7 DESCRIPTION OF THE BASELINE ENVIRONMENT

7.1 Introduction

According to section 28(e) of the NEMA Regulations, this section includes a description of the baseline environment that may be affected by the activity and the manner in which the biophysical, social, economic and cultural aspects of the environment may be affected by the proposed activity.

7.2 Study Area in Regional Context

7.2.1 Locality

Hendrina Power Station is located approximately 20km north of the town Hendrina in the Mpumalanga Province. The power station falls under the jurisdiction of the Nkangala District Municipality and in turn falls under the jurisdiction of the Steve Tshwete Local Municipality (**Figure 7.1**).

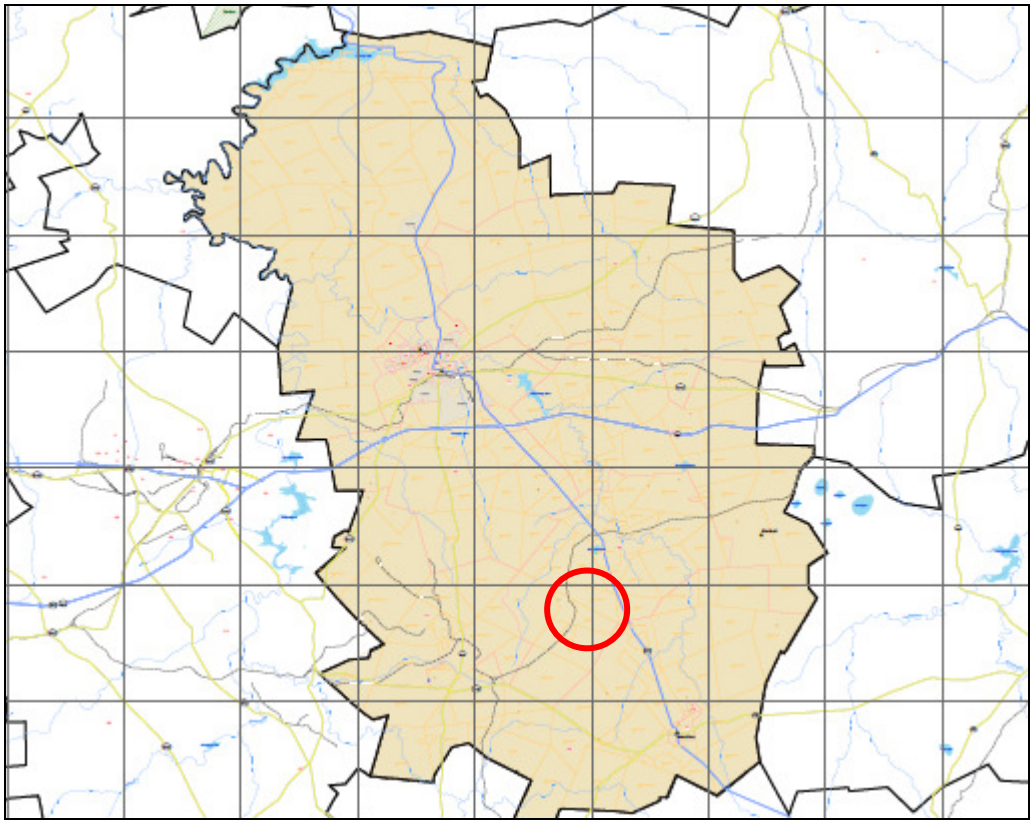

Figure 7.1: The location of the Hendrina Power Station within the Steve Tshwete Local Municipality

7.2.2 Study Area

In order to identify suitable alternative sites it was necessary to demarcate a suitable study area. The Hendrina Ash Dam EIA study area is therefore located within an eight (8)

kilometre radius around a centre point within the Hendrina Power Station (**Figure 7.2**). The study area is approximately 200 square kilometres in size and includes a total of 15 different farms divided into 77 farm portions. A list of the farm portions are included in **Table 7.1**. **Figure 7.3** shows the location of the 5 identified alternatives within the demarcated study area.

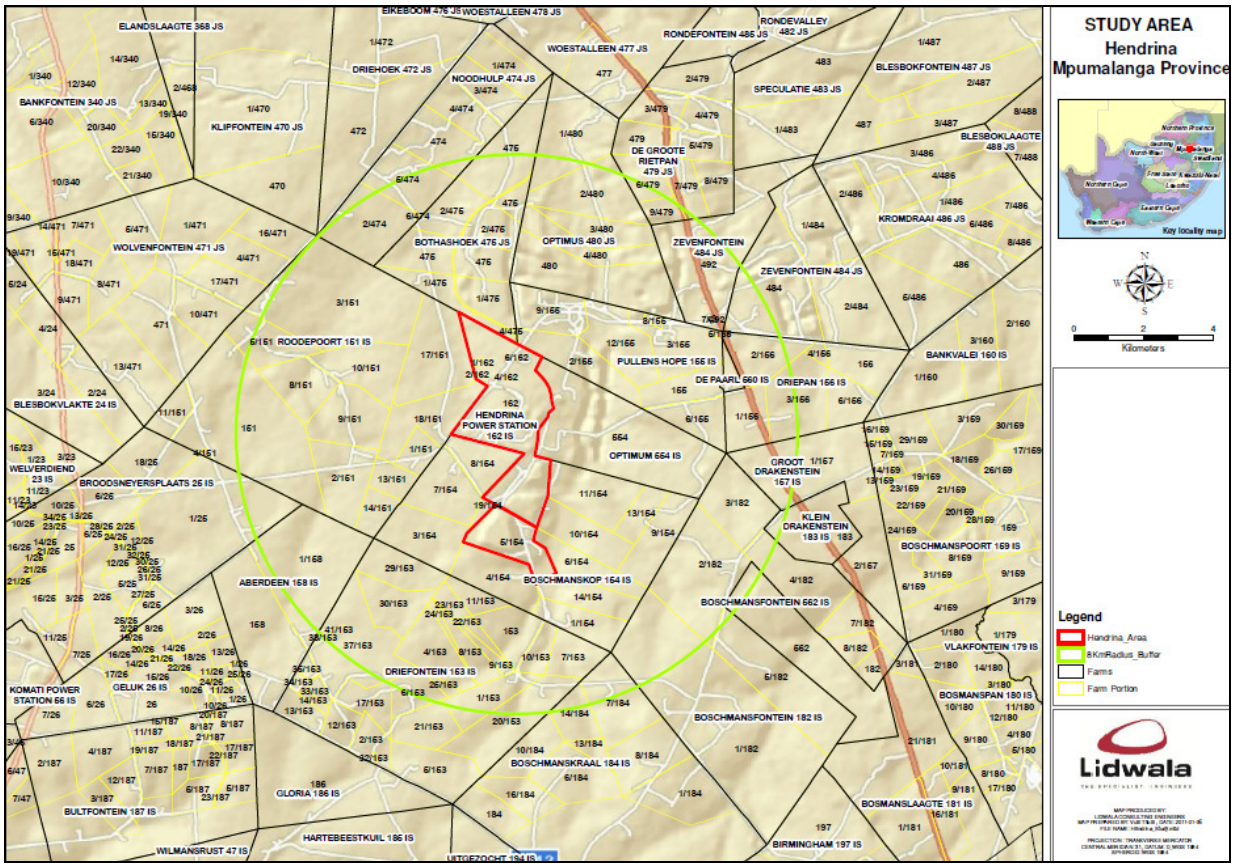

Figure 7.2: Hendrina Ash Dam Study Area

Table 7.1: Farm Portions situated within the Hendrina Ash Dam Study Area

SG_CODE	FARM_NO	PORTION	FARM NAME
T0IS00000000015100013	151	00013	ROODEPOORT 151 IS
T0IS00000000015100014	151	00014	ROODEPOORT 151 IS
T0IS00000000015100017	151	00017	ROODEPOORT 151 IS
T0IS00000000015100018	151	00018	ROODEPOORT 151 IS
T0IS00000000015300000	153	00000	DRIEFONTEIN 153 IS
T0IS00000000015300001	153	00001	DRIEFONTEIN 153 IS
T0IS00000000015300004	153	00004	DRIEFONTEIN 153 IS
T0IS00000000015300006	153	00006	DRIEFONTEIN 153 IS
T0IS00000000015300007	153	00007	DRIEFONTEIN 153 IS
T0IS00000000015300008	153	00008	DRIEFONTEIN 153 IS
T0IS00000000015300009	153	00009	DRIEFONTEIN 153 IS
T0IS00000000015300010	153	00010	DRIEFONTEIN 153 IS
T0IS00000000015300011	153	00011	DRIEFONTEIN 153 IS
T0IS00000000015300022	153	00022	DRIEFONTEIN 153 IS
T0IS00000000015300023	153	00023	DRIEFONTEIN 153 IS

T0IS00000000015300024	153	00024	DRIEFONTEIN 153 IS
T0IS00000000015300025	153	00025	DRIEFONTEIN 153 IS
T0IS00000000015300029	153	00029	DRIEFONTEIN 153 IS
T0IS00000000015300030	153	00030	DRIEFONTEIN 153 IS
T0IS00000000015300037	153	00037	DRIEFONTEIN 153 IS
T0IS00000000015300038	153	00038	DRIEFONTEIN 153 IS
T0IS00000000015300041	153	00041	DRIEFONTEIN 153 IS
T0IS00000000015400001	154	00001	BOSCHMANSKOP 154 IS
T0IS00000000015400003	154	00003	BOSCHMANSKOP 154 IS
T0IS00000000015400004	154	00004	BOSCHMANSKOP 154 IS
T0IS00000000015400005	154	00005	BOSCHMANSKOP 154 IS
T0IS00000000015400006	154	00006	BOSCHMANSKOP 154 IS
T0IS00000000015400007	154	00007	BOSCHMANSKOP 154 IS
T0IS00000000015400008	154	00008	BOSCHMANSKOP 154 IS
T0IS00000000015400009	154	00009	BOSCHMANSKOP 154 IS
T0IS00000000015400010	154	00010	BOSCHMANSKOP 154 IS
T0IS00000000015400011	154	00011	BOSCHMANSKOP 154 IS
T0IS00000000015400013	154	00013	BOSCHMANSKOP 154 IS
T0IS00000000015400014	154	00014	BOSCHMANSKOP 154 IS
T0IS00000000015400019	154	00019	BOSCHMANSKOP 154 IS
T0IS00000000015500000	155	00000	PULLENS HOPE 155 IS
T0IS00000000015500002	155	00002	PULLENS HOPE 155 IS
T0IS00000000015500003	155	00003	PULLENS HOPE 155 IS
T0IS00000000015500005	155	00005	PULLENS HOPE 155 IS
T0IS00000000015500006	155	00006	PULLENS HOPE 155 IS
T0IS00000000015500008	155	00008	PULLENS HOPE 155 IS
T0IS00000000015500009	155	00009	PULLENS HOPE 155 IS
T0IS00000000015500012	155	00012	PULLENS HOPE 155 IS
T0IS00000000015600001	156	00001	DRIEPAN 156 IS
T0IS00000000015600002	156	00002	DRIEPAN 156 IS
T0IS00000000015600003	156	00003	DRIEPAN 156 IS
T0IS00000000015700001	157	00001	GROOT DRAKENSTEIN 157 IS
T0IS00000000015800001	158	00001	ABERDEEN 158 IS
T0IS00000000015100000	151	00000	ROODEPOORT 151 IS
T0IS00000000015100001	151	00001	ROODEPOORT 151 IS
T0IS00000000015100002	151	00002	ROODEPOORT 151 IS
T0IS00000000015100003	151	00003	ROODEPOORT 151 IS
T0IS00000000015100005	151	00005	ROODEPOORT 151 IS
T0IS00000000015100008	151	00008	ROODEPOORT 151 IS
T0IS00000000015100009	151	00009	ROODEPOORT 151 IS
T0IS00000000015100010	151	00010	ROODEPOORT 151 IS
T0IS00000000016200000	162	00000	HENDRINA POWER STATION 162 IS
T0IS00000000016200001	162	00001	HENDRINA POWER STATION 162 IS
T0IS00000000016200002	162	00002	HENDRINA POWER STATION 162 IS
T0IS00000000016200003	162	00003	HENDRINA POWER STATION 162 IS
T0IS00000000016200004	162	00004	HENDRINA POWER STATION 162 IS
T0IS00000000016200006	162	00006	HENDRINA POWER STATION 162 IS
T0IS00000000055400000	554	00000	OPTIMUM 554 IS

T0IS00000000056000000	560	00000	DE PAARL 560 IS
T0JS00000000048000000	480	00000	OPTIMUS 480 JS
T0JS00000000048000002	480	00002	OPTIMUS 480 JS
T0JS00000000048000003	480	00003	OPTIMUS 480 JS
T0JS00000000048000004	480	00004	OPTIMUS 480 JS
T0JS00000000048400000	484	00000	ZEVENFONTEIN 484 JS
T0JS00000000047500000	475	00000	BOTHASHOEK 475 JS
T0JS00000000047500000	475	00000	BOTHASHOEK 475 JS
T0JS00000000047500000	475	00000	BOTHASHOEK 475 JS
T0JS00000000047500001	475	00001	BOTHASHOEK 475 JS
T0JS00000000047500001	475	00001	BOTHASHOEK 475 JS
T0JS00000000047500002	475	00002	BOTHASHOEK 475 JS
T0JS00000000047500002	475	00002	BOTHASHOEK 475 JS
T0JS00000000047500004	475	00004	BOTHASHOEK 475 JS

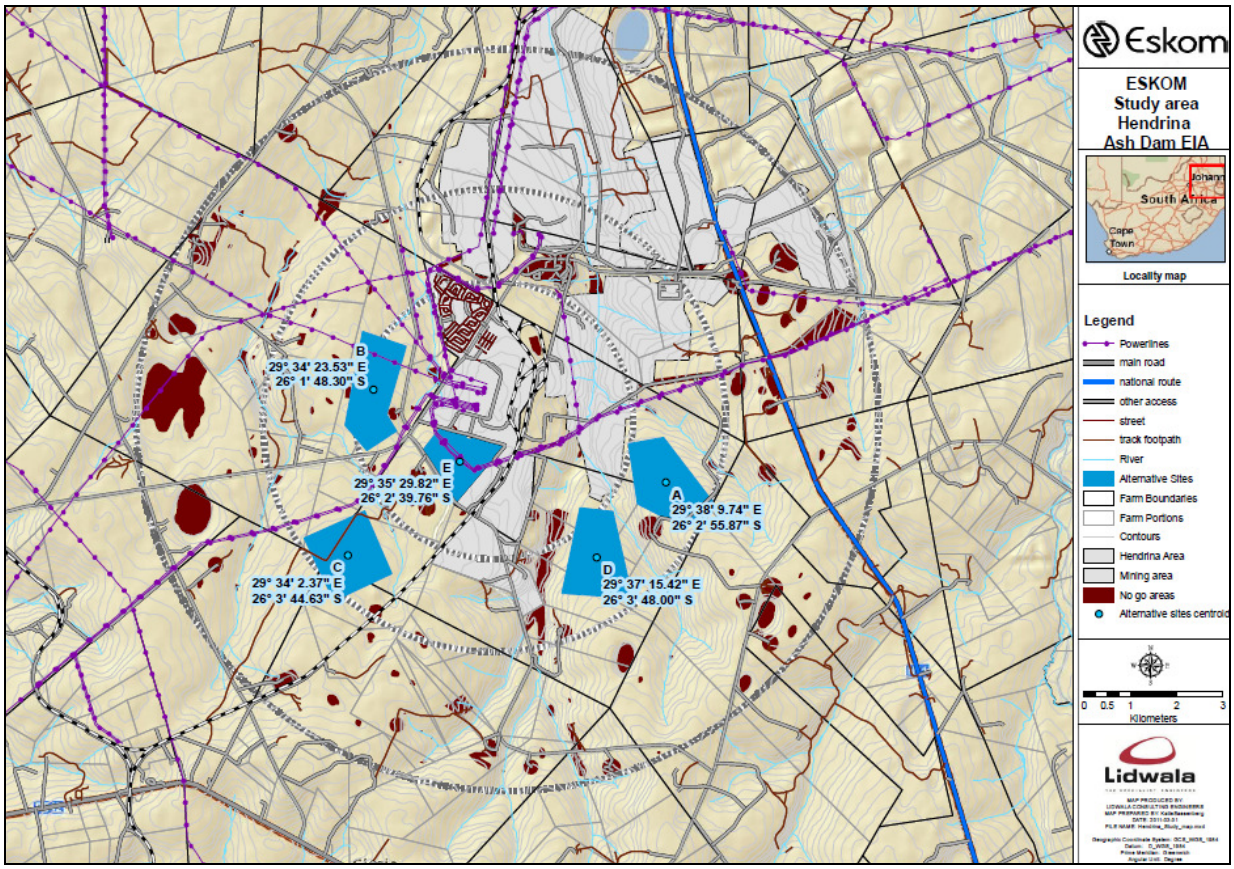

Figure 7.3: The location of the 5 identified alternatives within the demarcated study area

Table 7.2 outlines the farms associated with each alternative site

Table 7.2: Farm Portions situated within the Hendrina Ash Dam Study Area

SG_CODE	FARM_NO	PORTION	FARM NAME
Alternative A			
T0IS00000000055400000	554	00000	OPTIMUM 554 IS
T0IS00000000015400009	154	00009	BOSCHMANSKOP 154 IS
T0IS00000000015400011	154	00011	BOSCHMANSKOP 154 IS

T0IS00000000015400013	154	00013	BOSCHMANSKOP 154 IS
Alternative B			
T0IS00000000015100001	151	00001	ROODEPOORT 151 IS
T0IS00000000015100017	151	00017	ROODEPOORT 151 IS
T0IS00000000015100018	151	00018	ROODEPOORT 151 IS
Alternative C			
T0IS00000000015400003	154	00003	BOSCHMANSKOP 154 IS
T0IS00000000015400007	154	00007	BOSCHMANSKOP 154 IS
T0IS00000000015100014	151	00014	ROODEPOORT 151 IS
T0IS00000000015800001	158	00001	ABERDEEN 158 IS
T0IS00000000015300029	153	00029	DRIEFONTEIN 153 IS
Alternative D			
T0IS00000000015400006	154	00006	BOSCHMANSKOP 154 IS
T0IS00000000015400009	154	00009	BOSCHMANSKOP 154 IS
T0IS00000000015400010	154	00010	BOSCHMANSKOP 154 IS
T0IS00000000015400011	154	00011	BOSCHMANSKOP 154 IS
T0IS00000000015400013	154	00013	BOSCHMANSKOP 154 IS
Alternative E			
T0IS00000000015400008	154	00008	BOSCHMANSKOP 154 IS

7.3 Description of the Baseline Environment

7.3.1 Topography

The area within the study area is characterised by typical undulating terrain of the Mpumalanga Province. The natural topography of the area has been highly disturbed as a result of mining and agricultural activities.

Similar topography is found at all 5 of the Alternative sites ranging from flat to slightly undulating.

7.3.2 Climate

The climate in the study area can be described as typical highveld conditions with summers that are moderate and wet, while winters are cold and dry. The mean annual precipitation is approximately 735 mm/year, with rain experienced predominantly in the summer months (October to April).

Minimum temperatures have been recorded from -1.8°C to 13.7°C with maximum temperatures ranging between 18°C and 27°C.

The prevailing wind direction is recorded as being from the north-east and north.

The climate at all 5 alternative sites will be the same.

7.3.3 Geology

The Hendrina power station and surrounds are located on coal-bearing rocks of the Vryheid Formation, part of the lower Karoo Supergroup. These rocks are principally deltaic and fluvial siltstones and mudstones, with subordinate sandstones (Johnson et al, 2006). The coal seams originated as peat swamps, or similar environments. Where the Dwyka Group is absent (suspected in the study area), the Vryheid Formation has been deposited directly onto rugged pre-Karoo topography, and the thickness of the Formation can be quite variable as a result. The Vryheid Formation rocks are well lithified (hard) and have little primary porosity. All five Alternatives have the same underlying geology. The geology of the study area is shown in **Figure 7.4**.

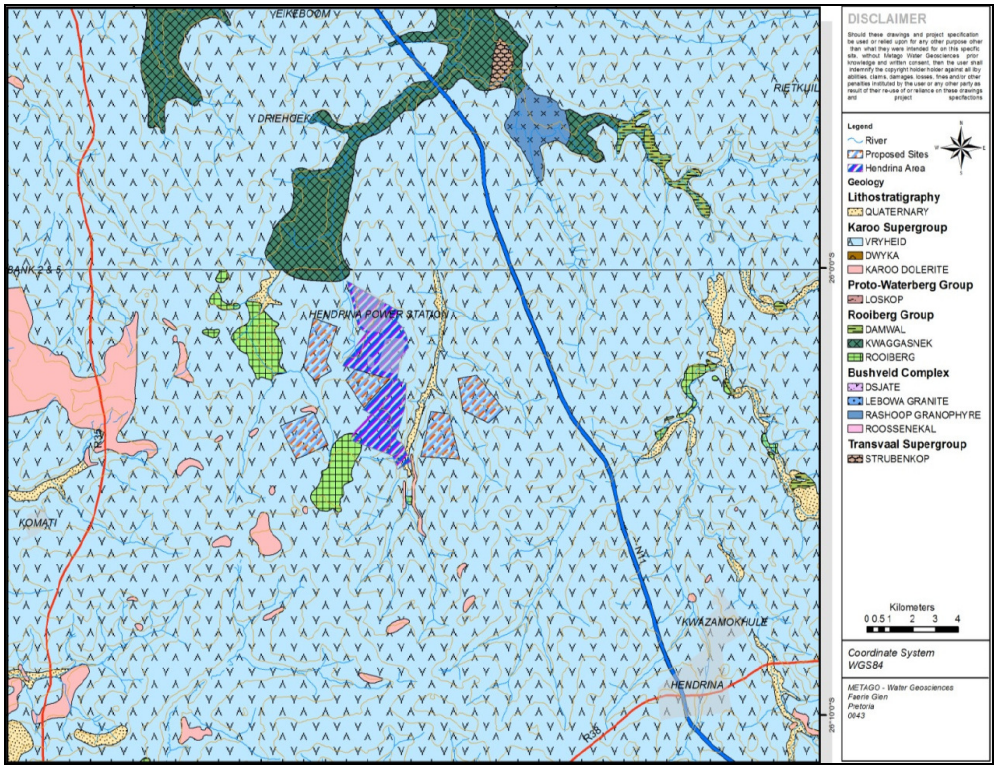

Figure 7.4: Geology of the Study area

7.3.4 Land Cover and Land Use

Land cover categories are presented in **Figure 7.5**. For the purpose of this assessment, land cover are loosely categorised into classes that represent natural habitat and land use categories that contribute to habitat degradation and transformation on a local or regional scale. Areas that are characterised by high levels of transformation and habitat degradation is generally accepted as being suitable for development purposes as it is unlikely that biodiversity attributes of sensitivities will be present or affected by development. Conversely, areas that are characterised by extensive untransformed and pristine habitat are generally not regarded suitable options for development purposes. The status of natural habitat does however have bearing on the suitability of a site.

The region comprises extensive transformed habitat that resulted from agriculture and mining, rendering remaining habitat fragmented and isolated and ultimately relatively sensitive. Little natural grassland habitat remains in the area, the majority being around streams and rivers where ploughing is not possible or soils are poor in nutrients. One of the shortfalls of the Environmental Potential Atlas database (ENPAT) is that it does not reflect the current status of natural habitat within the study area. At this stage of the process it is therefore assumed that all areas indicated to comprise of natural grassland is representative of the regional vegetation types and are in a good condition. While this assumption is unlikely to hold true for most of the study area, an assessment of the actual ecological status of grasslands within the study area is beyond the scope of this report and will only be compiled during the EIA phase.

The land cover and land use descriptions for the various alternatives are as follows:

- **Alternative A:** Comprises mostly transformed habitat (agricultural) with a small portion of remaining natural grassland
- **Alternative B:** Comprises mostly agricultural fields with a small portion of remaining natural grassland
- **Alternative C:** Comprised of agricultural fields with no remaining natural grassland
- **Alternative D:** Comprises mostly agricultural fields in addition to mining areas and small portions of remaining natural grassland.
- **Alternative E:** Comprised entirely of transformed habitat (agricultural, mining and residential areas).

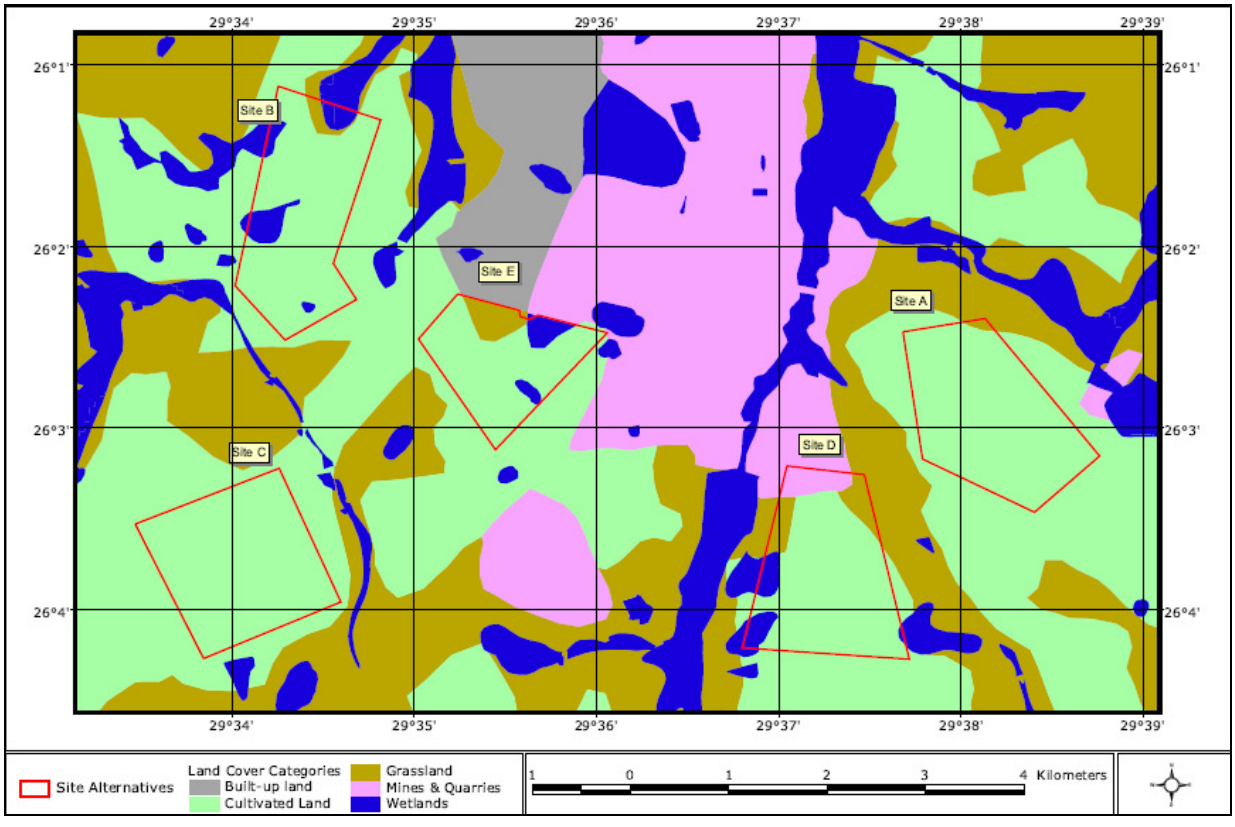

Figure 7.5: Land cover categories for the study area

7.3.5 Natural Vegetation

- **Regional Vegetation - VEGMAP**

Terrestrial grassland patches that are captured within the respective site alternatives represent the Eastern Highveld Grassland. This vegetation type is Endangered and only small fractions are conserved in statutory reserves. Some 44% is transformed by cultivation, plantations, mines, urbanisation and by building of dams. Cultivation may have had a more extensive impact than which is currently indicated by land cover data. The vegetation is short dense grassland dominated by Aristida, Digitaria, Eragrostis, Themeda and Tristachya species. Small rocky outcrops are scattered across the landscape. Wiry grasses and woody species are associated with these outcrops. These include species such as Acacia caffra, Celtis africana, Diospyros lycioides, Parinari capensis, Protea caffra and Searsia magalismontanum (Mucina & Rutherford, 2006). The Endangered status of this vegetation type warrants a medium-high environmental sensitivity. Small portions of the Eastern Temperate Freshwater Wetlands vegetation type are located within the study area.

- **MBCP Categories**

Classification of the Terrestrial Biodiversity Classification categories (**Figure 7.6**) in the study area is as follows:

- **Highly Significant areas** - protection needed, very limited choice for meeting targets;
- **Important and Necessary areas** - protection needed, greater choice in meeting targets;
- **Areas of Least Concern** – natural areas with most choices, including for development;
- **Areas with No Natural Habitat Remaining** – transformed areas that make no contribution to meeting targets.

Figure 7.6 shows the MBCP categories as they relate to the five alternative sites.

The only category of note within the site alternatives is 'Least Concern, generally conforming to the remaining natural grassland, as depicted in the land cover database as well as wetland and surface water habitats. These areas are generally regarded as moderately sensitive, mainly as a result of the extensive habitat transformation of the general region and the small portions of remaining natural habitat.

No area of restriction is identified within any of the proposed site alternatives in terms of the MBCP classification database.

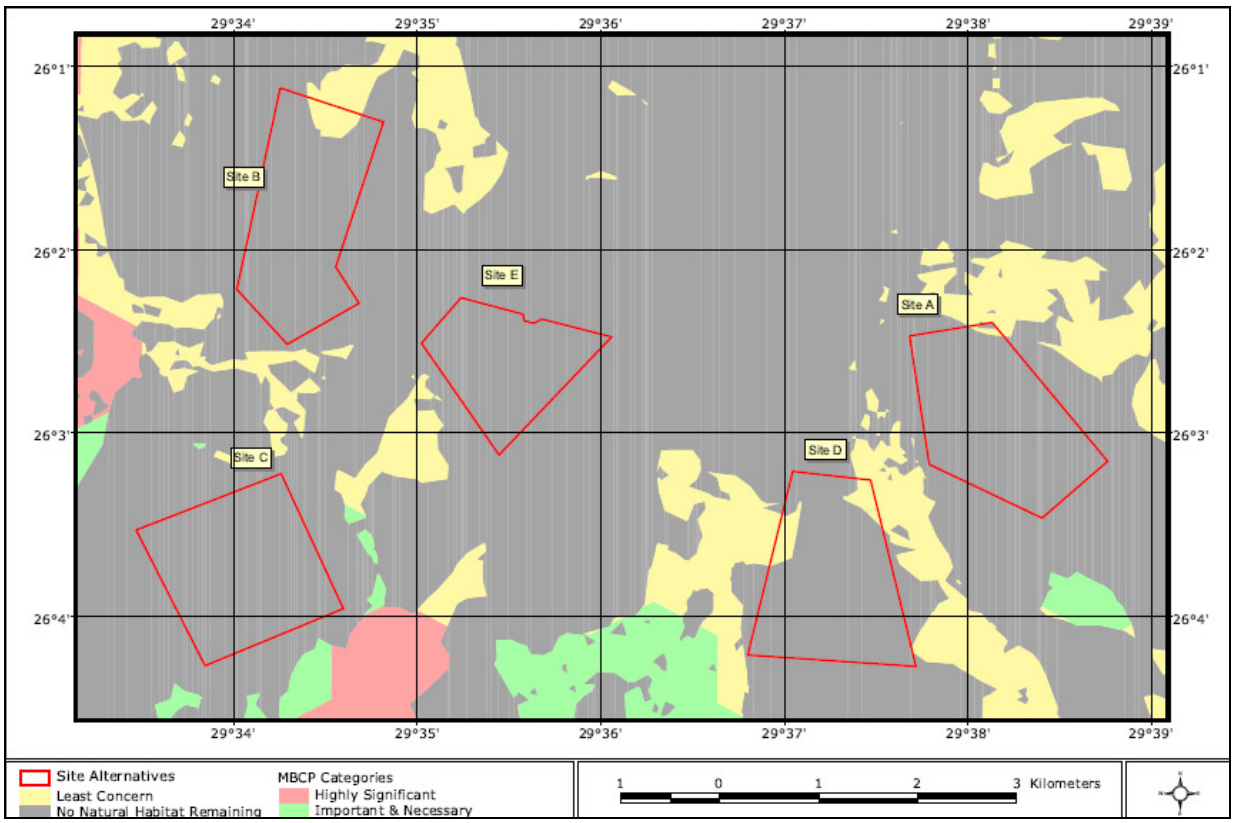

Figure 7.6: The MBCP categories as they relate to the five alternative sites.

The SANBI database indicates the known presence of only 38 plant species within this particular ¼ degree grid (2629BA). This low diversity is the result of poor floristic knowledge of the area and is not a reflection of a poor habitat and floristic diversity.

No floristic species of conservation importance is known to occur in this region, according to the SANBI database. However, all areas of natural grassland habitat and wetland habitat, in particular, are regarded suitable for the potential presence of flora species of conservation importance

Further detail can be obtained from the Biodiversity Specialist Report in **Appendix K**.

7.3.6 Animal Life

A total of 11 Red Data fauna species exhibit a moderate likelihood of occurring in the region, considering the type and distribution of habitat types. In particular, wetland related habitat is regarded significant for the potential presence of Red Data fauna species and most of the moderately likely species utilises wetland habitat extensively

The study area is ultimately characterised by a matrix of transformed faunal habitat (maize field etc.) with scattered portions of untransformed grassland and wetland habitats, but little of the original ecological characteristics remain within the larger region.

Further detail can be obtained from the Biodiversity Specialist Report in **Appendix K**.

7.3.7 Macro Habitats

- ***Preliminary Macro Habitat Types***

Habitat types that were identified within the proposed site alternatives include the following:

- **Agricultural fields** – comprises areas that are currently actively cultivated (mainly maize). Edges are generally characterised by a composition of weeds, invasive forbs and poor quality grasses and herbs. The faunal component of these areas might be relative diverse, but mostly comprises animals that utilises these areas on an infrequent basis or because of the unnatural food source that is presented by agriculture during parts of the year. The composition of animals in these areas are entirely different to that of natural grassland habitat;
- **Natural grasslands** – Fragmented and isolated areas of natural grassland comprise grassland attributes of moderate sensitivity. These areas are frequently also associated with wetland habitat of the region. The species composition of these areas provides indication of the natural status of the grassland remnants. A diverse composition that is typical of the Eastern Highveld Grassland vegetation type comprises an admixture of forbs (particularly geophytes) and grasses. It should be noted that, at this stage of the process, no distinction is yet made between prime grassland and areas where a poor quality is prevalent;
- **Wetlands** – all areas of wetland related habitat. For a detailed delineation and description, the reader is referred to the relevant document that is compiled for this aspect; and
- **Transformed habitat** – all areas where development has resulted in the decimation of natural habitat. Species generally associated with these areas comprises plants that are used for garden purposes, windbreaks or species associated with habitat transformation.

- ***Macro Habitat Sensitivities***

- **Agricultural fields** – No attributes of natural habitat remains within these areas and a low ecological sensitivity is ascribed to these parts. It is also unlikely that these areas will recover to a natural state;
- **Natural grasslands** – A moderate to high sensitivity (depending on the actual status) is normally ascribed to these parts, mainly as a result of the severe fragmentation and isolation of remaining fragments;
- **Wetlands** – A high sensitivity is ascribed to these parts; and
- **Transformed habitat** – No attributes of natural habitat remains within these areas and a low ecological sensitivity is ascribed to these parts. It is also unlikely that these areas will recover to a natural state.

- ***Discussion on Alternative Sites***

- **Alternative A:** Comprise mostly agricultural fields with mining activity to the west. Extensive grassland and riparian habitat located to the east and north of this site is a concern, but could potentially be protected by means of strict mitigation measures. The suitability of this site for the proposed development is therefore regarded medium.
- **Alternative B:** Although this site comprises extensive agricultural fields, some parts are characterised by wetland habitat that was not previously captured on the database and only observed during the brief site investigation. As a result of the presence of these scattered wetlands, the suitability of the site for the proposed development is regarded medium, also considering the distance to the power station.
- **Alternative C:** This site comprises exclusively of agricultural fields and no habitat of sensitivity is present within the proposed boundaries. A riparian habitat is located to the east of the site and this habitat will need to be crossed by the required pipeline infrastructure. In addition, extensive natural grassland and riparian wetland is present to the south and east of this site, rendering the suitability of this site for the proposed development is regarded as medium-low.
- **Alternative D:** Similar to Site A, this site comprises extensive agricultural areas, but grassland and riparian habitat is located to the immediate east and west of the site. The perceived ecological status of the wetland areas to the west was estimated to be relative low as a result of mining activities. Ultimately, the suitability of the site for the proposed development is regarded as medium, mainly as a result of the presence of extensive areas of natural grassland habitat located to the east of the site.
- **Alternative E:** The presence of wetland and grassland habitat that was not captured in the existing database, within this site was confirmed during the site investigation. The position of this site in close proximity to the power station implies that no sensitive habitat needs to be crossed by the required infrastructure. Surrounding habitat is similarly low in sensitivity. The suitability of the site for the proposed development is regarded as medium. This site is furthermore entirely isolated by means of road infrastructure and mining development.

Further detail can be obtained from the Biodiversity Specialist Report in **Appendix K**.

7.3.8 Avifauna

Data on the bird species that could occur in the study area and their abundance was obtained from the Southern African Bird Atlas Project (Harrison et al, 1997). These data provided an indication of the bird species that were recorded in the quarter degree squares within which this proposed project falls, i.e. 2629BA and 2529DC.

Table 7.3: Red Listed bird species recorded in the quarter degree squares (2629BA and 2529DC) within which the study area is located (Harrison et al, 1997). Report rates are percentages of the number of times a species was recorded by the number of times the square was counted. Conservation status is classified according to Barnes (2000).

Total Cards		66	64
Total Species		193	221
Total Breeding Species		44	27
Name	**Conservation status**	**2629BA report rate**	**2529DC report rate**
Botha's Lark	EN	2	-
Southern Bald Ibis	VU	5	14
African Marsh-Harrier	VU	2	-
Lesser Kestrel	VU	3	13
African Grass Owl	VU	2	2
Denham's Bustard	VU	-	2
White-bellied Korhaan	VU	-	2
Yellow-billed Stork	NT	3	-
Greater Flamingo	NT	27	36
Lesser Flamingo	NT	8	17
Secretarybird	NT	3	5
Black Harrier	NT	2	-
Pallid Harrier	NT	-	2
Blue Korhaan	NT	3	2
Black-winged Pratincole	NT	5	2
Black Stork	NT	-	5
White Stork	Bonn	11	14

EN=Endangered; VU=Vulnerable; NT=Near-threatened; Bonn=Protected Internationally under the Bonn Convention on Migratory Species.

The SABAP data lists 1 Endangered, 6 Vulnerable and 9 near threatened species as occurring within the study area. In addition, one species, the White Stork is protected internationally under the Bonn Convention on Migratory Species.

SABAP 2 data was also consulted, with the two pentads in the study area, 2600_2935 and 2555_2935, recording totals of 70 and 78 species respectively. Only one card had been submitted for pentad 2600_2935, while three counts have been conducted in pentad 2555_2935 to date. This represents insufficient data to be considered an accurate indication of species present or absent. It was noted, however, that pentad 2555_2935 had report rates of 33% (i.e. 1 of 3 counts) for both Greater and Lesser Flamingoes.

Two CWAC sites occur in the study area. A potential CWAC site is any body of water, other than the oceans, which supports a significant number of birds. This definition includes natural pans, vleis, marshes, lakes, rivers, estuaries and lagoons as well as the whole gamut of manmade impoundments. The two CWAC sites are Oranje Pan and Coetzeespruit Dam. Key IUCN Listed species recorded at the CWAC sites include the Greater Flamingo and African Marsh-Harrier.

CAR route MM03 of the Mpumalanga Precinct runs in close proximity to the Study area. Southern Bald Ibis was the only key species recorded on this route during the study period.

The 2629BA QDGS, in which all 5 alternative sites are found, also incorporates part of an Important Bird Area (IBA) - Amersfoort-bethal-carolina District. Although this IBA falls outside of the 8km study radius, it is known to hold a large proportion (>10%) of the global population of the endangered Botha's Lark (Barnes 1998). This species favors short dense, natural grassland found on plateaus and upper hill slopes. Such habitat was not observed at any of the proposed sites for this project. The majority of the study area comprised of agricultural lands, planted pastures, vleis and dams which are habitats not usually preferred by Botha's Lark. The Globally threatened Wattled Crane was listed as a vagrant to this IBA, while other key listed species recorded include Southern Bald Ibis, Lesser Kestrel, Blue Crane, African Grass Owl, Lanner Falcon and Blackwinged Lapwing. However, of these only the Southern Bald Ibis, African Grass Owl and Lesser Kestrel were recorded in the SABAP1 data from the QDGS, and the fact that the study area does not fall within the IBA, suggests that those species not recorded in SABAP1 data, are unlikely to occur on site.

- **Bird Micro-habitats**

An examination of the micro habitats available to birds was conducted. These are generally evident at a much smaller spatial scale than vegetation types, and are determined by a host of factors such as vegetation type, topography, land use and man-made infrastructure. The following micro-habitats were identified in the study area.

- *Cultivated Lands and Pasture*
  Arable or cultivated land as well as pastures, represents a significant feeding area for many bird species in any landscape for the following reasons: through opening up the soil surface, land preparation makes many insects, seeds, bulbs and other food sources readily accessible to birds and other predators; the crop or pasture plants cultivated are often eaten themselves by birds, or attract insects which are in turn eaten by birds; during the dry season arable lands often represent the only green or attractive food sources in an otherwise dry landscape. Arable lands exist in this study area, mostly planted to pasture or corn at the time of site visit. Relevant bird species that will be attracted to these areas include the Denham's Bustard and White Stork

- *Drainage Lines and Wetlands*
  Drainage lines and wetlands are an important form of habitat to numerous species. Drainage lines are often surrounded by natural grasslands, which may provide habitat for species such as African Grass Owl and Botha's lark. Various waterfowl, such as ducks and geese, may make use of these areas

- *Man-made Dams*
  Artificially constructed dams have become important attractants to various bird species in the South African landscape. Various waterfowl frequent these areas and crane

species often use dams to roost in communally. Birds such as flamingos and African Spoonbills may make use of these areas. Therefore dams are a key element of this study, and as shown in the sensitivity map, should be classed as no-go areas for this project.

- *Open Grassland*
  Grasslands represent a significant feeding area for many bird species, as well as possible breeding areas for others such as the African Grass Owl. Specifically, these open grassland patches typically attract the Blue Crane, Grey Crowned Crane (which have been identified in the nearby IBA discussed above) Sothern Bald Ibis, Secretarybird, White-bellied Korhaan, Denham's Bustard and White Stork. The grassland patches are also a favourite foraging area for game birds such as francolins and Helmeted Guineafowl. This in turn attracts large raptors because of both the presence and accessibility of prey.

- *Stands of Alien Trees*
  These areas will mostly be important to physically smaller bird species and passerines, as well as providing roosting for certain raptors and larger species such as Geese and Ibises.

Table 7.4 below shows the micro habitats that each Red Data bird typically frequents in the study area. It must be stressed that birds can and will, by virtue of their mobility, utilise almost any areas in a landscape from time to time. However, the analysis below represents each species' most preferred or normal habitats. These locations are where most of the birds of that species will spend most of their time – so logically that is where impacts on those species will be most significant.

Table 7.4: Preferred Micro-habitats and likelihood of occurrence on site of Red Data species recorded in the relevant QDGS's.

Species	Preferred Micro-habitat	Likelihood of occurrence on site
Botha's Lark	Long, mature natural grassland	Unlikely
Southern Bald Ibis	Grassland	Likely
African Marsh-Harrier	Dams and Wetlands	Possible
Lesser Kestrel	Arable lands and Grasslands	Possible
African Grass Owl	Grasslands	Unlikely
Denham's Bustard	Cultivated lands and Grasslands	Possible
White-bellied Korhaan	Cultivated lands and Grasslands	Possible
Yellow-billed Stork	Cultivated lands and Grasslands	Possible
Greater Flamingo	Dams and wetlands	Possible
Lesser Flamingo	Dams and Wetlands	Possible
Secretarybird	Cultivated lands and Grasslands	Unlikely
Black Harrier	Cultivated lands and Grasslands	Possible
Pallid Harrier	Grasslands and Wetlands	Unlikely
Blue Korhaan	Cultivated lands and Grasslands	Possible
Black-winged Pratincole	Cultivated lands and Grasslands	Possible
Black Stork	Rivers and Kloofs	Unlikely

White Stork	Cultivated lands and Grasslands	Likely

Further detail can be obtained from the Avifauna Specialist Report in **Appendix L**.

7.3.9 Surface Water

A characterisation of the rivers in the study area reveals that the receiving Klein-Olifants River is an order three river (**Table 7.5**). Six attributes were used to obtain the PES on desktop quaternary catchment level by the NSBA (Nel et al., 2004). These attributes predominantly allude to habitat integrity of instream and riparian habitat. With this in mind, the receiving Klein-Olifants River and the Woestalleen systems according to the NSBA (Nel et al., 2004) fall within a D-category, which relates to a largely transformed ecosystem state (Table 8). Biological communities also reflect fair to unacceptable health in these systems (RHP, 2001). The instream habitat associated with the ecoregion in the study area reflects more degradation than adjacent ecoregions (RHP, 2001).

According to the desktop PES category from DWAF (2000), the rivers in quaternary catchment B12B fall in a C ecological category, indicating a moderately modified ecosystem with clear community modifications and some impairment of health evident. The catchment at present is affected by severe erosion, sedimentation, weirs, infrastructural development in the form of power stations and mines, and translocation of species (Labeo umbratus). The EIS (DWAF, 2000) is considered moderately sensitive due to the expected presence of flow intolerant fish species in parts of the catchment, and the system's sensitivity to changes in flow and water quality.

Most of the surface water systems are perennial systems. Nel et al. (2004) lists a status of critically endangered for all the river signatures associated with the study area. The ascribed river status indicates a limited amount of intact river systems carrying the same heterogeneity signatures nationally. This implies a severe loss in aquatic ecological functioning and aquatic diversity in similar river signatures on a national scale (Nel et al., 2004).

Table 7.5: Desktop river characterisation of rivers and streams located in the study area (Nel et al., 2004) and DWAF (2000).

	Klein-Olifants River	Woestalleen System
River Order	3	1
Quaternary Catchment	B12B	B12B
Class	Perennial	Perennial
PES (NSBA)	D	D
PES (DWAF)	C	C
EIS (DWAF)	Moderate	Moderate
Conservation Status (NSBA)	Critically Endangered	Critically Endangered

- ***Drivers of Ecological Change***

The property falls within the Upper Olifants Sub-Area of the Olifants Water Management Area (WMA4). The Upper Olifants Sub-Area is the most urbanised of the 4 sub-areas in WMA4. The Upper Olifants covers an area of 11 464 km2 with a mean annual runoff of 10 780 million m3 (Midgley et al., 1994). Surface runoff in this area is regulated by a number of large dams, namely Witbank, Bronkhorstspruit and the Middleburg dams (Basson et al., 1997). Majority of the urban population is located in Witbank and Middelburg areas, and it is projected that the population in these urban areas is expected to grow in the near future therefore increasing the water requirement in the Sub-Area (**Table 7.6**). Extensive coal mining activities are taking place in the sub-area, both for export to other provinces and for use in the six active coal fired power stations in the sub-area. Water quality in this sub-area is therefore under threat. Mining activities in the area impact on the natural hydrological system by increasing infiltration and recharge rates of the groundwater. Approximately 62 million m3 is predicted to decant from mining activities (post closure) every year, creating a need for water quality management plans in this Sub-Area (DWAF, 2004).

Table 7.6: Reconciliation of water requirements and availability (million m^3/a) for the year 2000 in the Olifants Water Management Area (DWAF, 2004b).

Sub-area	MAR	Local yield	Transfers in	Transfer out	Local requirement	Deficit
Upper Olifants	465	238	171	96	314	1
Middle Olifants	481	210	91	3	392	94
Steelpoort	396	61	0	0	95	34
Lower Olifants	698	100	1	0	104	63

- ***Expected Fish***

The expected fish species list was limited to fish that have been sampled in, and immediately around or adjacent to the quaternary catchments associated with the study area. A total of 14 indigenous species representing 5 families are expected to utilise surface water systems associated with the study area. Table 10, shows the expected species as well as their conservation status. No species with conservation status occur in the study area, however, Barbus neefi is Data Deficient (DD). Barbus trimaculatus has a status of Least Concern (LC), but some literature suggests that it is Vulnerable (V) in the Orange-system (Benade et al., 1995). Amphilius uranoscopus as well as Chiloglanis pretoriae both have been sampled in quaternary catchment B12C and are expected to occur in the study area (Kleynhans et al., 2007). Both of these fish are rheophillic; having a low tolerance for degraded water quality and a high preference for sensitive habitat, thus making them excellent indicators of ecosystem health.

The expected fish list also includes alien and introduced species. Labeo umbratus naturally occurs in the Vaal-system, but has been introduced into the Limpopo and Olifants systems. Alien species that are expected in and around the study area include Gambusia affinis and Micropterus salmoides (**Table 7.7**).

Table 7.7: Fish species expected to utilise the river systems associated with the study area, in and around the quaternary catchment (B12A, B12B and B12C). Alien species are shown in red while sensitive species are indicated in green. LC = Least Concern; DD = Data Deficient; EX = Exotic (IUCN, 2009).

Status	Family	Species	Status
LC	Amphiliidae	Amphilius uranoscopus	Stargazer Catfish
LC	Cyprinidae	Barbus anoplus	Chubbyhead barb
DD	Cyprinidae	Barbus neefi	Sidespot barb
LC	Cyprinidae	Barbus paludinosus	Straightfin barb
LC -Vulnerable in Orange*	Cyprinidae	Barbus trimaculatus	Threespot barb
LC	Cyprinidae	Barbus unitaeniatus	Longbeard barb
LC	Mochokidae	Chiloglanis pretoriae	Shortspine rock catlet
LC	Clariidae	Clarias gariepinus	Sharptooth catfish
LC	Cyprinidae	Labeo cylindricus	Redeye labeo
LC	Cyprinidae	Labeo molybdinus	Leaden labeo
Introduced	Cyprinidae	Labeo umbratus	Moggel
LC	Cyprinidae	Labeobarbus marequensis	Largescale yellowfish
LC	Cyprinidae	Labeobarbus polylepis	Smallscale yellowfish
LC	Cichlidae	Pseudocrenilabrus philander	Southern mouthbrooder
LC	Cichlidae	Tilapia sparrmanii	Banded tilapia
EX	Poeciliidae	Gambusia affinis	Mosquito fish
EX	Centrarchidae	Micropterus salmoides	Largemouth bass
DD: Data deficient; LC: Least Concern; EX: Exotic (alien) *: Benade et al., 1995			
	Alien/Exotic/Introduced		Sensitive

- ***Expected Aquatic Macroinvertebrates***

A number of macroinvertebrate families are expected to utilise the habitat provided by the surface water systems associated with the proposed development and are shown in **Table 7.8** (Gerber, 2002; Thirion, 2007). Also reflected by **Table 7.8** is the respective sensitivity scores associated with each invertebrate family. The majority of expected macroinvertebrates are of low to moderate sensitivity, scoring between 3 and 8 out of a possible 15. Conversely a few relatively sensitive families are expected, these include: Heptageniidae, Leptophlebiidae, Tricorythidae and Chlorocyphidae.

Table 7.8: Macroinvertebrate species expected to use the non perennial systems for a part of their life cycle.

Order	Family	Common Name	SASS Score
Turbellaria	Planaria	Flatworms	3
Annelida	Oligochaeta	Aquatic earthworms	1
	Hirudinea	Leeches	3
Crustacea	Potamonautidae	Crabs	3
	Atyidae	Freshwater prawns	8
Hydracarina	Hydrachnellae	Water mites	8
Ephemeroptera	Baetidae	Small Minnow Flies	4
	Caenidae	Cain Flies	6
	Heptageniidae	Flat-headed Mayflies	13
	Leptophlebiidae	Prongill Mayflies	9
	Tricorythidae	Stout Crawlers	9
Odonata	Chlorocyphidae	Damsel flies	10
	Chlorolestidae	Sylphs	8
	Coenagrionidae	Sprites and Blues	4
	Lestidae	Emerald Damsel flies	8
	Aeshnidae	Hawkers	8
	Corduliidae	Cruisers	8
	Gomphidae	Clubtails	6
	Libellulidae	Darters	4
Hemiptera	Belostomatidae	Giant water bugs	3
	Corixidae	Water boatmen	3
	Gerridae	Pond skaters	5
	Hydrometridae	Water measurers	6
	Naucoridae	Creeping water bugs	7
	Notonectidae	Back swimmers	3
	Pleidae	Pygmy back swimmers	4
	Veliidae	Ripple bugs	5
Trichoptera	Hydropsychidae	Caseless caddis flies	4
	Hydroptilidae	Cased caddis flies	6
	Leptoceridae	Cased caddis flies	6
Coleoptera	Dytiscidae	Diving beetles	5
	Elmidae	Riffle beetles	8
	Gyrinidae	Whirligig beetles	5
	Hydrophilidae	Water scavenger beetles	5
Diptera	Ceratopogonidae	Biting midges	5
	Chironomidae	Midges	2
	Culicidae	Midges	1
	Ephydridae	Shore flies	3
	Muscidae	House flies	1
	Psychodidae	Moth flies	1
	Simuliidae	Black flies	5
	Syrphidae	Rat tailed maggots	1
	Tabanidae	Horse flies	5
	Tipulidae	Crane flies	5
Gastropoda	Ancylidae	Freshwater limpets	6

Order	Family	Common Name	SASS Score
	Lymnaeidae	Pond snails	3
	Physidae	Pouch snails	3
	Planorbinae	Orb snails	3
	Thiaridae		3
	Corbiculidae		5
Pelecypoda	Sphaeriidae		3

Further detail can be obtained from the Surface Water Specialist Report in **Appendix M**.

7.3.10 Groundwater

Groundwater storage and transport in the unweathered Vryheid Formation is likely to be mainly via fractures, bedding planes, joints and other secondary discontinuities. The success of a water supply borehole in these rocks depends on whether one or more of these structures are intersected. In general the Vryheid Formation is considered to be a minor aquifer, with some abstractions of local importance. Relatively minor outcrops of the Rooiberg and Quaggasnek Formations that underlie the Vryheid Formation are also found in the study area.

The Department of Water Affairs (DWA) have produced a series of 1:500 000 scale hydrogeology maps (General Hydrogeology Map Series), together covering the whole of South Africa. Analysis of median borehole yields and aquifer types has allowed DWA to classify the hydrogeology of the country according to an alphanumeric code incorporating aquifer type and borehole yield, as follows:

Table 7.9: General Hydrogeology Map Classification Of South Africa

Aquifer Type	Borehole Yield Class (L/s)				
	Class "1" 0 - 0.1	Class "2" 0.1 - 0.5	Class "3" 0.5 - 2.0	Class "4" 2.0 - 5.0	Class "5" >5.0
Type "a": Intergranular	A1	A2	A3	A4	A5
Type "b": Fractured	B1	B2	B3	B4	B5
Type "c": Karst	C1	C2	C3	C4	C5
Type "d": Intergranular and fractured	D1	D2	D3	D4	D5

The area within an 8 km radius of the Hendrina site is almost all classified as "D2". The small outcrop of the Quaggasnek Formation in the NW of the study area appears to be the reason for the small area classified as "D3" on the general hydrogeology map series. **Figure 7.7** provides an overview of the hydrogeology of the study area.

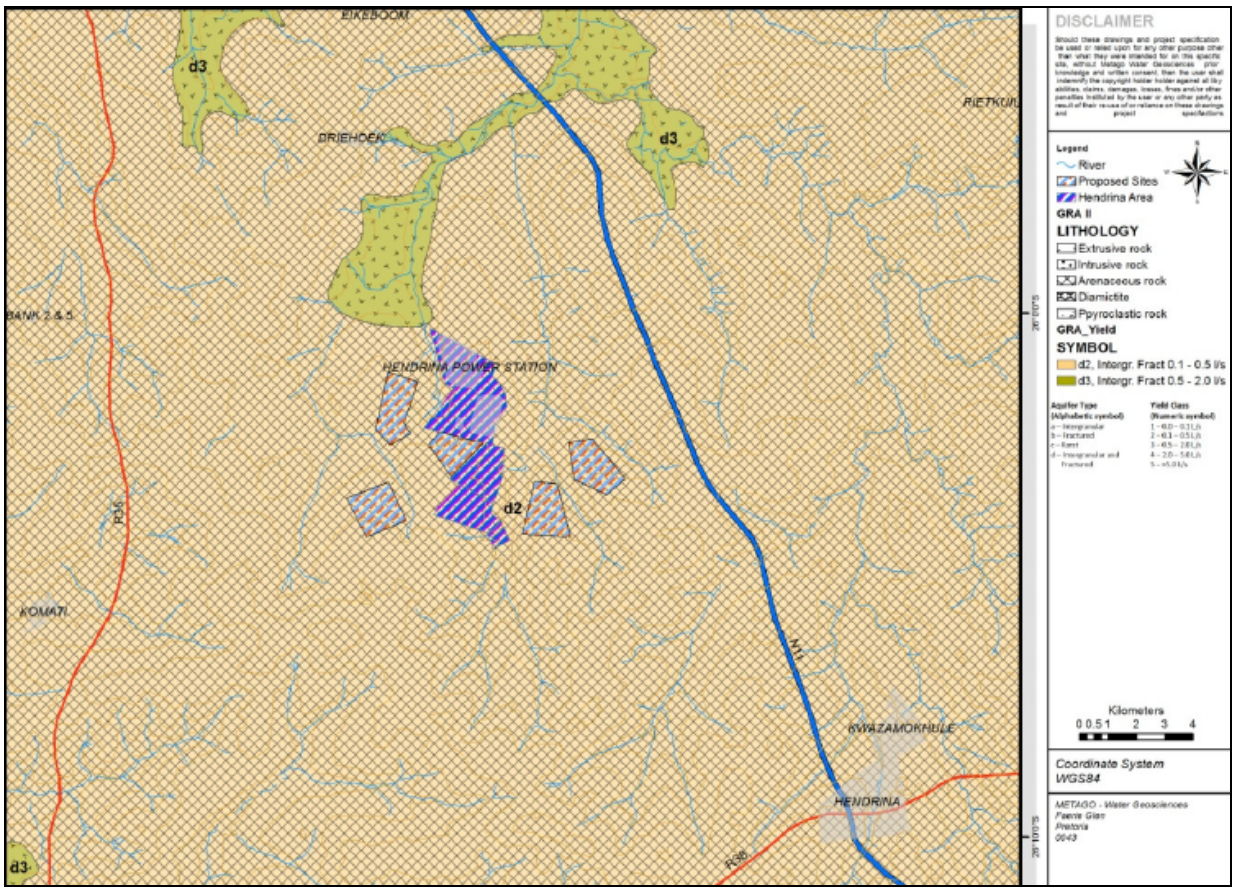

Figure 7.7: An overview of the hydrogeology of the study area.

A number of databases including the National Groundwater Database (NGDB), data from the Water Management System (WMS), maps published for the Groundwater Resource Assessment Phase I (GRA I) project, data from the Groundwater Resource Assessment Phase II (GRA II) project and information on water-use registrations obtained from the WARMS (Water Authorisation and Resource Management System) dataset managed by the Department of Water Affairs (DWA) were consulted for this study. The type of data collated included borehole yield estimates, groundwater level and groundwater chemistry data, as well as information on aquifer characteristics and exploitation potential.

From the NGBD, there are only 3 boreholes available within close proximity of the site (with one of the borehole within the 8km radius).

A field visit was undertaken on 21 April 2011 in order to inspect the Hendrina power station site, identify potential receiving environments (e.g. wetlands, water sources) (where possible) and take groundwater level measurements and electrical conductivity readings where accessible boreholes allowed. Information from the field visit was combined with the desktop study using existing datasets to develop a conceptual model of groundwater occurrence in the vicinity of the site. Based on the conceptual model, possible groundwater issues of concern were identified, and management actions proposed. Possible sources, pathways and receptors of groundwater contamination were considered.

The study area is located in quaternary catchment B12B, within the Olifants Water Management Area. The Groundwater Harvest Potential Map of South Africa (Baron et al, 1998) classifies the study area as having an estimated groundwater harvest potential of 10 000 to 15 000 m3/km2/year (i.e. relatively low). The average borehole yield is > 0.4 litres per second (L/s), and the total dissolved solids concentration of the (unpolluted) groundwater is between 200 and 300 mg/l (i.e. relatively fresh). No major groundwater abstractions are shown on the DWA 1:500 000 scale hydrogeology map of the area (Sheet 2526 Johannesburg). The GRA2 data for the quaternary catchment B12B is summarized in **Table 7.10** below:

Table 7.10: GRA2 Data Summary for B12B

QUATERNARY CATCHMENT B12B	
Area (km2)	658.5
Average water level (metres below ground level)	8.7
Volume of water in aquifer storage (Mm3/km2)	467.7
Specific Yield	0.003
Harvest Potential (Mm3/a)	14.6
Contribution to river base flow (Mm3/a)	7.8
Utilizable groundwater exploitation potential in a wet season (Mm3/a)	9.5
Utilizable groundwater exploitation potential in a dry season (Mm3/a)	6.3

Several of the boreholes in the ashing area that are routinely sampled (GHT, 2010) have poor water quality, due to increased concentrations of elements such as K, Cl, Mn, SO4, or due to low pH values. Low pH can lead to increased mobility of a range of groundwater contaminants, such as trace metals. A range of conductivity values were observed in the boreholes visited, and groundwater levels (with one exception) were found to be within 5 m of the ground surface. With one or two exceptions, groundwater levels appear to be stable in the vicinity of the ash dam (see **Figure 7.10** above). Borehole AB03, which has shown a large rise in groundwater level in the last eight years, is located close to a pumping station used for the control of water from the ash dam, and may have been influenced by leakage or discharge from this facility.

- **Conceptual Model of Groundwater Occurrence**

Recharge moving through the soil zone combines with leachate from the ash storage facility and migrates downwards through the unsaturated zone to the water table. Groundwater below the water table moves with the local groundwater gradient towards discharge zones (surface water resources such as rivers, wetlands and dams). Due to the shallow depth to groundwater in the immediate vicinity of the ash dams and associated infrastructure it is assumed that leakage from the base of the ash dam occurs (i.e. a groundwater mound has formed under the ash dam). This is supported by the poor groundwater quality in some boreholes close to the ash dam, reported by GHT (2010). Following observations made during the field visit, it is likely that any leachate from the current ash disposal area that is not intercepted by the underdrain systems (or other leachate control facilities) will flow through the aquifer towards the lake or dam that is located about 1 km due east of the ash dam. Groundwater will flow at shallow depth in the

weathered zone or via fractures, faults, fissures and other secondary discontinuities in the deeper rock. Locally the groundwater gradients are expected to be modified by mounding associated with the ash dams and other water sources.

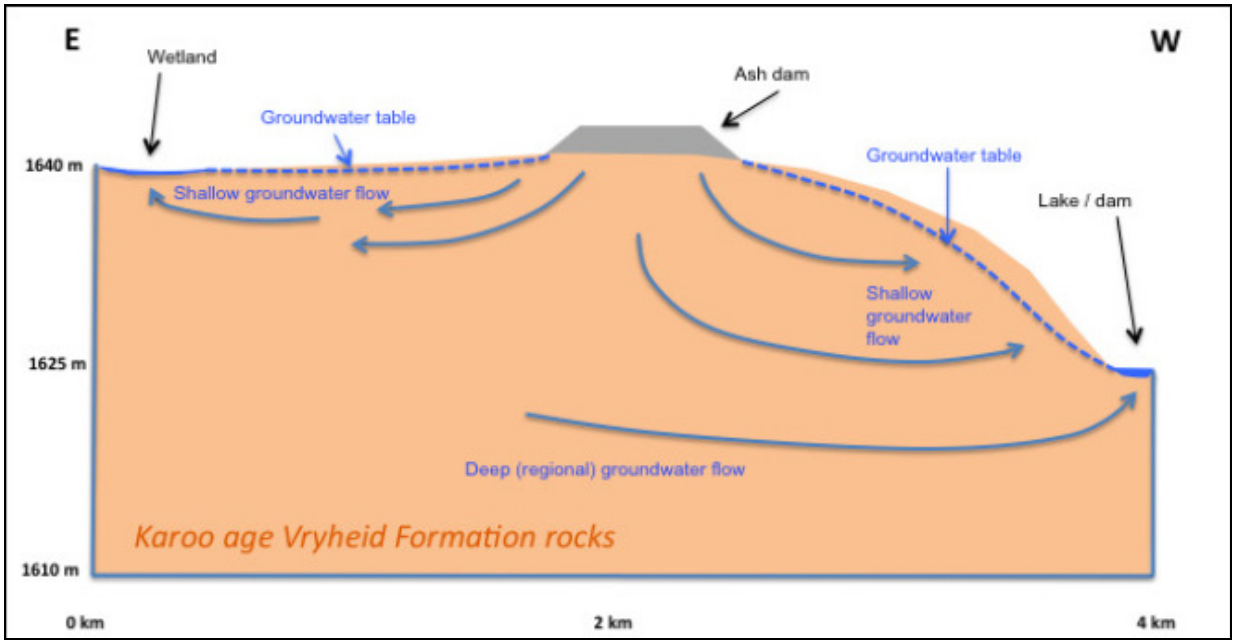

Figure 7.8: Sketch Cross-Section of Groundwater occurrence at Hendrina (note vertical Exaggeration)

Further detail can be obtained from the Ground Water Specialist Report in **Appendix N**.

7.3.11 Sites of Archaeological, Historical and Cultural Interest

The only known significant heritage sites are situated outside of the study area and are therefore more than 8km from the power station. Due to the fact that the study area is characterised by agricultural, industrial and mining activities it is anticipated that no significant heritage sites will be identified in the area. A full Heritage impact assessment will be undertaken on the preferred sites in the EIA phase of the study.

7.3.12 Visual Aspects

The study area for the visual assessment is located close to Hendrina in the Steve Tshwete Municipality of the Mpumalanga Province.

There are no major towns in the immediate area. Middelburg lies 40 km to the north west, and Hendrina some 16km to the south east. A number of farms and homesteads occur throughout the study area, and in close proximity to the power station.

The N11 bypasses the site in the east and the R542 traverses a section of the study area in the south west. In addition, a number of secondary roads interconnect with the national and arterial roads, as well as with one another.

Mining and related activity is a prolific land use in the study area, which in combination with the existing power station results in a decidedly industrial visual character within an otherwise rural and agricultural regional setting. Power lines which extend to the north, west and east of the power station contribute further to this existing visual intrusion. Refer to **Figure 7.9**.

The topography of the area is typical of the Mpumalanga Highveld, mainly a gently undulating plateau, varying between 1680m and 1600m amsl along the Woes-Alleen Spruit. The north of the study area appears lower lying and undulating, while the south is characterised by low hills.

In addition to the above mentioned spruit, a large number of dams and pans are present in the study area, although many of these have been disturbed to some extent by mining activity. The drainage lines which traverse the study area all flow north towards the Olifants River.

The ENPAT describes the terrain as *moderately undulating plains and pans* and the natural vegetation type as *Bankenveld.*

With its moderately dry subtropical climate, the study area receives between 621 and 752 mm of rainfall per annum.

No formally protected areas or conservation areas are located in close proximity to the proposed site, or within the identified study area.

The study area falls within the Mpumalanga Province, which is a particularly popular and well frequented tourist destination in South Africa. There are no known tourist facilities or destinations within the study area, but tourists en route to other parts of Mpumalanga may utilise the main regional access routes such as the N11 and the R542.

Further detail can be obtained from the Visual Impact Specialist Report in **Appendix O**.

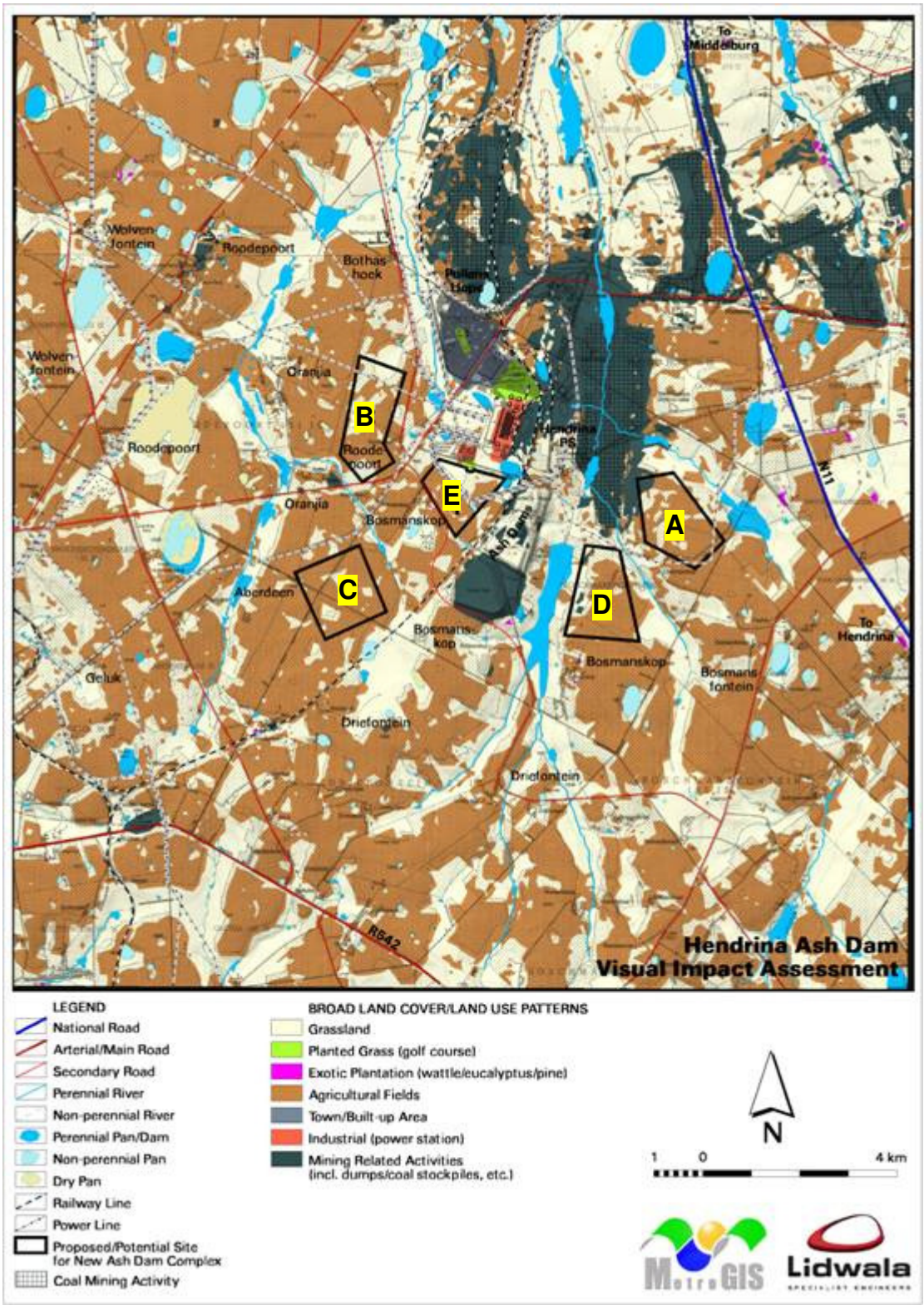

Figure 7.9: Land cover / land use patterns of the study area.

7.3.13 Social Environment

The Hendrina Power Station is situated in the Mpumalanga Province and within the Steve Tshwete Local Municipality area of jurisdiction.

The closest towns include Hendrina and Middleburg with the small community of Pullen's Hope situated right next to the power station.

The town of Hendrina was proclaimed on 5 June 1916 and is approximately 20 km from the power station. Hendrina is the second largest town in the municipality (after Middelburg). The main business / commercial activities in Hendrina include the OTK co-operation and a large manufacturing company.

Pullen's Hope is situated directly adjacent to the power station and is considered to be the fourth largest settlement in the municipal area. The original stands were developed by Eskom to accommodate personnel employed at the Hendrina power station. The current ownership of the community is assumed to be municipal however, this remains to be confirmed.

The socioeconomic analysis is specifically aimed at spatial related matters, i.e. demographics, employment and income and economic profile. The 2001 Census figures were used and comparisons were made with the Demarcation Board Data. The latter is based on the 1996 Census data which has been statistically manipulated to coincide with the newly demarcated study area.

- ***Demographics***

Table 7.11: Population Growth in Steve Tshwete Local Municipality

	2001	**1996**	**% Growth**	**% Average Annual Growth**
African	114 371	91 224	25,4	5,1
Coloured	3 547	3 530	0,5	0,1
Indian	1 313	1 900	31,0	6,2
White	23 541	37 747	38,0	7,6
Total	**142 772**	**135 412**	**5,4**	**1,08**

Source: 2001 Census data

The African population increased by 25,4% over 5 years or 5,1% on average annually. The Indian and White population decreased by 31% and 38% respectively over the 5 years or 6, 2% and 7,6% on average annually. Therefore, the need for housing in the lower income brackets, mainly subsidy linked housing has increased and will tend to increase over time.

- ***Population Estimates***

Population estimates for Steve Tshwete Municipality are reflected in **Table 7.12 below** and includes the total number of people.

Table 7.12: Number and Percentage by Gender

	Male	Female	Total	Male %	Female %	Total %
Steve Tshwete	70 596	72 184	142 772	49,4	50,6	**100**
Nkangala	491 225	529 363	1 020 590	48,1	51,9	**100**
Mpumalanga	1 497 325	1 625 985	3 122 985	47,9	52,1	**100**

Source: 2001 Census data

The study area has an advantage in terms of its male population compared to that of the Nkangala District and Mpumalanga. This can mainly be attributed to more job opportunities created by the mining and industrial sectors.

- ***Level of Education***

The level of education for the population in the study area is reflected in **Table 7.13 below** format with specific reference to number of people with primary, secondary and tertiary qualifications.

Table 7.13: Level of Education in Steve Tshwete Local Municipality

Persons	2001	%
None	15 769	27,8
Pre School	2 063	3,6
School	37 243	65,6
College	958	1,7
Technikon	319	0,6
University	226	0,4
Adult Education Centre	48	0,1
Other	132	0,2
Total	**56 758**	**100**

Source: 2001 Census data

- Only 3% of the population has a tertiary or higher qualification.
- 27,8% of the population have no qualification. It is noted that infants and children less than 5 years are excluded from this figure.
- Access to farm schools and the availability of schools for specially the rural population have been highlighted as part of the IDP prioritisation process. The high levels of illiteracy reflect the need for education facilities and after school learning.

- ***Population Growth Estimates***

It should be noted that population growth statistics should only be used as a guideline for future planning. These figures must be reviewed and adjusted on an ongoing basis with the availability of more relevant and specific data. Specific reference is made to the latest Census figures.

The population growth estimates are reflected for the time period 1996 to 2001 and the time period 2001 to 2006. However, the latest Census figures are disputed by Council. It was therefore suggested that the following assumptions are made for the short term as the next cycle in the Census data capturing will commence early in 2006. Any changes in the tendencies relating to population trends will then be captured.

The growth rates will be as follows for the period 2001 to 2006, namely:

- Middelburg: 3,3%
- Mhluzi: 0,0%
- Hendrina: 0,0%
- Kwazamokhule: 2,0%
- Middelburg NU: 2,3%

Table 7.14: Population Growth Rate 1996 – 2006 in Steve Tshwete Local Municipality

Area	Population Growth		Population 2001	Population Increase 2001 - 2006
	1991 - 1996	1996 - 2001		
Middelburg	1,1	3,3	42 296	49 750
Mhluzi	10,6	1,7	46 011	46 011
Hendrina	1,5	8,9	885	885
Kwazamokhule	17,9	2,0	12 843	14 180
Middelburg NU	12,0	2,3	40 737	45 642
Middelburg (MP 313)	0,7	1,1	142 772	156 468

Source: Census 2001

- The proposed population growth implies that an additional 13 696 people will reside in the study area. At a household size of approximately 3,94 people, this represents an additional 3 476 households.
- The increase in population and number of households has a significant influence on service delivery, provision of affordable housing, education, health facilities and infrastructure.
- The need for additional housing are outlined as part of the spatial analysis (refer to Chapter 2).
- A relatively high population growth rate is predicted for the urban areas with specific reference to Middelburg and Kwazamokhule. The current estimated backlog of 6 883 stands consist of 2 308 stands in Newtown accommodating 9 289 residents, whilst approximately 4 575 backyard families are residing in Mhluzi (Waste disposal survey:

October 2000). In Middelburg an additional 1 500 units should be developed annually from 2001 to 2006 to address the expected growth. The bulk of the residential units will be required to accommodate the homeless, mainly relying on government housing subsidies.

- A backlog of approximately 350 stands is present in Kwazamokhule. The development of Kwazamokhule X7 consisting of 600 residential stands will, once servicing has taken place, address the backlog sufficiently.

- **Economic:**

  - *Employment and Income*

The analysis of employment and income levels in the study area are reflected as informal, formal and unemployed workforce, and average income per capita.

Table 7.15: Informal, Formal and Unemployed Workforce 2001 in Steve Tshwete Local Municipality

Area	1996	%	2001	%
Employed	47 423	80,4	41 678	64,6
Unemployment	11 574	19,6	22 798	35,4
Not economically active	-	-	31 619	-
Total labour force	**58 997**	**100**	**64 476**	**100**

Source: 2001 Census data

- The economic active population decreased by approximately 15,8% from 1996 to 2001.
- The total labour force increased by 9,3%.

  - *Income*

The per capita income for the study area is provided for 1996 and 2001.

Table 7.16: Individual Monthly Income in Steve Tshwete Local Municipality

Persons	1996	%	2001	%
None	91 608	64,2	54 806	53,7
R1 - R400	6 258	4,4	3 586	3,5
R401 - R800	13 100	9,2	17 642	17,3
R801 - R1600	9 897	6,9	6 257	6,1
R1 601 – R3 200	9 888	6,9	6 057	6,0
R3 201 - R6 400	6 723	4,7	9 666	9,5
R6 401 - R12 800	3 593	2,5	2 957	2,9
R12 801 - R25 600	1 177	0,8	624	0,6
R25 601 - R51 200	278	0,2	285	0,3
R51 201 - R102 400	135	0,1	93	0,1
R102 401 - R204 800	90	0,08	**-**	**-**

Over R204 801	25	0,02	**-**	**-**
Total	**142 772**	**100**	**101 973**	**100**

Source: 2001 Census data

Table 7.16 indicates that the percentage of people with no income increased from 53,7% to 64,2% as percentage of the total in the respective census. However, the increase over the 5 years is 67%, or 13,42% on average annually. People earning between R1 and R1 600 totals 29 255 compared to 27 485 during 1996. This represents an increase of 6,4% between 1996 and 2001, or 1,2% on average annually. In total 84% of the inhabitants of Steve Tshwete Local Municipality falls within the lower income bracket.

Table 7.17: Annual Household Income in Steve Tshwete Local Municipality

Household	1996	%	2001	%
None	5 578	15,1	1 691	7,1
R1 - R4 800	2 163	5,8	929	3,9
R4 801 - R9 600	5 068	13,7	3 122	13,1
R9 601 - R19 200	6 397	17,3	5 417	22,8
R19 201 - R38 400	6 705	18,1	4 740	19,9
R38 401 - R76 800	5 008	13,5	3 269	13,7
R76 801 - R153 600	3 604	9,7	2 947	12,4
R153 601 - R307 200	1 784	4,8	1 563	6,6
R307 201 - R614 400	479	1,3	113	0,5
R614 401 - R1 228 800	123	0,3	**-**	-
R1 228 801 - R2 457 600	95	0,3	**-**	**-**
Over R2 457 600	39	0,1	**-**	**-**
Total	**37 043**	**100**	**23 791**	**100**

Source: 2001 Census data

From the above mentioned table it is clear that 51,8% of the households earn less than R19 200 per year. This reflects on monthly household income of less than R1 600. This figure has increased from 46,9% during 1996 to 51,8% during 2001. Therefore, it is clear that more low income households within the lower bracket of the Governments Housing Subsidy Scheme are moving to the study area. The pressure on limited financial resources will increase which will negatively impact on service delivery. If R3 200/month or R38 400 per annum is used as the cut off point for people qualifying for Government subsidies, the percentage increase to an alarming 69,9% of the total number of households, compared to 66,8% during 1996. Household with no annual income increase from 7,1% to 15,1% from 1996 to 2001.

- *Employment and GGP Contribution to the Local Economy*

The Steve Tshwete Local Municipality is situated in the centre of the Nkangala District Municipality. The economic structure of the Steve Tshwete economy is presented graphically in **Figure 7.10** below.

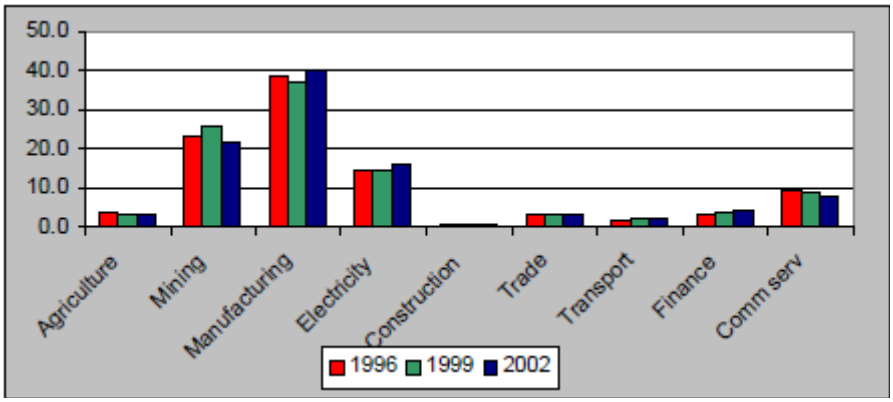

Figure 7.10: GGP profile by sector, 1996 to 2002
Source: Global Insight Version, 1.50 (172), 2003

Manufacturing dominates the local economy. This is followed by the mining, electricity and community services sectors. As a result of growth in the remaining sectors, the relative importance of the manufacturing sector decreased during 1996 – 1999 but during 1999 – 2002 the relative contribution of the manufacturing sector increased to levels higher than in 1996. Conversely, the mining sectors proportional contribution increased during 1996 - 1999 and decreased to levels lower than in 1996.

The agriculture and community services sectors' proportional contribution decreased during the medium term (1996 - 2002) while the transport and finance sectors contribution increased during the same period.

The growth rates achieved by the various sectors are presented in **Table 7.18** below.

Table 7.18: Growth rates 1996 - 2002

Sectors	1996 - 1999	1999 - 2002	1996 - 2002
Agriculture	0.2	3.4	1.6
Mining	7.5	2.0	2.6
Manufacturing	2.7	7.3	5.0
Electricity	2.9	7.8	5.3
Construction	6.9	2.1	2.3
Trade	3.8	4.1	3.9
Transport	12.6	9.0	10.8
Finance	12.4	7.0	9.7
Comm. services	0.3	0.6	0.4
Total	**4.1**	**4.2**	**4.2**

Source: Global Insight Version, 1.50 (172), 2003

Transport, finance, electricity and manufacturing recorded relatively high growth rates between 1996 and 2002, whereas mining and construction declined significantly recently (1999 - 2002).

The aggregate Steve Tshwete economy recorded a relatively high growth rate for all the periods under observation. This economy grew at the second highest growth rate when

compared to the other local municipalities in the Nkangala District. The above economic analysis presents the following implications for Steve Tshwete:

- Middelburg constitutes one of Nkangala's two key industrial areas. Hence, the strong growth in the manufacturing sector should be stimulated and maintained. This implies that the growth should be stimulated in specific subsectors to facilitate a diversification of the manufacturing base.
- The agriculture sector should be included in the development initiatives in a manner that exploits the opportunities associated with the Maputo Corridor.
- The high growth of the transport sector indicates that opportunities exist for the establishment of transport related initiatives, as well as the formation of a transport hub that serves as a link between the remainder of Mpumalanga and Gauteng.

Apart from the above mentioned implications, various initiatives should be formulated and implemented to ensure that Steve Tshwete's sectoral advantages (agriculture, mining, manufacturing, and finance) are leveraged/exploited.

During the EIA phase the latest statistics will be included in order to determine if the trend that is seen with these figures are still relevant. If major changes did occur within this local municipality it will be reflected in the EIA. It must also be investigated if these trends differ if in actual fact this will have a influence on this project from a social point of view.