BEE scorecard. We support transformation in all areas of our company dynamics.



03 Human Resources

031 Employment Equity

Lizelle Gregory (100% interest)

Lizelle Gregory obtained a degree in Landscape Architecture from the University of Pretoria in 1992 and passed her board exam in 1995.

Her professional practice number is PrLArch 97078.

Ms. Gregory has been a member of both the Institute for Landscape Architecture in South Africa (ILASA) and South African Council for the Landscape Architecture Profession (SACLAP), since 1995.

Although the existing Environmental Legislation doesn't yet stipulate the academic requirements of an Environmental Assessment Practitioner (EAP), it is recommended that the Environmental Consultant be registered at the International Association of Impact Assessments (IAIA). Ms. Gregory has been registered as a member of IAIA in 2007.

Ms. Gregory attended and passed an International Environmental Auditing course in 2008. She is a registered member of the International Environmental Management and Assessment Council (IEMA).

She has lectured at the Tshwane University of Technology (TUT) and the University of Pretoria (UP). The lecturing included fields of Landscape Architecture and Environmental Management.

Ms. Gregory has more than 25 years experience in the compilation of Environmental Evaluation Reports:

Environmental Management Plans (EMP);

Strategic Environmental Assessments;

All stages of Environmental input ;

EIA under ECA and the new and amended NEMA regulations and various other Environmental reports and documents.

Ms. Gregory has compiled and submitted more than 600 Impact Assessments within the last 5-6 years. Furthermore, Ms. L. Gregory is also familiar with all the GDARD/Provincial Environmental policies and guidelines. She assisted and supplied GAUTRANS/former PWV Consortium with Environmental input and reports regarding road network plans, road determinations, preliminary and detailed designs for the past 12 years.



03 Human Resources

032 Members

Consulting

Anè Agenbacht

Introduction to Sustainable Environmental Management—An overview of Principles, Tools, & Issues (Potch 2006)
Leadership Training School (Lewende Woord 2010)
BA Environmental Management (UNISA 2011)
PGCE Education (Unisa 2013) - CUM LAUDE
Project Manager
More than 10 years experience in the compilation of various environmental reports

Mary-Lee Van Zyl

MSc Plant Science (UP)
BSc (Hons) Plant Science (UP)
BSc Ecology (UP)
More than 5 years working experience in the Environmental field
Specialises in ECO works, Basic Assessments, EIA's, and Flora Reports
Compilation of various Environmental Reports

Dashentha Moodley

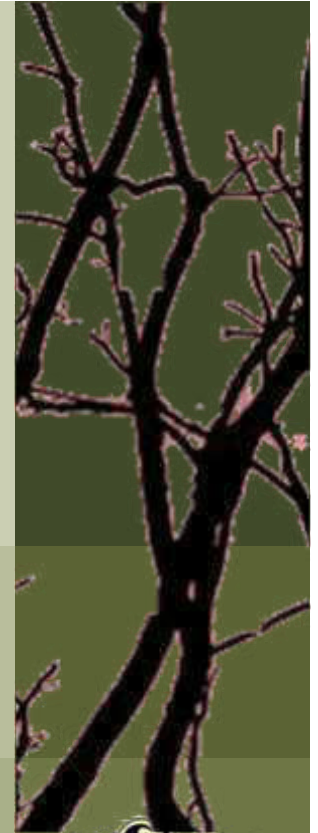
BA (Hons) Degree in Environmental Management (UNISA) - CUM LAUDE
Bachelor of Social Science in Geography & Environmental Management (UKZN)
More than 6 years experience in WUL Applications & Integrated Environmental Management within water resource management.
Senior Environmental Practitioner & Water Use Licence Consultant
Specialises in Water Use License & Compilation of various Env. Reports

Adèle Drake

BA Geography & History (UP)
NQF Level 7 Air Quality Management (UJ)
More than 15 years experience in the field of Environmental Management within Mining Industry (surface and underground), Forestry Industry, Renewable Energy Industry (WEF), and Environmental Consulting. Also ISO 14000, ISO 9000, and Safety Management Auditor.

Ronell Kuppen

BSc (Hons) in Geography (UNISA)
BA Environmental and Development (UKZN)
More than 5 years experience in Environmental Consulting
Specializing in WUL Applications, Waste License Applications, EIAs, Basic Assessments, Public Participations, Borrow Pits



03 Human Resources

033 Personnel

Ben Bhukwana

BSc Landscape Architecture (UP)

More than 8 years experience in the field of Landscape Architecture (Design, Construction, Implementation, and Management).
Specialises in landscape design, ECO, rehabilitation plans and compilation various environmental reports and compilation of tender documents

Juanita de Beer

Diploma Events Management and Marketing (Damelin)

Specializes in Public relations and Public Participation Processes (4 years experience)
Specialises in compiling various environmental reports

Alfred Thomas

CIW Foundation & Internet Marketing (IT Academy)

12 years experience in GIS and IT in general.
GIS Operator and Multimedia Specialist.

Lizette Delpont

MSc. In Aquatic Health (UJ)

BSc. Hons. Environmental Management

Environmental Assessment Practitioner and Wetland Specialist
Registered with the South African Wetland Society (SAWS)

A.E. van Wyk

BSc Environmental Sciences (Zoology and Geography)

Environmental Control Officer
Junior avifauna specialist



03 Human Resources

034 Personnel

Elsa Viviers

Interior Decorating (Centurion College)

(Accounting/ Receptionist) and Secretary to Lizelle Gregory

Loura du Toit

N. Dip. Professional Teacher (Heidelberg Teachers Training College)

Librarian and PA to the Project Manager

Merriam Mogalaki

Administration Assistant with in-house training in bookkeeping

Landscape Contracting

Elias Maloka

Assisting with Public Participations and Office Admin

Site manager overseeing landscape installations.

Irrigation design and implementation.

Landscape maintenance

More than 18 years experience in landscape construction works.

The contracting section comprises of six permanently employed black male workers. In many cases the team consists of up to 12 workers, depending on the quantity of work.



03 Human Resources

035 Personnel

In-house Specialists

Corné Niemandt

MSc Plant Science (UP 2015) – Cum Laude

BSc (Hons) Zoology (UP 2012)

BSc Ecology (UP 2011)

Specialises in ecological surveys and report writing

Compilation of fauna and flora specialist reports

GIS: Generating maps



03 Human Resources

036 Personnel