



Eskom Holdings SOC Limited



Environmental Impact Assessment for the Proposed Expansion of Ash Disposal Facilities at the Hendrina Power Station, Mpumalanga Province

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FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

VOLUME 1



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EXECUTIVE SUMMARY

1 INTRODUCTION

1.1 Project Background

Eskom's core business is the generation, transmission and distribution of electricity. 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 other poverty alleviation initiatives in the country, and outside.

If Eskom is to meet its mandate and commitment to supply the ever-increasing needs of end-users, one of its options is to extend the life of its infrastructure of generation capacity and transmission and distribution powerlines. This expansion includes not only the building of new power stations but also expanding and upgrading existing power stations to ensure that the operating life of the power stations can be extended.

The Hendrina Power Station, in the Mpumalanga Province currently uses a wet ashings system for the disposal of ash. Hendrina Power Station currently has five wet ash disposal facilities, 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).

At the current rate of disposal on Dams 3 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 technical 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 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
- Wet ash disposal facility ground footprint of 139 ha and the rerouting of the power lines and DWS water pipe line that currently traverses the proposed site;
- Ground footprint of associated infrastructure such as Ash Water Return Dams, ash water return channels, pump stations, drainage channels, access roads, switchgear room, ash lines 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. Further, 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, among others.

1.2 Description of the Study Area

Hendrina Power Station is located in the Mpumalanga Province approximately 24 km south of Middleburg and 20 km North of the town of Hendrina. The power station and surrounds falls within the Steve Tshwete Local Municipality which forms part of the Nkangala District Municipality.

The greater part of the study area is made up of agricultural and mining activities (**Figure 2**). The proposed site for the proposed new wet ash disposal facility at Hendrina Power station is located directly adjacent to the existing wet ash disposal facilities and is currently utilised for agriculture (**Figure 3**).



Figure 2: The agricultural and mining activities that form the greater part of the study area.



Figure 3: Preferred site for the proposed new wet ash disposal facility

2 PROCESS TO DATE

The Environmental Impact Assessment (EIA) process for the proposed new wet ash disposal facility is comprised of two main phases, namely the Scoping phase and Impact Assessment phase. This report documents the tasks which have been undertaken as part of the Impact Assessment phase of the EIA. These tasks include the public participation process and the documentation of the issues which have been identified as a result of these activities.

To date, tasks that have commenced include the:

- Identification of stakeholders or I&APs;
- Notification and advertisements;
- Background Information Documents; and
- Ongoing consultation and engagement

More detail on the above is available in **Chapter 6**.

The Draft EIA Report was released for public review and comment from **21 February 2013** to **24 April 2013**. The revised draft EIA report was also released to the public for their review and commenting purposes. During the review period a public participation process (PPP) was undertaken, allowing Interested and Affected Parties (I&APs) to engage with the project proponents and independent environmental consultants. The PPP consisted of a public meeting as well as one-on-one interactions, where required. Issues raised by I&APs during the public participation process were documented and are included in this Final EIA Report.

The relevant authorities required to review the proposed project and provide an Environmental Authorisation were consulted from the outset of this study, and have been engaged throughout the project process. The National Department of Environmental Affairs (DEA) is the competent authority for this Project. The Department of Water and Sanitation (DWS), and the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) are noted as key commenting authorities. For a comprehensive list see Chapter 2 and 6.

The Impact Assessment Phase of an EIA serves to assess the impacts identified during the scoping phase. The EIA Phase has been undertaken in accordance with the requirements of sections 24 and 24D of the National Environmental Management Act (NEMA) (Act 108 of 1998), as read with Government Notices R 543 of the 2010 EIA Regulations. The purpose of the Impact Assessment Phase of an EIA is as follows:

- Ensure that the process is open and transparent and involves the Authorities, proponent and stakeholders;
- Address issues that have been raised during the preceding Scoping Phase;
- Assess alternatives to the proposed activity in a comparative manner;

- Assess all identified impacts and determine the significance of each impact; and
- Formulate mitigation measures.

3 SUMMARY OF THE LEGISLATION CONTEXT

The legislative framework applicable to this project is diverse and consists of a number of Acts, Regulations and Treaties which must be complied with. A summary of the key legislation as provided hereunder.

- National Environmental Management Waste Act, Act 59 of 2008
- The National Environmental Management: Air Quality Act No 39 of 2004;
- GN R1179 (GG 16536 of 25 August 1995) – Hazardous Chemical Substances Regulations promulgated in terms of the Occupational Health and Safety Act No 85 of 1993;
- Hazardous Substances Act No 15 of 1973
- Constitution of South Africa, 1996 (with reference to noise)
- Explosives Act No 26 of 1956 and Regulation 1604 of 8 September 1972;
- National Environmental Management Act No 107 of 1998 (with reference to noise and prevention of pollution)
- National Environmental Management: Biodiversity Act No 10 of 2004 (in respect of Fauna, Flora and National Heritage Resources)
- Conservation of Agricultural Resources Act No 43 of 1989 (in respect of Fauna, Flora and National Heritage Resources)
- National Forest Act No 84 of 1998 (in respect of protected trees)
- National Veld and Forest Fire Act No 101 of 1998
- National Heritage Resources Act No 25 of 1999
- Promotion of Access to Information Act No 2 of 2000 (in respect of record-keeping and interested and affected parties and monitoring of environmental impacts)

The process also investigates the consistency of the Hendrina Wet Ash Disposal Facility Extension project with the NEMA Principles as well as with the Equator Principles and those of the International Finance Corporation (IFC) Performance Standards on Social and Environmental Sustainability.

4 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, Bronkhorstspuit and the Middleburg dams (Basson et al., 1997). The 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.

5 IMPACT ASSESSMENT SUMMARY

5.1 Construction phase impacts

During the construction phase, the majority of impacts identified were considered to be of low significance in the event that the appropriate mitigation measures are implemented.

The following impacts were assessed to be of High significance:

- Wet Ash Disposal Facility
 - Agricultural land
 - Loss of agricultural land
 - Surface water
 - Loss of wetland function
 - Altered Hydrology
 - Loss of water resources down stream
 - Heritage
 - Destruction of Heritage sites and features

A total of five (5) impacts related to the construction of the wet ash disposal facility were assessed as having a high significance before the implementation of mitigation measures, and the loss of agricultural land were assessed high before and after mitigation. After the implementation of mitigation measures the intensity levels of all other impacts reduced significantly.

With regards to the construction of the power lines and pipeline there where no impacts that were considered to be of a high significance, the majority where considered either medium or low before the implementation of mitigation measures.

5.2 Operational phase impacts

The following impacts were assessed to be of high significance in the event that mitigation measures are not implemented as required:

- Wet Ash Disposal Facility
 - Surface Water
 - Loss of water resources down stream
 - Changes in natural surface water flow patterns
 - Heritage
 - Destruction of heritage sites and features
 - Social
 - Continued generation of electricity for the national grid

With regards to the Wet ash disposal facility a total of four (4) impacts were assessed as having a high significance before the implementation of mitigation measures. After the implementation of mitigation measures the intensity levels of all impacts dropped, except for the social impact in terms of continued electricity generation, which is considered to be a positive impact.

With regards to the operational phase for the power lines and pipeline there where no impacts that were considered to be of a high significance, the majority where considered either medium or low before the implementation of mitigation measures

5.3 Decommissioning phase impacts

As with the construction and operational phases, the majority of impacts identified associated with the de-commissioning phase were considered to be of low significance in the event that the appropriate mitigation measures are implemented.

No impacts were assessed as having a high significance before the implementation of mitigation measures.

Socio-Economic impacts were not assessed for the de-commissioning phase. It is also anticipated that all environmental impacts will be revisited at power station closure in order to update the impact analysis to take all new information and plans into account.

5.4 Cumulative Impacts

The majority of cumulative impacts identified associated with the project were considered to be of low significance in the event that the appropriate mitigation measures are implemented.

The following impacts were assessed to be of High significance in the even that mitigation measures are not implemented as required:

- Wet Ash Disposal Facility
 - Surface water
 - Loss of wetland function
 - Deterioration of water quality
 - Biodiversity
 - Impacts on SA's conservation obligations and targets
 - Increase in local and regional fragmentation / isolation of habitat

With regards to the wet ash disposal facility a total of four (4) cumulative impacts were assessed as having a high significance before the implementation of mitigation measures. After the implementation of mitigation measures the intensity levels of all impacts dropped.

5.5 Final Conclusions

5.5.1 Air Quality

PM10 concentrations are likely to exceed the NAAQS 2015 limit of 75 µg/m³ for more than 3 km from the source. Impacts from the wet ash disposal facility may be high but with water sprays in place and functioning properly, these impacts will reduce significantly. The potential for impacts at the sensitive receptors will also depend on the wind direction and speed which could not be accounted for in this assessment.

Fugitive dust can easily be mitigated. It is recommended that the dust management measures as stipulated in the EMP be applied to ensure the proposed activities have an insignificant impact on the surrounding environment and human health. It is also recommended that single dust fallout buckets be installed downwind of the tailings dam in order to monitor the impacts from this source.

5.5.2 Ground Water

The main impact on groundwater of the proposed ash disposal facility is likely to be a reduction in water quality beneath the site, and in the vicinity (most likely within a few hundred metres) of the site, if there are leakages from the facility. The numerical model results suggest that the movement of leachate away from the ash disposal facility should take place relatively slowly, with the surface water receiver being the drainage to the north west of the proposed ash disposal facility site. Less serious is the anticipated water table mounding beneath the site and the potential alteration of local groundwater flow directions. The main way to mitigate all of these impacts is to maintain the ash disposal facility in good condition (especially the HDPE liner and the drainage system) and to ensure that only ash slurry is disposed of at the facility. Once the ash disposal facility is decommissioned, it should be re-vegetated and the drainage system maintained to reduce downward movement of leachate. The impact of the construction of the water pipeline diversion or the electricity power lines on groundwater is expected to be minimal, unless spills occur during construction or waste is disposed into the trenches or pits during the construction phase.

It is recommended that the ash disposal facility and leachate control system continue to be maintained after ash disposal has ceased. If possible a layer of top soil should be added to the ash disposal facility on closure to encourage re-vegetation. Monitoring and management of groundwater levels and quality in the vicinity of the ash dam, or as agreed with authorities, should be continued after ash dam closure, and if required the numerical model updated with the new data.

5.5.3 Surface Water

Ash management inherently carries environmental risk, particularly to surface and ground water systems. The extent of the proposed development in relation to the extent of other

uses in the water management area adds to cumulative impacts on the Olifants system. The Olifants system is compromised and any additional strain on surface water ecology should be considered in this light. Thus, the remaining ecological integrity associated with the Woest-Alleenspruit is of particular importance on a catchment scale. However, the surface water study carried out in July 2011 and the follow up study in 2014, indicated that wetlands associated with the study area are in a modified to largely modified state. In light of the PES, retained functionality, EIS and environmental least cost associated with Alternative E, it is the opinion of the specialist that the project can be executed without further impeding ecological integrity of wetlands located outside of the primary study area.

5.5.4 Biodiversity

It is evident that direct impacts associated with the various phases of the project are mostly restricted to the physical activities associated with construction activities and, to some extent, activities associated with the decommissioning phase (rehabilitation). Indirect as well as direct impacts are mostly restricted to the site and immediate surrounds.

The implementation of generic mitigation measures are expected to ameliorate impacts to an acceptable significance. In selected areas, mostly associated with wetland related habitat, will the success of mitigation measures be of a moderate nature.

5.5.5 Avifauna

From an avifaunal perspective, the overhead power-line poses the greatest threat to the majority of the red-listed focal species identified. Furthermore the following conclusions and recommendations are made:

- Habitat destruction and disturbance are impacts that are associated with all activities of the proposed project, however they are not expected to be highly significant should they be mitigated for as per this report and the use of the Construction EMPr.
- Collisions are expected to be the largest impact of this project and thorough line marking is required to mitigate for this, regardless of which line corridor is chosen.
- An “avifaunal walk through” is recommended in order to identify the exact spans of line for marking to mitigate for bird collisions.
- Provided that the high risk sections of line are mitigated in the form of marking, the impact should be contained. The EWT, through its partnership with Eskom and ongoing international networking, is well aware of the room for improvement on the effectiveness of line marking devices. However, it is our view that currently available devices, although not 100 % effective, would provide an acceptable level of mitigation for this project.

- Provided that a bird-friendly monopole structure is used for all new pylon structures in the project, as discussed elsewhere in the report, the impact of electrocution should be contained.

5.5.6 Visual

The construction and operation of the proposed wet ash disposal facility and its associated infrastructure will have an impact on the visual environment especially within, 1km of the proposed site, but also within the greater region.

The wet ash disposal facility would be visible within an area that incorporates certain sensitive visual receptors. Such visual receptors include people travelling along roads, residents of homesteads and settlements and tourists visiting the region.

It is noteworthy that a high level of industrial, mining and electrical infrastructure is already present in close proximity to the proposed site. The Hendrina Power Station and the existing wet ash disposal facilities south east of the proposed site are of particular relevance in this regard, as they render the immediate visual environment already impacted upon. As a result, the visual prominence of the proposed wet ash disposal facility is expected to be absorbed somewhat.

5.5.7 Heritage

The aim of the survey was to locate, identify, evaluate and document sites, objects and structures of cultural significance found within the area in which it is proposed to develop the wet ash disposal facility and the rerouting of existing infrastructure.

The cultural landscape qualities of the region essentially consist of one component. The first is a rural area in which the human occupation is made up of a pre-colonial element (Iron Age) as well as a much later colonial (farmer and industrial) component.

Two cemeteries were identified, one of which would be impacted on by the proposed ash disposal facility.

- Based on current information regarding sites in the surrounding area, all sites known to occur in the study region are judged to have Grade III significance and therefore would not prevent the proposed development from continuing after the implementation of the proposed mitigation measures and its acceptance by SAHRA.

Therefore, from a heritage point of view it is recommended that the proposed development can continue. However, a request that if archaeological sites or graves are exposed during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

5.5.8 Power line Alternatives

The corridors were assessed for the relocation of the three power lines that currently traverse the site. Through the assessment it is clear that on the whole the impacts associated with corridor 3 have a lower significance and is thus considered more preferred. It is recommended that Eskom consider this alternative as the preferred, however it is essential to take the health and safety risks related to working in close proximity to the power lines into account.

6 WASTE MANAGEMENT LICENSE REPORT

In terms of the 2013 Norms and Standards for waste classification, the Hendrina Ash was classified as a Type 3 waste which is a low risk waste. Therefore, it is possible to consider delisting this waste in the future.

The facility is classified as a Class C landfill. Class C landfills are very similar in design to the current G:L:B+ landfills with the major difference being the HDPE layer added to the barrier system which may be considered more appropriate.

More information regarding the Waste Management License is included in **Chapter 10**.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Environmental Impact Statement

The impact assessment phase of this project identified and assessed the potential impacts that the wet ash disposal facility and associated infrastructure may have on the proposed site and on the surrounding areas. Through this assessment mitigation measures have been recommended in order to reduce or eliminate any impacts that were identified.

The EIA has concluded that the legislative requirement to consider alternatives during the EIA process is focussed strongly on feasible and reasonable alternatives that meet the requirements of the proposed project.

In terms of the 'no go' option, it was concluded that if the new wet ash disposal facility was not established it would 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 capacity, 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 newly-build facilities.

A more detailed discussion of the alternatives relative to this project is included in **Chapter 4**.

During the construction phase, the majority of impacts identified were considered to be of low significance in the event that the appropriate mitigation measures are implemented.

As with the construction phase, the majority of impacts identified associated with the operational and decommissioning phases are considered to be of low significance in the event that the appropriate mitigation measures are implemented.

All identified impacts have been based on normal operation conditions and all impacts identified were analysed according the following criteria, a summary of which is included in **Chapter 9**:

- Nature of the impact;
- Extent of the impact;
- Intensity of the impact;
- Duration of the impact;
- Probability of the impact occurring;
- Impact non-reversibility;
- Cumulative impacts;
- Impact on irreplaceable resources; and
- Confidence level.

7.2 Conclusions and Recommendations

In the view of the environmental assessment practitioner that the information contained in this report and the documentation attached thereto will be sufficient for the National DEA to make a decision in respect of the activities applied for with respect to the proposed new Wet Ash Disposal Facility at the Hendrina Power Station.

This EIA provides an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed new ashing facility at the Hendrina Power Station. The findings of the assessment conclude that identified significant impacts can be addressed with relevant mitigation measures, therefore, in the view of the EAP, no environmental fatal flaws should prevent the proposed project from proceeding.

More detailed Geo-technical and Geo-hydrological studies will accompany the Water Use Licence application submission. This should be taken into account when evaluating this submission.

The surface water study carried out in July 2011 indicated that the wetlands associated with the study area are in a modified to largely modified state. In light of the PES, retained functionality, EIS and environmental least cost associated with Alternative E, it is the opinion of the specialist, and supported by the EAP, that the project can be executed without further impeding ecological integrity of wetlands located outside of the primary study area.

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the recommendations from this EIA have been included within an Environmental Management Programme (EMPr) which has been included in **Appendix E**. This EMPr will form part of the contract with the contractors appointed to construct and maintain the proposed infrastructure. The EMPr would be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for key life cycle phases (i.e. construction and operation) of the proposed project is considered to be fundamental in achieving the appropriate environmental management standards as detailed for this project. In addition to this, it is imperative that an approved stormwater management plan is reviewed prior to the start of construction.

It is also recommended that the process of communication and consultation with the community representatives is maintained after the closure of this EIA process, during the construction and operational phases associated with the proposed project.

Eskom Holdings SOC Limited

**Environmental Impact Assessment for the Proposed Expansion of Ash Disposal
Facilities at Hendrina Power Station, Mpumalanga Province**

Environmental Impact Assessment Report

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