

1.1 Land Capability

1.1.1 Data Collection

A literature review was conducted in order to obtain any relevant information concerning the area, including information from the Environmental Potential Atlas (ENPAT), Weather Bureau and Department of Agriculture. Results from the soil study were taken into account when determining the land capability of the site.

The land capability assessment methodology as outlined by the National Department of Agriculture was used to assess the soil's capability on site.

1.1.2 Regional Description

The regional land capability is mostly class II soils with few limitations. This is evident in the large number of cultivated lands found in the region. In the areas where the soil is too shallow or too wet to cultivate, livestock are grazed.

1.1.3 Site Description

The soils identified on site were classified according to the methodology proposed by the Agricultural Research Council – Institute for Soil, Climate and Water (2002). Factors evaluated are tabled below.

The site is made up of two main land capability classes, namely class II – cultivation and class V and VII – grazing. The class II soils are suitable for cultivation and can be used for a wide range of agricultural applications. The class VII soils have continuing limitations that cannot be corrected; in this case rock complexes, flood hazard, stoniness, and a shallow rooting zone constitute these limitations. Figure 1 illustrates the various land capability units on site.

Table 1: Land Capability of the soils on site for agricultural use

Management unit	Agricultural	Transitional	Disturbed	Clay
Area (ha)	20 810	114 212	1 220	30 555
% of site	12.5	68.5	0.7	18.3
Rock Complex		Yes – hard plinthic	Possible	
Flooding Risk	F1 – None	F2 – Rare	F2 – Rare	F4 - Common
Erosion Risk	E2 – Low to Moderate	E5 – Moderate to High	E5 – Moderate to High	E1 - Low
Slope %	2 – 10 %	2 – 10 %	2 – 20 %	0 – 5 %
Texture	T1 – 15 – 45% Clay	T1 – 15 – 45% Clay	T1 – 15 – 45% Clay	T3 - >55% Clay
Depth	D1 - > 70 cm	D2 – 60 – 80 cm	D2 – 60 – 80 cm	D3 – 40 – 60 cm
Drainage	W2-3 Well – Imperfectly drained	W4 – Somewhat poorly drained	W4 – Somewhat poorly drained	W5 – Poorly drained
Mechanical Limitations	MB0 - None	MB3 – Shallow soils on rock	MB3 – Shallow soils on rock	MB0 - None
pH	pH > 5	pH > 5	pH > 5	pH > 5
Soil Capability	II -	VII	VII	V
Climate Class	C2	C2	C2	C2
Land Capability	II – Arable Land	VII – Light Grazing	VII – Light Grazing	V - Grazing

No limitation	Low to Moderate	Moderate	High	Very Limiting
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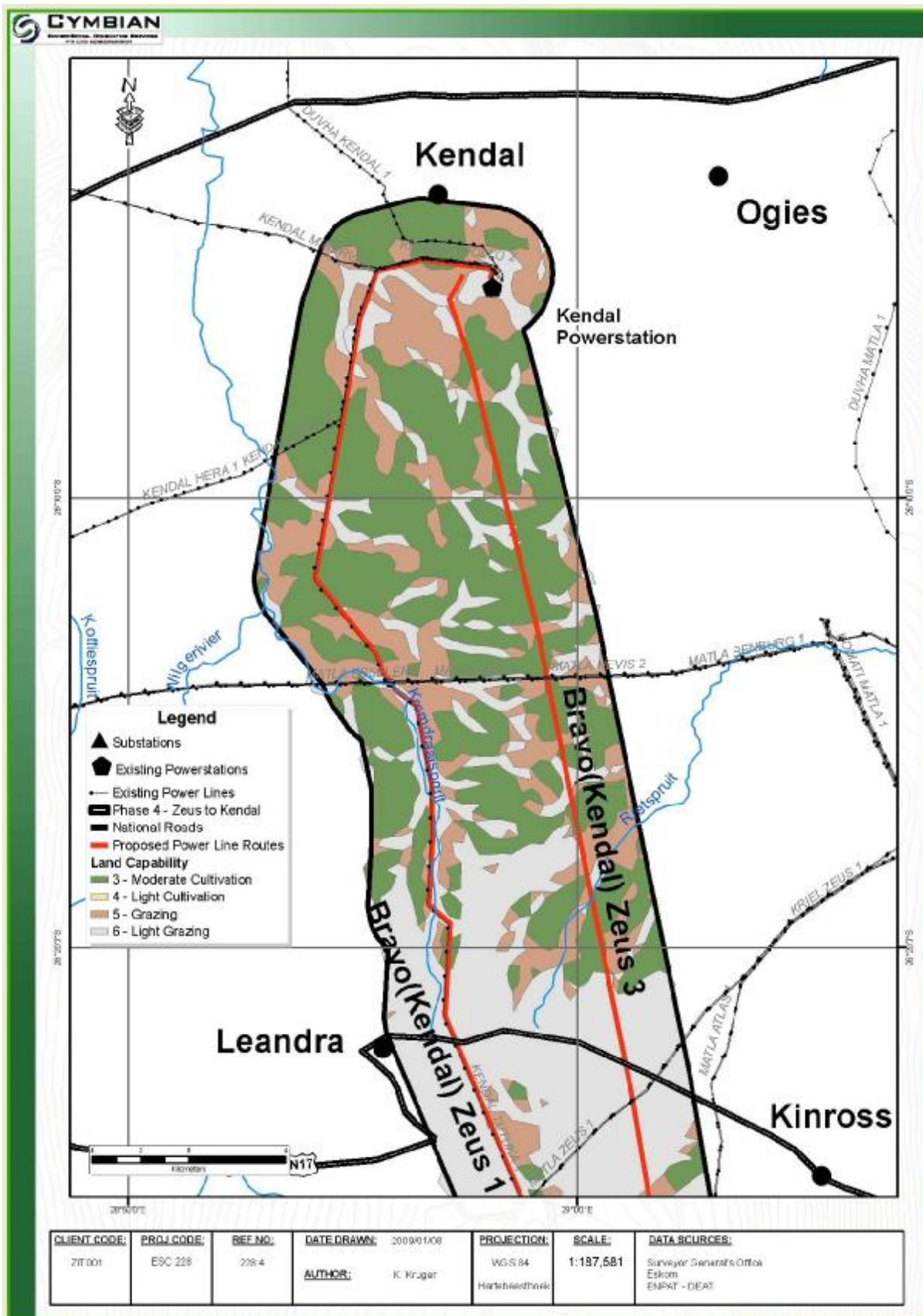


Figure 1: Land Capability Map of the northern section

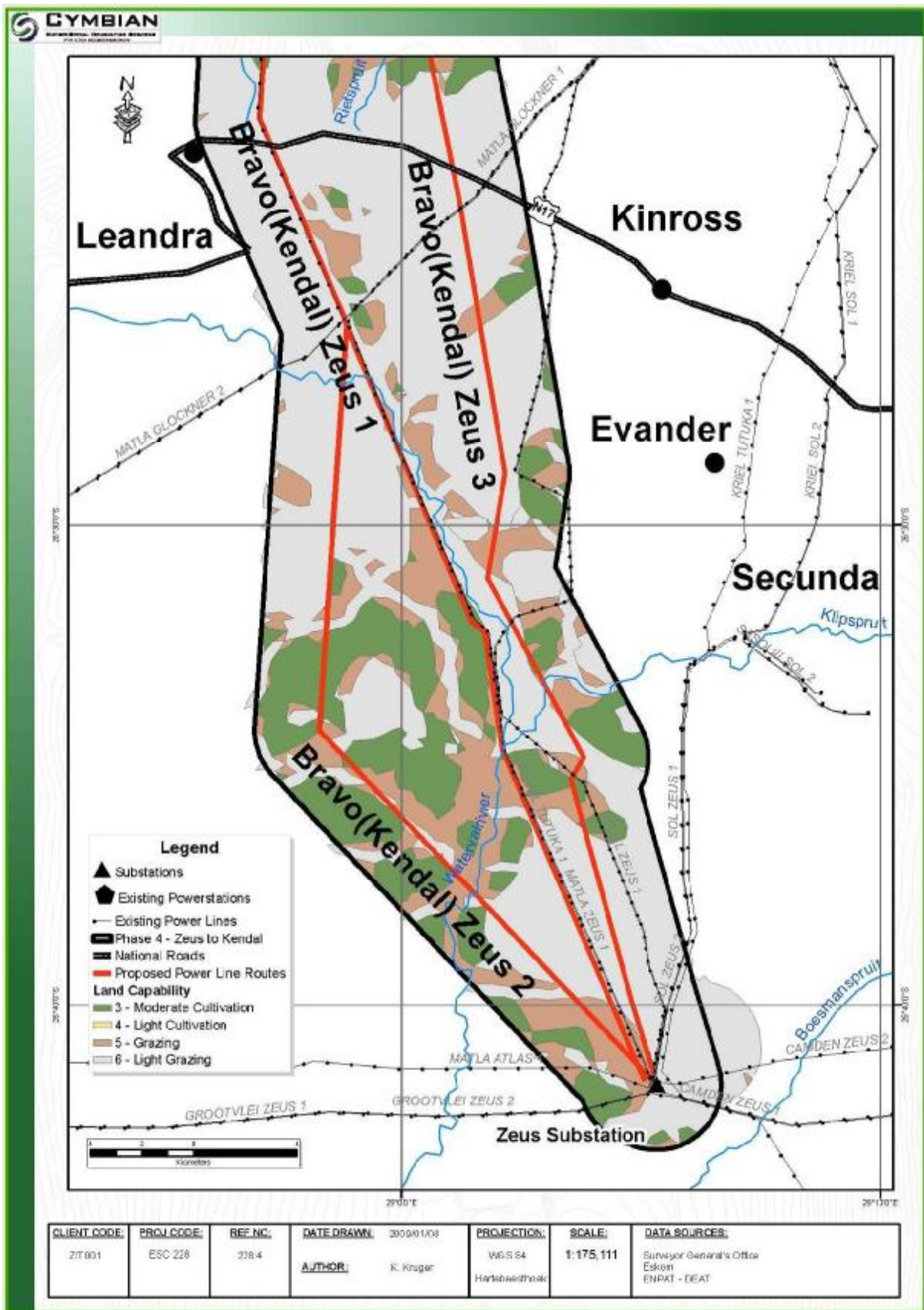


Figure 2: Land Capability Map of the southern section

1.2 Land Use

1.2.1 Data Collection

The Land Use data was obtained from the CSIR Land Cover database and supplemented with visual observations on site.

1.2.2 Site Description

The Land-Use is dominated by cultivated fields (maize), grazed grasslands, urban centres, coal mines and power stations. From the pictures (Figure 3) and map below (Figure 4 and Figure 5) it can be seen that the proposed routes traverses the entire spectrum of land uses found. Water bodies are the only land use regarded as sensitive and as such certain mitigatory measures will be outlined in Section 8.

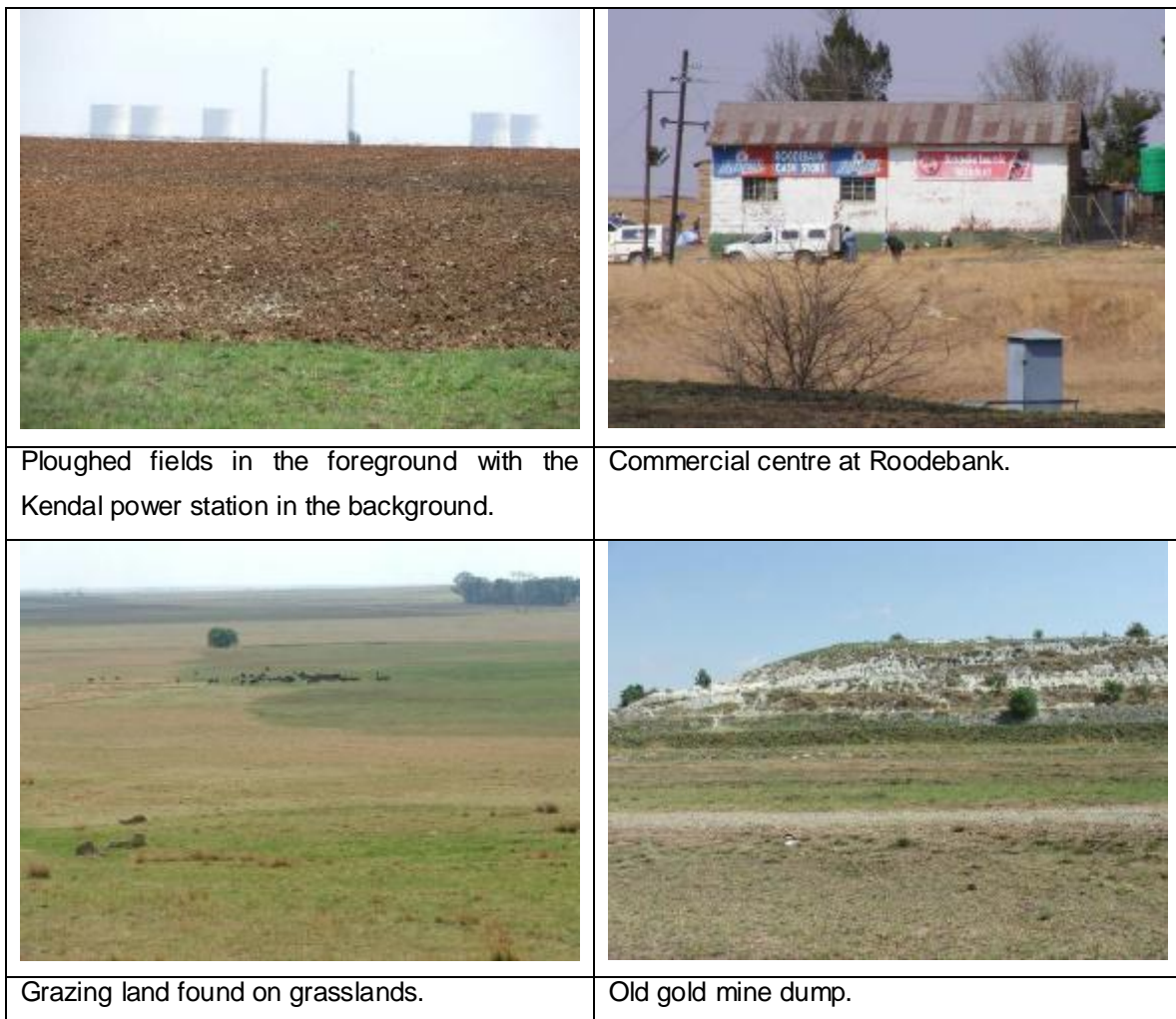


Figure 3: Land Uses encountered in the study site

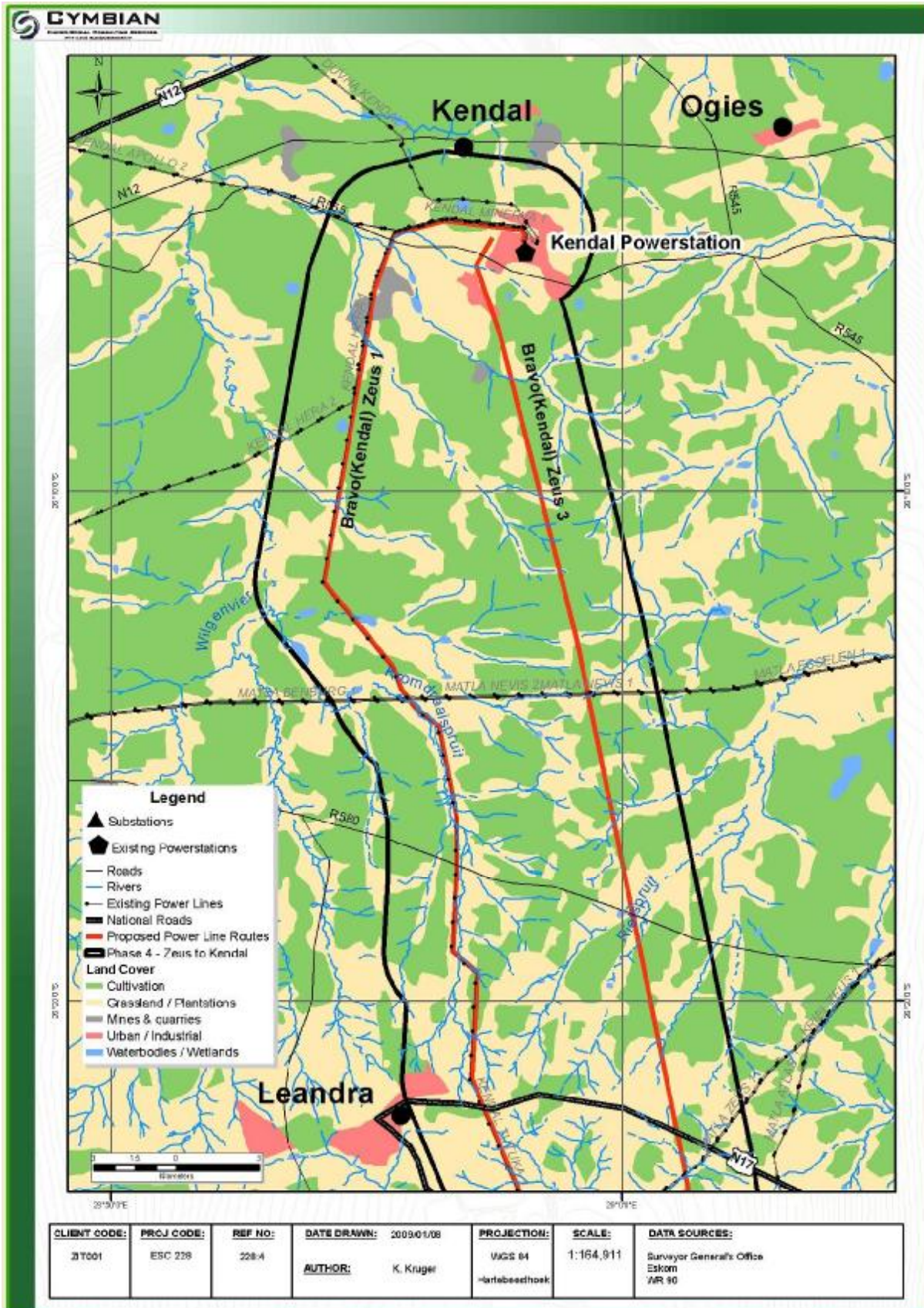


Figure 4: Land Use Map of the northern section of the site

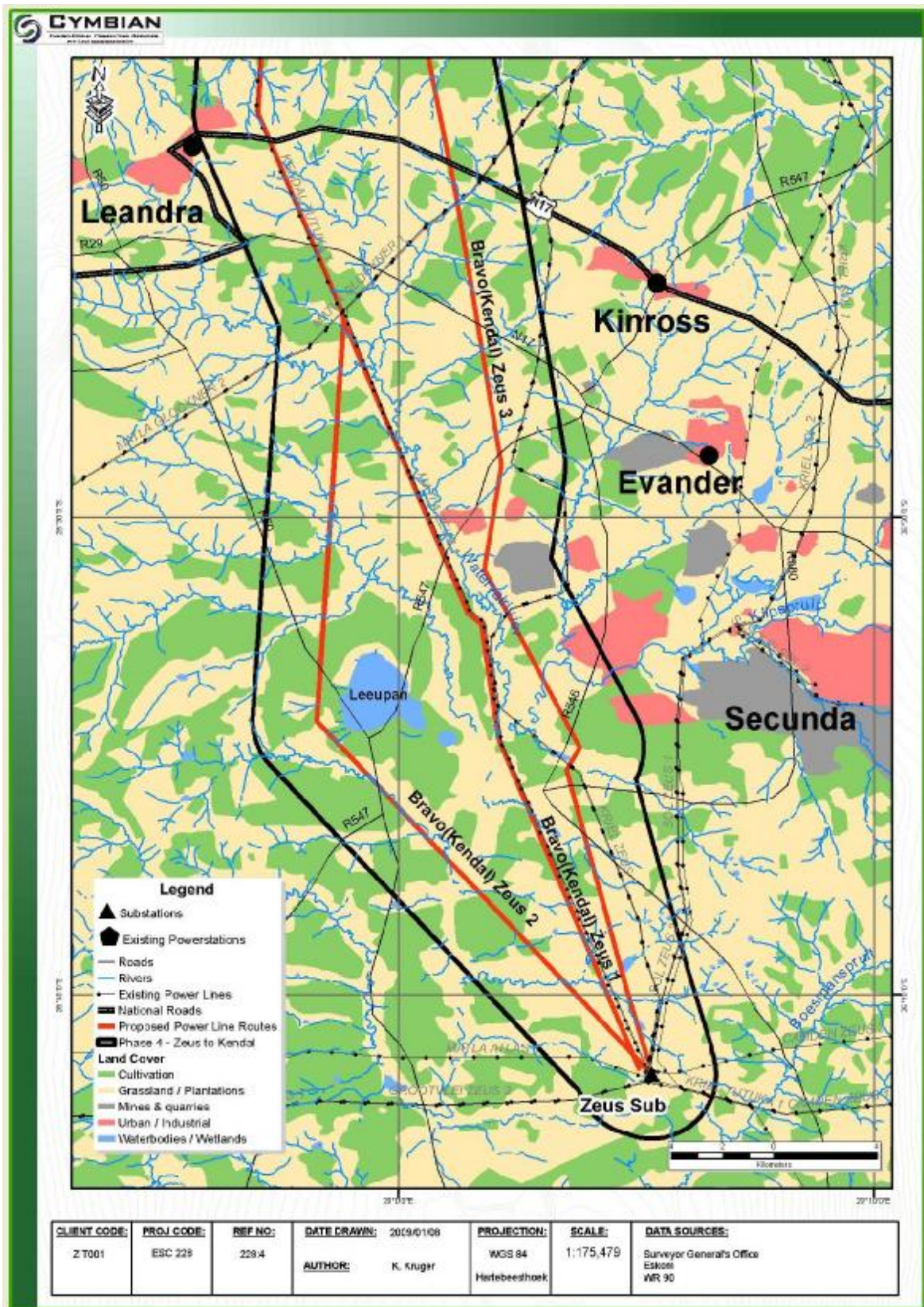


Figure 5: Land Use Map of the southern section of the site

From Figure 4 and Figure 5 above it can be seen that Alternatives 1 and 2 avoid agricultural land by following the drainage lines found in the area. Alternative 3 crosses over agricultural land but in so doing, avoids extensive periods of traversing in drainage lines. As wetlands, rivers and streams are seen as sensitive, it is suggested that the Alternative 3 alignment be utilised from a land use perspective.

1.3 Flora

1.3.1 Data Collection

The floral study involved extensive fieldwork, a literature review and a desktop study utilizing GIS. The site was investigated during two site visits conducted on the 8th – 12th September 2008 and the 3rd – 7th November 2008. The area within the servitude was sampled using transects placed at 300m intervals. At random points along the transect, an area of 20m x 20m was surveyed. All species within the 20m x 20m quadrant were identified, photographed and their occurrence noted. Sensitive features such as ridges or wetlands were sampled by walking randomly through the area concerned and identifying all species within the area.

The floral data below is taken from The Vegetation of South Africa, Lesotho and Swaziland (Mucina and Rutherford 2006). Also, while on site, the following field guides were used:

- Ü Guide to Grasses of Southern Africa (Frits van Oudtshoorn, 1999);
- Ü Field Guide to Trees of Southern Africa (Braam van Wyk and Piet van Wyk, 1997);
- Ü Field Guide to the Wild Flowers of the Highveld (Braam van Wyk and Sasa Malan, 1998);
- Ü Problem Plants of South Africa (Clive Bromilow, 2001);
- Ü Medicinal Plants of South Africa (Ben-Erik van Wyk, Bosch van Oudtshoorn and Nigel Gericke, 2002)

The occurrence of the species was described as either:

- Ü Very common (>50 % coverage);
- Ü Common (10 – 50 % coverage);
- Ü Sparse (5 – 10 % coverage); and
- Ü Individuals (< 5 % coverage).

1.3.2 Regional Description

According to the South African National Biodiversity Institute, the study area falls within the Grassland Biome, where most of the county's maize production occurs. The main vegetation types found in the region are the Soweto Highveld Grassland, Rand Highveld Grassland, Eastern Highveld Grassland and Eastern Temperate Freshwater Wetlands vegetation units as classified by Mucina and Rutherford¹. Each of these vegetation units are described in more detail below.

Soweto Highveld Grassland

The Soweto Highveld Grassland is found in the Mpumalanga and Gauteng Provinces in a broad band roughly delineated by the N17 Highway in the north, Perdekop in the southeast and the Vaal River in the south. The landscape is typical of the gently undulating Highveld plateau which supports dense tufted grassland dominated by *Themeda triandra*, *Elionurus muticus*, *Eragrostis racemosa*, *Heteropogon contortus* and *Tristachya leucothrix*. This grassland is only interrupted by wetlands, occasional ridges and agricultural activities.

This vegetation type is endangered as almost no conservation of the vegetation type occurs. An estimated 45% of the vegetation type has already been transformed by cultivation, urban sprawl and mining.

Rand Highveld Grassland

Rand Highveld Grassland is found in the highly variable landscape with extensive sloping plains and ridges in the Gauteng, North-West, Free State and Mpumalanga Provinces. The vegetation type is found in areas between rocky ridges from Pretoria to Witbank, extending onto ridges in the Stoffberg and Roossenekal regions as well as in the vicinity of Derby and Potchefstroom, extending southwards and north-eastwards from there. The vegetation is species rich, sour grassland alternating with low shrubland on rocky outcrops. The most common grasses on the plains belong to the genera *Themeda*, *Eragrostis*, *Heteropogon* and *Elionurus*. High numbers of herbs, especially *Asteraceae* are also found. In rocky areas shrubs and trees also prevail and are mostly *Protea caffra*, *Acacia caffra*, *Celtis africana* and *Rhus spp.*

¹ *The Vegetation of South Africa, Lesotho and Swaziland*, Mucina and Rutherford 2006.

This vegetation type is poorly conserved (approx 1 %) and has a target of 24 % of the vegetation type to be conserved. Due to the low conservation status this vegetation type is classified as endangered. Almost half of the vegetation type has been transformed by cultivation, plantations, urbanisation or dam-building. Scattered aliens (most prominently *Acacia mearnsii*) are present in the unit.

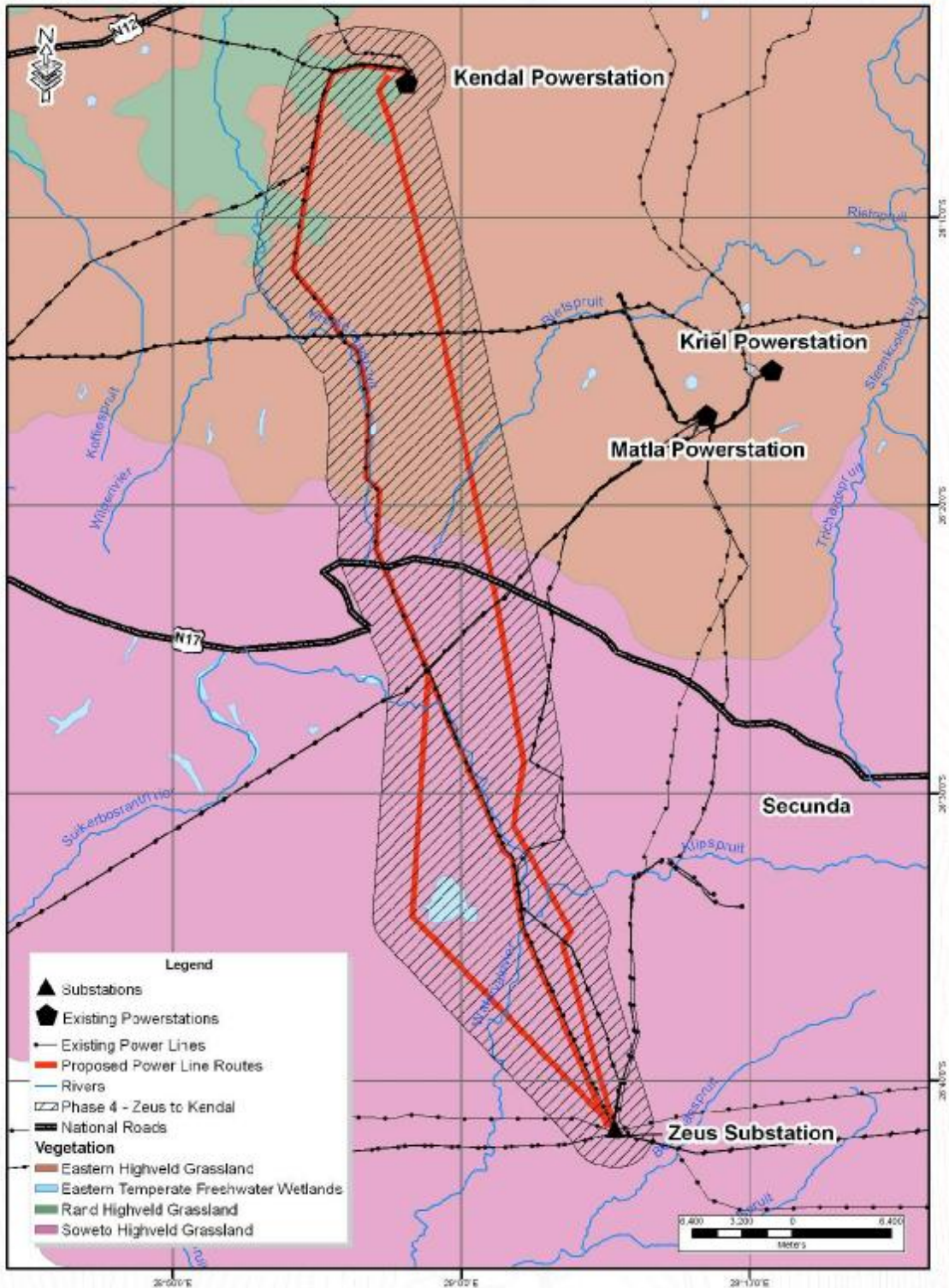
Eastern Highveld Grassland

The Eastern Highveld Grassland is found in the Mpumalanga and Gauteng Provinces on the plains between Belfast in the east and the eastern side of Johannesburg in the west and extending southwards to Bethal, Ermelo and west of Piet Retief. The landscape is dominated by undulating plains and low hills with short dense grassland dominating belong to the genera *Themeda*, *Aristida*, *Digitaria*, *Eragrostis*, *Tristachya* etc. Once again woody species are prevalent on the rocky outcrops.

In terms of conservation and disturbance, 44 % of the vegetation type is already transformed by cultivation, plantations, mines, and urbanisation. No serious alien invasion, but *Acacia mearnsii* can dominate in certain areas

Eastern Temperate Freshwater Wetlands

Another vegetation type associated with the region is the Eastern Temperate Freshwater Wetlands, found around water bodies and embedded within the Grassland biome. Eastern Temperate Freshwater Wetlands are typically found in flat landscapes or shallow depressions filled with (temporary) water bodies supporting zoned systems of aquatic and hydrophilous (water loving) vegetation of temporarily flooded grasslands and ephemeral herblands. Important species include *Cyperus congestus*, *Phragmites australis*, *Marsilea farinose*, *Rorippa fluviatilis*, *Disa zuluensis*, *Crassula tuberella* and the carnivorous herb *Utricularia inflexa*. These wetlands are one of the most sensitive vegetation units found in the region and have been extensively modified by mining and industrial activities in the region.



CLIENT CODE: ZITOC1	PROJ CODE: ESC 228	REF NO.: 01	DATE DRAWN: 2008/06/28 AUTHOR: G. Louwrens	PROJECTION: WGS 84 Hartebeesthoek	SCALE: 1:324,558	DATA SOURCES: Surveyor General's Office Eskom Mpumalanga Provincial C Plan Data
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Figure 6: Main Vegetation types of the region

1.3.3 Site Description

Four main vegetation types were identified, namely anthropogenic grassland, moist grassland, riparian vegetation and grazed grassland. Each of these vegetation types are described in more detail below and illustrated in Figure 11 below. The species list for the site is attached in **Error! Reference source not found.** The species that could occur in the quarter degree grids was obtained from the Plants of Southern Africa (POSA) online database upheld by the South African National Botanical Institute (SANBI) and supplemented with field notes. The list provides species names, common names, as well as notes on which species were observed on site. In total 198 species have been documented in the area with 103 confirmed species under the proposed routes.

***Hyparrhenia hirta* Anthropogenic Grassland (Grazed and Cultivated Fields)**

This tall grassland occurs over vast areas throughout Gauteng and the surrounding highveld. Disturbed grassland or other disturbed areas such as road reserves or fallow fields, not cultivated for some years, are also usually *Hyparrhenia* dominated (Coetzee et al. 1995; Bredenkamp & Brown 2003).

This *Hyparrhenia* – dominated grassland may appear to be quite natural, but they are mostly associated with an anthropogenic influence from recent or even iron-age times. This grassland is characterised by the tall growing dominant Thatch grass (*Hyparrhenia hirta*), and Bankrupt Bush (*Stoebe vulgaris*), an invader dwarf shrub which usually indicates grassland's degraded condition (Bredenkamp & Brown 2003).

This grassland mostly has low species richness, with only a few other species able to establish or survive in the shade of the dense sward of tall grass. Most of these species are relict pioneers or early seral species. The most prominent species include the grasses *Cynodon dactylon*, *Eragrostis plana*, *E. racemosa*, *E. curvula* and *Aristida congesta*. Forbs are rarely encountered, though a few individuals of species such as *Anthospermum rigidum*, *Conyza podocephala*, *Crabbea angustifolia* and *Helichrysum rugulosum* are often present (Bredenkamp & Brown 2003).

Figure 7 below provides an illustration of the *Hyparrhenia* grassland unit found among the ploughed fields in this case. In Figure 11 and Figure 12 this vegetation unit is illustrated by the cultivated fields.



Figure 7: *Hyparrhenia* grassland

Invaded grassland

The invaded grassland unit has arisen from the inherent susceptibility of the natural grassland of the region to be invaded by alien plants. In several places along the route the natural grassland has been invaded to such an extent that the vegetation is dominated by the alien invasive species. The most common aliens are *Acacia mearnsii* (*Black Wattle*), *Populus x canescens* (*Poplar*), *Tagetes minuta* (*Khaki bush*), *Bidens pilosa* (*Blackjack*), *Eucalyptus* (*Blue Gum*) and *Salix babylonica* (*Wattle*). This vegetation type is found in small pockets throughout the study site.



Figure 8: Invaded Grassland

Moist Grassland

The *Eragrostis plana* Grassland is well represented occurring mainly in high rainfall parts. This grassland type is a moist grassland, usually restricted to flat plains or bottomlands, mostly on moist, deep, clayey and poorly drained, seasonally wet soils, adjacent to wetlands, seasonal as well as perennial rivers. These habitats are often fairly unstable due to seasonal flooding and drying, which, together with frequent overgrazing, cause degradation of the vegetation (Bezuidenhout & Bredenkamp 1990).



Figure 9: Eragrostis Plana Moist Grassland

Eragrostis plana is conspicuous, often dominant member of this grassland type (Figure 9). *Paspalum dilatatum*, and the rhizomatous *Cynodon dactylon*, often presents in degraded sites, are also diagnostic, as well as the forbs *Crabbea acaulis*, *Berkheya radula*, *B. pinnatifida* and *Trifolium africanum*. Grass species such as *Eragrostis curvula*, *Themeda triandra*, *Setaria sphacelata* and *Digitaria eriantha* are often abundantly present, and may be locally dominant, while forbs are generally quite rare (Coetzee et al. 1995; Bredenkamp & Brown 2003).

Drainage areas and wetland communities

Drainage areas are seasonally wet areas that occur in low-lying drainage lines after rains. These areas are usually covered by hygrophytes such as sedges and reeds. The dominant sedge in the study area is *Juncus rigidus*. Sometimes bulrush (*Typha capensis*) and reeds (*Phragmites australis*) also occurs.

Wetlands are of a more permanent nature and occur in low-lying areas such as tributaries of streams and rivers. Here hydrophytes can be found. Typical plants are the Orange River Lily (*Crinum bulbispermum*), bulrush (*Typha capensis*) and reeds (*Phragmites australis*), sedges of the *Cyperus*, *Fuirena* and *Scirpus* genera also occur (Figure 10).



Figure 10: Seepage Area

Grazed Grasslands

In addition to the above vegetation types found on site, a few remaining patches of Soweto Highveld Grassland, Rand Highveld Grassland and Eastern Highveld Grassland are also found in between the cultivated fields and the streams. These grasslands are often used for grazing but the species composition remains as described in Section 3.8.2 above.

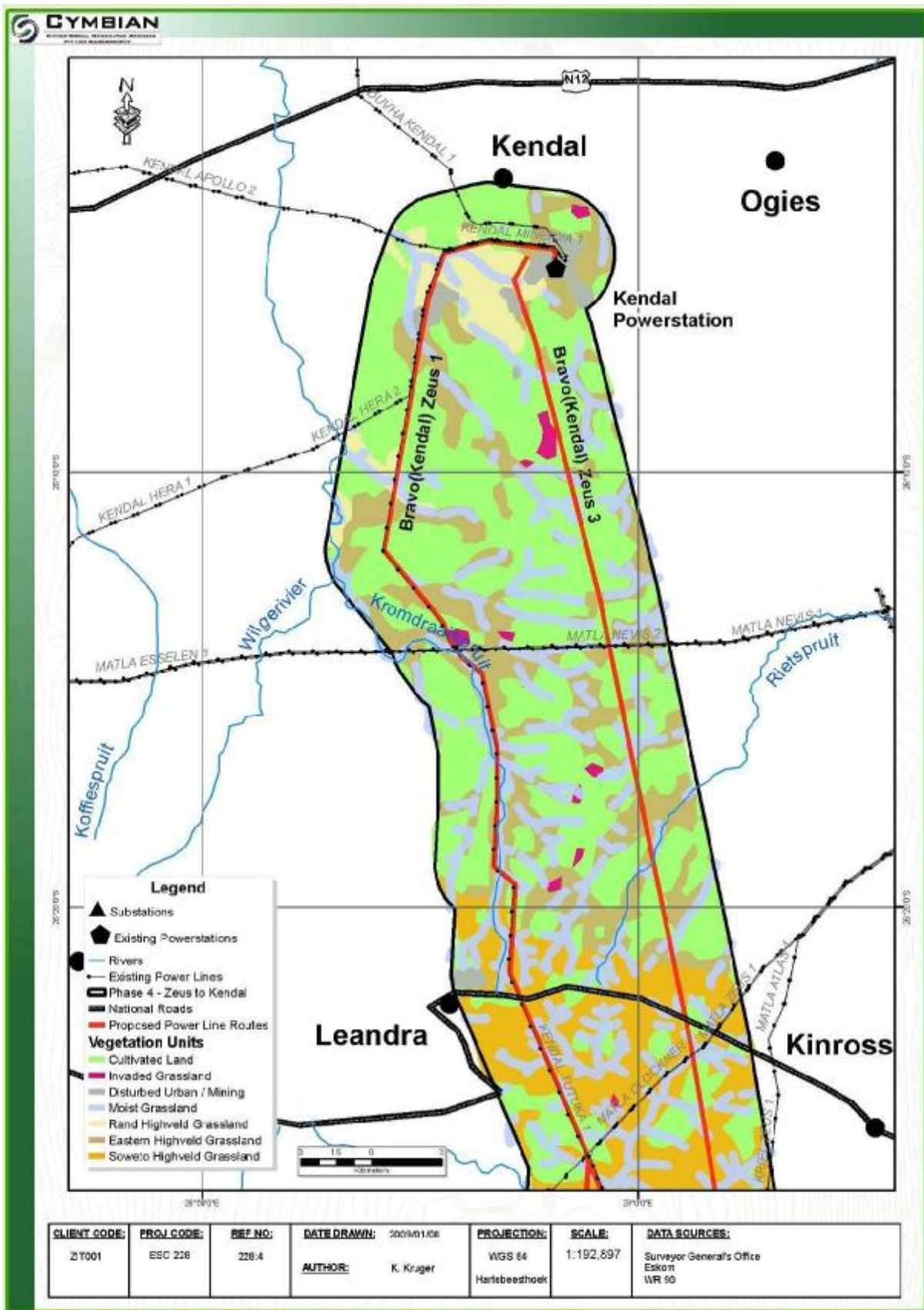


Figure 11: Vegetation units of the northern section of the site.

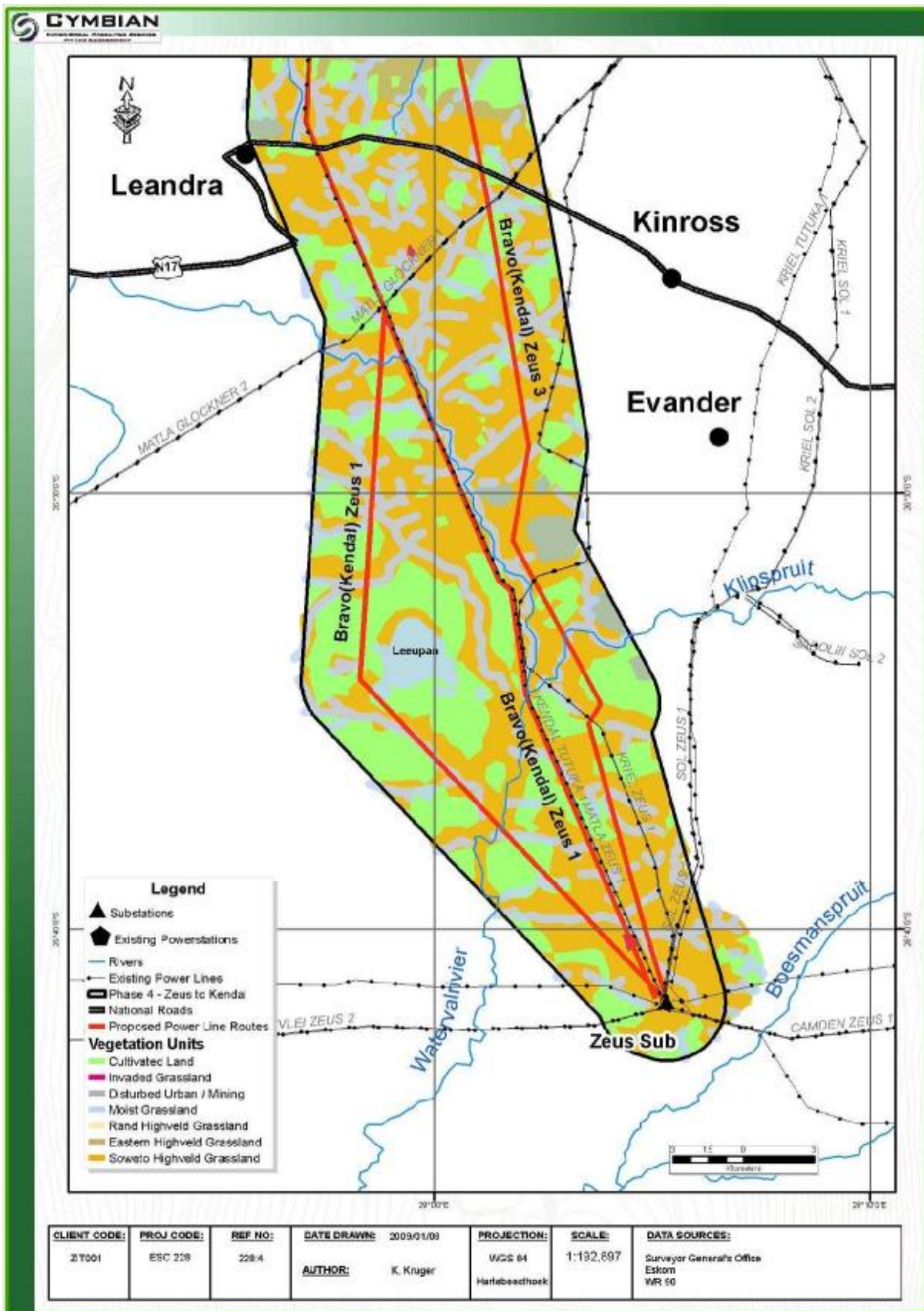


Figure 12: Vegetation units of the southern section of the site.

1.3.4 Sensitive Flora

During the site assessment, special efforts were made to identify sensitive or endangered vegetation along the routes. No red data species were found along the routes but that does not exclude the potential for such species to occur. The nature of the vegetation in the area is such that the bulk of the sensitive species are associated with wetlands and streams. Therefore it is suggested that all stream and wetlands be buffered by 100m. This figure is the standard buffer zone required by the Department of Water Affairs and Forestry (DWAF) for areas outside of the urban edge.

1.4 **Fauna**

1.4.1 Data Collection

A literature review of the faunal species that could occur in the area was conducted. C-Plan data provided from the Mpumalanga provincial department was used to conduct a desktop study of the area. This data consists of terrestrial and aquatic components, ratings provide an indication as to the importance of the area with respect to biodiversity. Additionally, all fauna were noted during the site visits conducted on the 8th – 12th September 2008 and the 3rd – 7th November 2008. In addition and specialist avifauna report was compiled by Mr. Chris van Rooyen².

1.4.2 Regional Description

As a consequence of mining and farming in the area, it appears that only small animals are to be found at the site. Small mammals known to occur in the area include hedgehog, rabbits, mongoose, meerkat and the ubiquitous rats and mice. Given the habitat, it is likely that korhaans, larks, longclaws, species of Euplectes (bishops and widows), weavers, starlings and sparrows occur in the grassland.

The study area does include areas of terrestrial and aquatic habitats. These areas should be treated as sensitive and should therefore be managed accordingly; if feasible they should be avoided.

² Bird Impact Assessment Study, Bravo Integration Project: Phase 4, December 2008.

1.4.3 Site Description

The scope of work indicated that an avifauna assessment was required. This section details the avifauna assessment as well as the herpetofauna and mammals observed on site.

Habitat

The habitat on site is described in the vegetation site description in Section 3.8.3 above. All of the vegetation types identified have been disturbed to a certain extent, as the main land use in the area is dryland cultivation of grazing of livestock. The largest portion of the site is comprised of disturbed grassland, totalling approximately 61.7 % of the study site. The remainder of the site comprises rocky and moist grassland as well as seepage zones and wetlands. All of these are suitable habitat to a number of protected species found in the region.

Species observed on site

A detailed list of the species observed on site is attached in **Error! Reference source not found..**

Herpetofauna

Herpetofauna could potentially occur in all four habitat types. The seepage zones and wetlands could potentially support amphibians representative of the region. The quarter degree squares are known to contain *Agama atra* (Southern Rock Agama), *Bitens arietans* (Puff Adder), *Hemachatus haemachatus* (Rinkhals), *Causus rhombeatus* (Common Night Adder), *Lycodonomorphus rufulus* (Common Brown Water Snake), *Aparallactus capensis* (Cape Centipede Eater), *Cordylus vittifer* (Transvaal Girdled Lizard), *C. vandami* (Van Dam's Girdled Lizard), *Varanus niloticus* (Water Monitor), *Pachydactylus capensis* (Cape Thick-toed Gecko), *Leptotyphlops conjunctus conjunctus* (Cape Thread Snake) and *Mabuya capensis* (Cape Skink). *Hemachatus haemachatus* (Rinkhals) and *Leptotyphlops conjunctus conjunctus* (Cape Thread Snake) are endemic to Southern Africa. During the site visit the only one of the species above that was observed was a *Hemachatus haemachatus* (Rinkhals).

Avifauna

Avifauna on site was identified during the site visits. Table 2 below provides a list of the species observed as well as their occurrence. In addition to the site observations, a detailed specialist study was undertaken and is attached in **Error! Reference source not found..**

Table 2: Avifauna Species List

Species	Common name	Occurrence
<i>Phalacrocorax africanus</i>	Reed Cormorant	Pair
<i>Ardea cinerea</i>	Grey Heron	Individual
<i>Ardea melanocephala</i>	Blackheaded Heron	Individual
<i>Bubulcus ibis</i>	Cattle Egret	Individual
<i>Bostrychia hagedash</i>	Hadedda Ibis	Pair
<i>Plegadis falcinellus</i>	Glossy Ibis	Individual
<i>Alopochen aegyptiacus</i>	Egyptian Goose	Pair
<i>Elanus caeruleus</i>	Blackshouldered Kite	Common
<i>Francolinus swainsonii</i>	Swainson's Francolin	Individual
<i>Numida meleagris</i>	Helmeted Guineafowl	Common
<i>Fulica cristata</i>	Redknobbed Coot	Individual
<i>Gallinula chloropus</i>	Moorhen	Individual
<i>Anthropoides paradisea</i>	Blue Crane	Pair
<i>Sagittarius serpentarius</i>	Secretary Bird	Pair
<i>Eupodotis cafra</i>	Whitebellied Korhaan	Individual
<i>Vanellus armatus</i>	Blacksmith Plover	Pair
<i>Vanellus coronatus</i>	Crowned Plover	Common
<i>Streptopelia semitorquata</i>	Redeyed Dove	Pair
<i>Streptopelia senegalensis</i>	Laughing Dove	Common
<i>Asio capensis</i>	Marsh Owl	Carcass
<i>Colius striatus</i>	Speckled Mousebird	Pair
<i>Mirafra africana</i>	Rufousnaped Lark	Common
<i>Corvus albus</i>	Pied Crow	Individual
<i>Saxicola torquata</i>	Stone Chat	Individual
<i>Phylloscopus trochilus</i>	Willow Warbler	Individual
<i>Cisticola fulvicapilla</i>	Neddicky	Individual
<i>Motacilla clara</i>	Cape Wagtail	Individual
<i>Anthus cinnamomeus</i>	Grassveld Pipit	Individual
<i>Passer domesticus</i>	House Sparrow	Common
<i>Ploceus velatus</i>	Masked Weaver	Common
<i>Euplectes orix</i>	Red Bishop	Pair
<i>Emberiza capensis</i>	Cape Bunting	Individual

In total 32 bird species were identified during the site investigations, including some sensitive species which are discussed in more detail in Section 3.9.4. The species on site include waterfowl, grassland specialists and common generalists. This is attributed to the variety of habitats that occur on site, as well as the adequate supply of fresh water.

Mammals

Several mammal species were observed on site, and it was notable that most of the species were limited to a game farm just north of the Zeus substation. Smaller mammals such as mongoose were found throughout the site. The species identified are listed below.

Table 3: Mammal Species List

Species	Common name	Occurrence
<i>Antidorcas marsupialis</i>	Springbok	Herd
<i>Damaliscus dorcas phillipsi</i>	Blesbok	Herd
<i>Cynictis pencilata</i>	Yellow Mongoose	Individuals
<i>Orycteropus afer</i>	Aardvark / Antbear	Individuals
<i>Connochaetes taurinus</i>	Blue wildebeest	Herd
<i>Hystrix africaeaustralis</i>	Porcupine	Individual
<i>Ceraottherium simum</i>	White Rhinoceros	Individuals



Figure 13: Fauna including springbok (left) and Blue wildebeest (right)

1.4.4 Sensitivities and power line interactions

The impacts to fauna are experienced in a number of ways, but due to the placement of the power lines on pylons the impacts are largely limited to avifauna. The construction and erection of the pylons could impact on habitat for ground dwelling fauna, but due to the large number of existing power lines in the area, this is a low possibility. Therefore the focus will be on the avifauna component.

The Red Data bird species that occur within the study area were recorded by the Bird Atlas project and are listed in Table 4 below. The species that could potentially be impacted on by the power lines are shaded in grey.

Table 4: Red data bird species

Species	Reporting rate %	Conservation status (Barnes 2000)	Habitat requirements (Barnes 2000; Hockey <i>et al</i> 2005; Harrison <i>et al</i> 1997; Young <i>et al</i> 2003; personal observations)
YELLOW-BILLED STORK <i>Mycteria ibis</i>	2628BB:7.4 2628BD:2.7 2628DB:8.7 2629AC:4.1 2629CA:4.0	near threatened	Always associated with water – dams, wetlands, rivers, marshes, even small pools. Could be present at larger water bodies e.g. Leeuwpan. Vulnerable to collisions.
PINK-BACKED PELICAN	2628BB:- 2628BD:- 2628DB:- 2629AC:- 2629CA:1.3	vulnerable	Always associated with large water bodies. Could be present at larger water bodies e.g. Leeuwpan. Vulnerable to collisions.
LANNER FALCON <i>Falco biarmicus</i>	2628BB:- 2628BD:1.8 2628DB:1.1 2629AC:1.4 2629CA:0.7	near threatened	Generally prefers open habitat, but exploits a wide range of habitats. Will nest in wooded areas if suitable cliffs are present. No negative interaction expected, except possible breeding on crow nests on the proposed lines.
WATTLED CRANE <i>Bugenerus carunculatus</i>	2628BB:- 2628BD:- 2628DB:1.1 2629AC:- 2629CA:-	critically endangered	Shallow wetlands with extensive short emergent vegetation. To a lesser degree in natural grassland and croplands. No suitable habitat along the alignment. Vagrant to the area.
BLUE KORHAAN <i>Eupodotis caerulescens</i>	2628BB:1.9 2628BD:10.8 2628DB:14.1 2629AC:- 2629CA:12.7	near threatened	Grasslands, pastures and cultivated fields. Vulnerable to collisions.
GREATER PAINTED SNIPE <i>Rostratula benghalensis</i>	Not recorded by Bird Atlas but recorded by CWAC	near threatened	Various aquatic habitats, preferring exposed mud adjacent to cover. Recorded at Leeuwpan. No interactions expected.
BLACK-WINGED PRATINCOLE <i>Glareola nordmanni</i>	2628BB:3.7 2628BD:3.6 2628DB:1.1 2629AC:2.0 2629CA:3.3	near threatened	Agricultural landscapes, ploughed lands. No interactions expected.
MELODIOUS LARK <i>Mirafra cheniana</i>	2628BB:- 2628BD:- 2628DB:1.1 2629AC:- 2629CA:-	near threatened	Open climax Themeda grassland, pastures and fallow lands. Vulnerable to habitat destruction and disturbance.

Species	Reporting rate %	Conservation status (Barnes 2000)	Habitat requirements (Barnes 2000; Hockey <i>et al</i> 2005; Harrison <i>et al</i> 1997; Young <i>et al</i> 2003; personal observations)
BLACK STORK <i>Ciconia nigra</i>	2628BB:- 2628BD:- 2628DB:- 2629AC:- 2629CA: 1.3	near threatened	Associated with rivers, dams and cliffs. Could be present at larger water bodies e.g. Leeuwpán. Vulnerable to collisions.
SECRETARY BIRD <i>Sagittarius serpentarius</i>	2628BB:5.6 2628BD:6.3 2628DB:10.9 2629AC:6.1 2629CA:7.3	near threatened	Prefer open grassland, densities low in maize growing areas. Was recorded during field visits in the study area. Vulnerable to collisions.
WHITE-BELLIED KORHAAN <i>Eupodotis senegalensis</i>	2628BB:3.7 2628BD:1.8 2628DB:5.4 2629AC:- 2629CA:0.7	vulnerable	Often in the interface between grassland and savanna. Avoids severely grazed and recently burnt sites. Vulnerable to collisions.
LESSER FLAMINGO <i>Phoenicopus minor</i>	2628BB:0.9 2628BD:0.9 2628DB:5.4 2629AC:0.7 2629CA:7.3	near threatened	Moves extensively between water bodies. May be found in small numbers on any suitable dam. Vulnerable to collisions.
GREATER FLAMINGO <i>Phoenicopus ruber</i>	2628BB:2.8 2628BD:2.7 2628DB:21.7 2629AC:5.4 2629CA:17.3	near threatened	Moves extensively between water bodies. May be found in small numbers on any suitable dam. Vulnerable to collisions.
LESSER KESTREL <i>Falco naumanni</i>	2628BB:11.1 2628BD:9.9 2628DB:8.7 2629AC:10.2 2629CA:10.0	vulnerable	No negative impacts expected from power line. Small and nimble species, likely to use the power line as hunting perch.
AFRICAN GRASS-OWL <i>Tyto capensis</i>	2628BB:- 2628BD:1.8 2628DB:1.1 2629AC:- 2629CA:2.0	vulnerable	Likely to be found in rank grass adjacent to wetlands. Could be vulnerable to collisions with power line as potentially suitable habitat could exist in wetlands. Also vulnerable to habitat destruction.
BLUE CRANE <i>Anthropoides paradiseus</i>	2628BB:0.9 2628BD:14.4 2628DB:39.1 2629AC:- 2629CA:3.3	vulnerable	Low reporting rate but can be present in the pockets of remaining grassland and wetlands. Vulnerable to collisions.

Species	Reporting rate %	Conservation status (Barnes 2000)	Habitat requirements (Barnes 2000; Hockey <i>et al</i> 2005; Harrison <i>et al</i> 1997; Young <i>et al</i> 2003; personal observations)
CASPIAN TERN <i>Sterna caspia</i>	2628BB:- 2628BD:- 2628DB:3.3 2629AC:1.4 2629CA:1.3	near threatened	Estuaries and large inland water bodies. No negative interactions expected.
AFRICAN MARSH-HARRIER <i>Circus ranivorus</i>	2628BB:0.9 2628BD:9.9 2628DB:- 2629AC:2.7 2629CA:1.3	vulnerable	Large permanent wetlands with dense reed beds. Sometimes forages in smaller wetlands and adjacent grassland. Could be vulnerable to collisions with power line as potentially suitable habitat could exist in wetlands. Also vulnerable to habitat destruction.
BLACK HARRIER <i>Circus maurus</i>	2628BB:- 2628BD:- 2628DB:- 2629AC:4.1 2629CA:4.0	near threatened	Dry grassland and rarely in agricultural fields. Vulnerable to collisions with power lines.
PALLID HARRIER <i>Circus macrourus</i>	2628BB:- 2628BD:- 2628DB:1.1 2629AC:0.7 2629CA:-	near threatened	Grasslands associated with open pans and floodplains. Vulnerable to collisions with power lines.
BOTHA'S LARK <i>Spizocorys fringillaris</i>	2628BB:- 2628BD:- 2628DB:- 2629AC:2.0 2629CA:0.7	endangered	Prefers short grass, such as heavily grazed grassland in upland areas. No negative interactions expected. Vulnerable to habitat destruction and disturbance.
CHESTNUT-BANDED PLOVER <i>Charadrius pallidus</i>	2628BB:2.8 2628BD:- 2628DB:- 2629AC:- 2629CA:-	near threatened	Found primarily in salt pans. No negative interactions expected.
DENHAM'S BUSTARD <i>Neotis denhami</i>	2628BB:- 2628BD:0.9 2628DB:- 2629AC:- 2629CA:-	vulnerable	In the grassland biome it favours sour grassland in high rainfall areas. Vagrant to the area, no negative interactions expected.
SOUTHERN BALD IBIS <i>Geronticus calvus</i>	2628BB:- 2628BD:1.8 2628DB:- 2629AC:2.0 2629CA:-	vulnerable	Likely to be found on recently burnt ground and unburnt, short-grazed grassland, cultivated pastures, reaped maize fields and ploughed lands. Vulnerable to collision with power lines.

Species	Reporting rate %	Conservation status (Barnes 2000)	Habitat requirements (Barnes 2000; Hockey <i>et al</i> 2005; Harrison <i>et al</i> 1997; Young <i>et al</i> 2003; personal observations)
GREY CROWNED CRANE Balearica regulorum	2628BB:- 2628BD:- 2628DB:1.1 2629AC:- 2629CA:-	vulnerable	Breeds in marshes, pans, and dam margins with tall emergent vegetation. Feeds in adjacent short grasslands and croplands. Vulnerable to collision with power lines.

Power Line Interactions

According to the Avifauna assessment the following interactions are prevalent in South Africa. Because of their size and prominence, electrical infrastructures constitute an important interface between wildlife and man. Negative interactions between wildlife and electricity structures take many forms, but two common problems in southern Africa are electrocution of birds and other animals and birds colliding with power lines. Other problems are electrical faults caused by bird excreta when roosting or breeding on electricity infrastructure, and disturbance and habitat destruction during construction and maintenance activities.

According to the specialist report the most severe potential impact that the proposed line will have is bird collisions with the overhead earth wire. This impact will most likely occur close to wetlands, where the line skirts a dam, where it crosses a drainage line and in areas of natural grassland.

Species at risk are water birds of several species where it skirts larger dams, particularly Leeuwan, where flamingo collisions have been recorded. Collision hazards also exist where the line will cross pockets of natural grassland, as this is the preferred habitat of most of the remaining large terrestrial Red Data species, including the Blue Crane, Blue Korhaan, White-bellied Korhaan and Secretarybird in the Mpumalanga highveld. As mentioned earlier, the impacts on grassland and wetlands that are evident in the study area have been severe, reducing most Red Data, large terrestrial species to vagrants. The dense grid of existing power lines that covers the whole study area is a death trap for cranes, and the impact of these lines on the remaining Blue Cranes in the area can only be guessed at. Large areas of what seems to be suitable grassland remain the study area, yet they are devoid of any cranes. Given the extreme vulnerability of cranes to power lines, there is no question that the power lines must have effectively sterilized large areas for these birds. There are, however, substantial numbers of non Red Data power line sensitive species in the study area that have managed to survive and even thrive in some instances despite the habitat degradation that have occurred. In some instances, man-made developments such as the proliferation of artificial water bodies have benefited certain species. Examples are Red-knobbed Coot, Reed Cormorant *Phalacrocorax africanus*, Egyptian Goose, White-breasted Cormorant *Phalacrocorax lucidus*, Black-headed Heron *Ardea melanocephala*, Grey Heron *Ardea cinerea* and Yellow-billed Duck (Harrison *et.al* 1997). These species (and many other non Red Data ducks, herons and waders) run the risk of collision with the proposed power lines.

During the site investigations several dead birds were found underneath the existing power lines that traverse over the study area. The birds included Blue Crane, Lesser Flamingo, Marsh Owl, Secretary Bird, Sacred Ibis and Feral Pigeon (refer to Figure 14).



Figure 14: Dead birds found underneath the existing power lines on site, Lesser Flamingo (left) Marsh Owl (centre) and Secretary Bird (right).

Preferred Alternative

According to the specialist report, attached in Appendix 3, the most suitable power line alternative is Alternative 3. This is due to the avoidance of drainage areas and wetlands as well as the more developed nature of the route.

1.5 Wetland and Riparian Zone Delineation

1.5.1 Riparian Zones vs. Wetlands

Wetlands

The riparian zone and wetlands were delineated according to the Department of Water Affairs and Forestry (DWAF) guideline, 2003: A practical guideline procedure for the identification and delineation of wetlands and riparian zones. According to the DWAF guidelines a *wetland* is defined by the National Water Act as:

“land which is transitional between terrestrial and aquatic systems where the water table is usually at or near 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 the guidelines indicate that wetlands must have one or more of the following attributes:

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

During the site investigation the following indicators of potential wetlands were identified:

- Ü Terrain unit indicator;
- Ü Soil form Indicator;
- Ü Soil wetness indicator; and
- Ü Vegetation indicator.

Riparian Areas

According to the DWAF guidelines a *riparian area* is defined by the National Water Act as:

“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”

The difference between Riparian Areas and Wetlands

According to the DWAF guidelines the difference between a wetland and a riparian area is:

“Many riparian areas display wetland indicators and should be classified as wetlands. However, other riparian areas are not saturated long enough or often enough to develop wetland characteristics, but also perform a number of important functions, which need to be safeguarded... Riparian areas commonly reflect the high-energy conditions associated with the water flowing in a water channel, whereas wetlands display more diffuse flow and are lower energy environments.”

1.5.2 Delineation

The site was investigated for the occurrence of wetlands and riparian areas, using the methodology described above and described in more detail in the DWAF guidelines.

Terrain Unit Indicator

The terrain on site varies from 1480 mamsl to 1760 mamsl as illustrated in **Error! Reference source not found.**. From **Error! Reference source not found.** it can be seen that the site is located in an area of undulating hills with the dominant terrain units on site being the midslope, footslope and valley bottom units. According to the DWAF guidelines the valley bottom is the terrain unit where wetlands are most likely to occur, but they are not excluded from any of the other terrain units.

Soil Form Indicator

The soils on site follow a strong correlation with the underlying geology. The Sandstone soils are generally sandy, deep soils that are good for agriculture, while the Dolerite soils are dark in colour and have a high clay content. These soils are less suitable for agriculture and are mostly used for grazing.

The soils are located on the rolling landscape described above that slopes to the numerous streams and rivers in the area. Water enters the soils profile and then flows through the profile down-slope. This action of water movement through the slope typifies a small section of the site (eluvial and plinthic soils). Closer to the streams (within the valley bottom terrain unit) the soils gradually deepen due to the down-slope transport of soil (colluvium). In addition these soils have gradually higher percentages of clays that over time have been washed down-slope and accumulate at the valley bottom where the slope angle reduces.

During the site visits the soils on site were identified (Refer to Section 3.5). Of the soils identified on site the Katspruit, Rensburg and Willowbrook soil forms are indicative of the permanent wetland zone, while the Kroonstad, Wasbank, Westleigh, Avalon, Inhoek and Longlands soil forms are indicative of the temporary or seasonal wetland zone.

Soil Wetness Indicator

The soils on site were subjected to a soil wetness assessment. If soils showed signs of wetness within 50 cm of the soil surface, it was classified as a hydromorphic soil and divided into the following groups:

Temporary Zone

- Ü Minimal grey matrix (<10%);
- Ü Few high chroma mottles; and

Ü Short periods of saturation.

Seasonal Zone

Ü Grey matrix (>10%);

Ü Many low chroma mottles present; and

Ü Significant periods of wetness (>3 months / annum).

Permanent Zone

Ü Prominent grey matrix;

Ü Few to no high chroma mottles;

Ü Wetness all year round; and

Ü Sulphuric odour.

The soils mentioned above were classified accordingly and the results are visually represented in **Error! Reference source not found.** and **Error! Reference source not found.**

Vegetation Indicator

The vegetation units on site are described in Section 3.8.3 above and illustrated in Figure 11. The vegetation found in the moist grassland and the seepage zone vegetation units both have species present to indicate the presence of wetlands.

1.5.3 Wetlands and Buffer Zones

According to the methodology that was followed for delineation of wetlands by DWAF, there are wetlands on site. It should however be noted that several of the so-called wetlands could also be classified as riparian zones as they follow drainage paths of the streams on site.

All the areas identified above perform critical ecosystem functions and also provide habitat for sensitive species. It is suggested that a 100 m buffer be placed from the edge of the wetland and riparian zones in order to sufficiently protect these zones. Figure 15 and Figure 16 below illustrates the various wetland zones including the buffers. From the figures it is once again clear that Alternative 3 is the best alignment, as it limits the interaction with the sensitive wetlands.

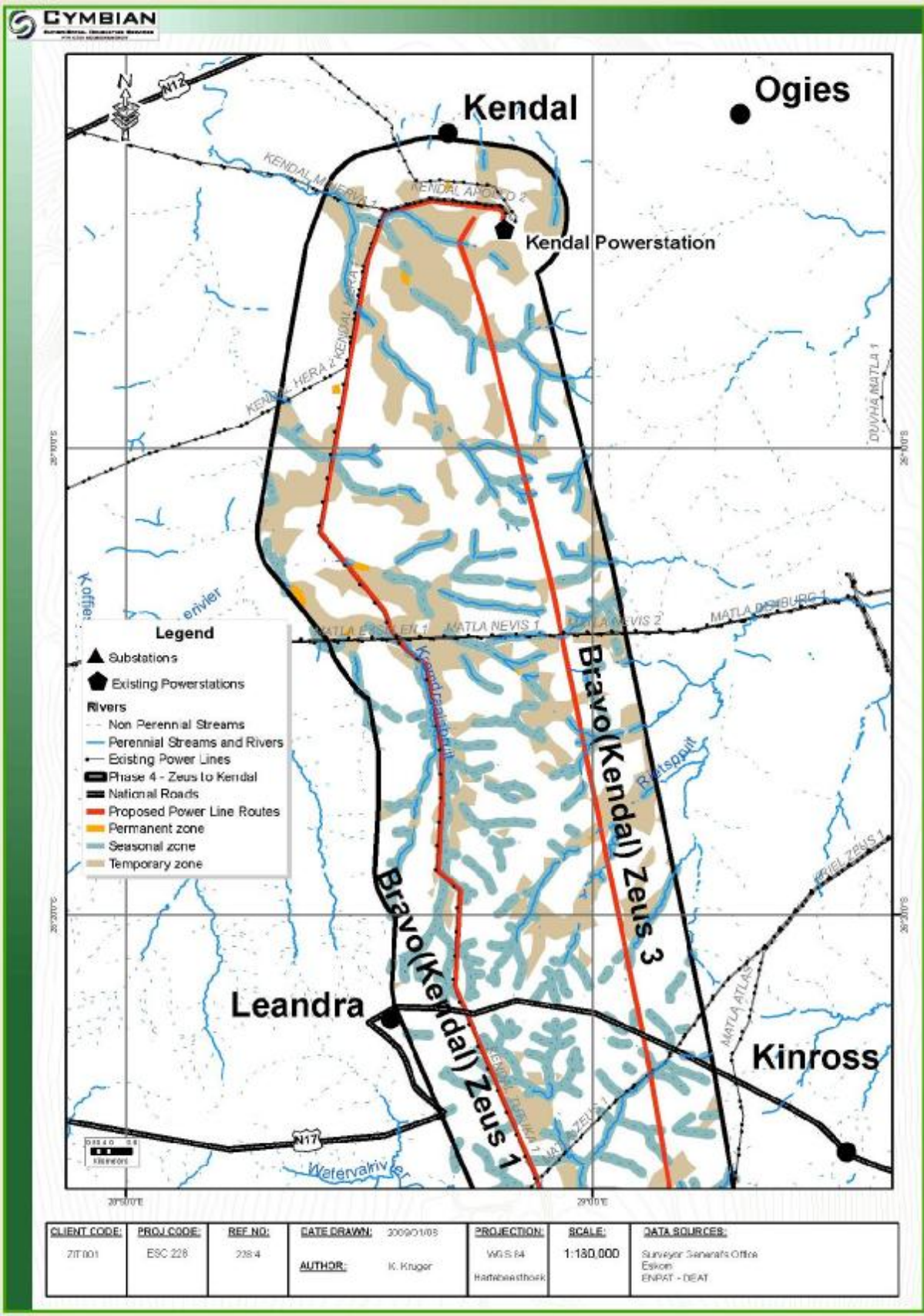


Figure 15: Wetland and Riparian Zone Map of the northern section of the site

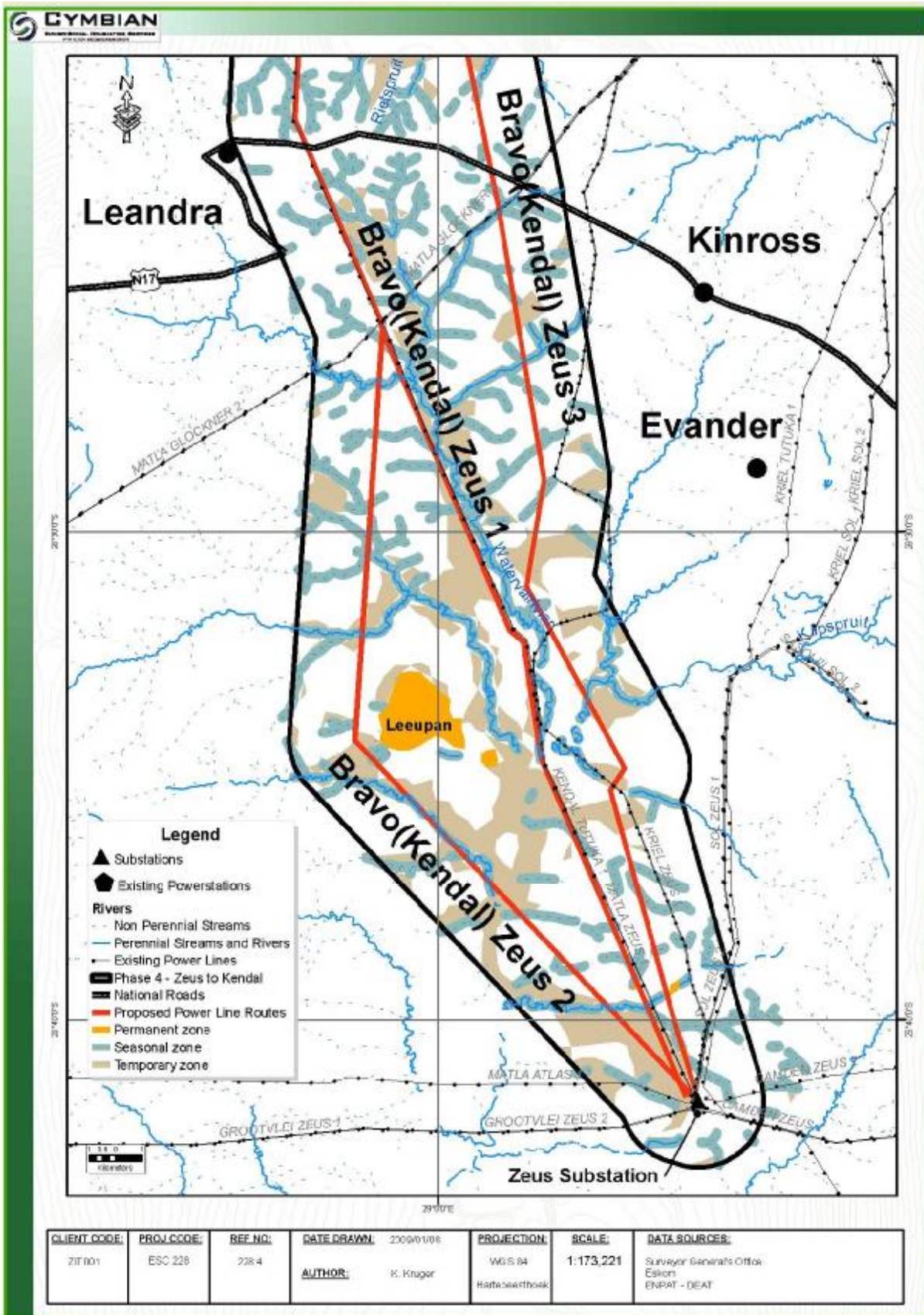


Figure 16: Wetland and Riparian Zone Map of the southern section of the site