

10.4.2 Description of the Baseline Environment

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.

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 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

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 magalismsontanum* (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

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. 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).

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.

10.4.3 Summary of Alternatives

a) No-Go Alternative

The 'no go' alternative is the option of not expanding the ashing system at the Hendrina Power Station with the development of a new ash dam.

Eskom's core business is the generation, transmission and distribution of electricity throughout South Africa. Electricity by its nature cannot be stored and must be used as it is generated. Therefore electricity is generated according to supply-demand requirements. The reliable provision of electricity by Eskom is critical to industrial development and poverty alleviation in the country.

If Eskom is to meet its mandate and commitment to supply the ever-increasing needs of end-users in South Africa, it has to continually expand its infrastructure of generation capacity and transmission and distribution power lines. This expansion includes not only the building of new power stations but also expanding and upgrading existing power stations to extend their life.

The Hendrina Power Station, in the Mpumalanga Province currently uses a wet ashing system for the disposal of ash. Hendrina Power Station currently have five ash dams, of which two (Ash dam 3 and 5) are currently in operation, the other three (Ash dam 1, 2 & 4) are not in use for the following reasons:

- Having reached full capacity (Dam 1)
- Stability issues (Dam 2)
- Temporary decommissioning (Dam 4). Ash dam 4 will be re-commissioned in 2011.

At the current rate of disposal on Dams 3, 4 and 5, the rate-of-rise will exceed 4m/year in 2018, which is not acceptable in terms of structural stability. The Hendrina Power Station

is anticipated to ash approximately 64.2 million m³ until the end of its life span which is currently estimated to be 2035.

It has been determined, through studies, that the existing ashing facilities are not capable to provide sufficient ash disposal capacity for this amount of ash for the full life of the station. The existing facilities (Ash Dams 3, 4 and 5) allow for the disposal of 20.9 million m³. Therefore, Hendrina Power Station proposes to extend its ashing facilities and associated infrastructure with the following development specifications:

- Additional airspace of 43.3 million m³
- Ash dam ground footprint of 139 ha
- Ground footprint of associated infrastructure such as Ash Water Return Dams of 70 ha

The need for this extension is to allow the Hendrina Power Station to continue ashing in an environmentally responsible way for the duration of the operating life of the Power Station. The need for the extension is related to the deteriorating coal quality, higher load factors, the installation of the Fabric filter plant (to meet requirements in terms of the National Environmental Management: Air Quality Act (Act 39 of 2004)) and the need to extend station life.

The 'no go' option will, therefore, contribute negatively to the provision of reliable base load power to the national grid. It will result in the need to close down the power station due to the lack of ash disposal facilities, causing a long term reduction in electricity supply. It is important to note that the additional power output from Hendrina Power Station is still required to meet the national demand irrespective of the new-build activities.

The 'no go' alternative will, however, be investigated further in the EIA phase as an alternative as required by the EIA Regulations.

b) Ash Disposal Method

The coal-fired power generation process results in large quantities of ash, which is disposed of in ash dams. Generally, Eskom uses coal of a low grade (called middlings coal) which produces a larger mass of ash during combustion. Over time, the quality of the coal provided to Eskom has degraded, due to higher ash quantities in the coal. With regards to ash management, Eskom uses either wet or dry methods of ash disposal. The Hendrina Power Station utilises a wet ashing disposal method. This process entails the hydraulic conveyance of ash where ash is mixed with water and pumped in the form of slurry via steel pipelines. The slurry is allowed to settle in the ash dams, and the water decanted to storage dams for re-use.

Due to the fact that Hendrina Power Station utilises a wet ashing disposal method, a strategic decision was taken that the new proposed ash dam will be built in order to link in with the existing ashing system.

c) Location Alternatives

A screening study was initiated upfront in the process in order to identify potential sites within the study area that would be suitable for use as alternative sites for the proposed new ash dam. The study area was demarcated using an 8 km radius around the Hendrina Power Station. Within this 8km radius two further demarcations were included, although based on technical impacts such as the costs involved in the project and the risk of security of supply, the distances involved also take into account the potential additional environmental impacts in terms of the distance required for new infrastructure to be constructed and operated.

- A 3 km radius within which no additional technical costs would be incurred in terms of the construction and operational of the proposed new ash dam;
- A 5 km radius within which minimal additional technical costs would be incurred in terms of the construction and operation of the proposed new ash dam

In order to ensure that sites were identified in the most objective manner possible, a sensitivity mapping exercise was undertaken for the study area. The purpose of such an exercise was to identify suitable areas within the study area that could accommodate the proposed new ash dam and associated infrastructure and to pro-actively identify sensitive areas (i.e. fatal flaws) that should ideally be avoided. **Figure 10.4** shows the final sensitivity map that was utilised to identify the five alternative sites (**Figure 10.5**) assessed in this scoping report.

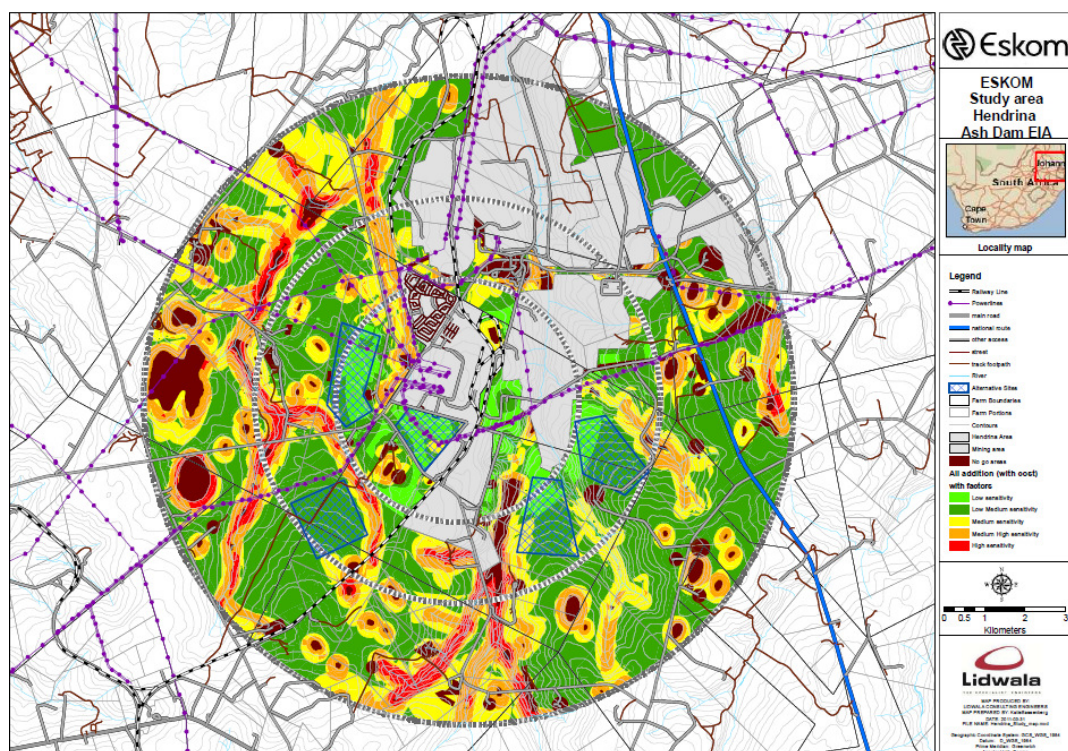


Figure 10.4: Recommended alternative sites (sensitivity map with the adjustment factors with cost)

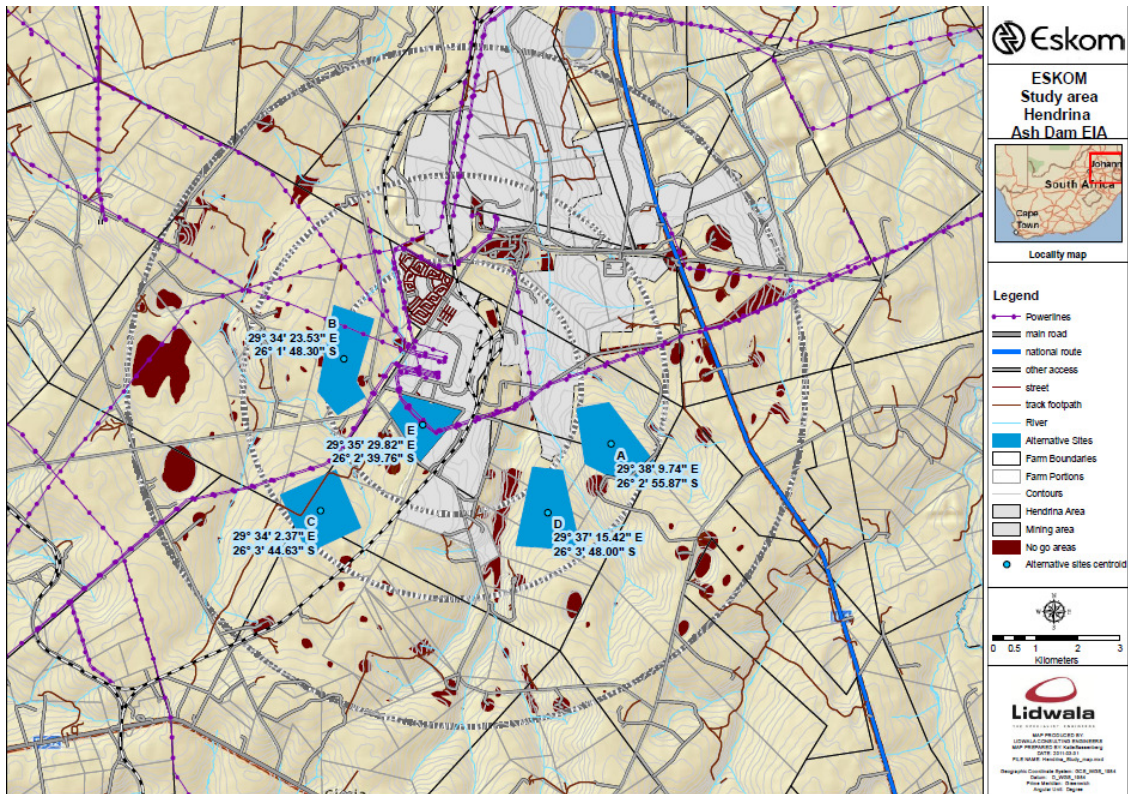


Figure 10.5: Five Alternative sites for further consideration during the Scoping Phase

The evaluation and nomination of a preferred site involves a highly interdisciplinary approach. The approach undertaken has involved a number of specialist studies which examine a number of different issues. In order to evaluate sites and determine a preferred site, the studies need to be comparative and therefore a site rating matrix was developed. The site preference rating system is applied to each discipline, and the rating of each site was conducted according to the following system:

- 1 = Not suitable for development / No-Go (impact of very high significance - negative)
- 2 = not preferred (impact of high significance - negative)
- 3 = acceptable (impact of moderate significance - negative)
- 4 = Preferred (impact of low or negligible significance - negative)

The final Site Ranking matrix is shown in **Table 10.4**.

Table 10.4: Final Site Ranking Matrix

Study	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Biodiversity	3	3	3	2	2
Avifauna	3	3	2	2	4
Surface Water	2	2	3	1	4
Ground	2	3	4	2	2