Eskom Holdings SOC Limited

FINAL ENVIRONMENTAL IMPACT ASSESSMENT, FOR THE PROPOSED CONTINUOUS DISPOSAL OF ASH AT THE MAJUBA POWER STATION, MPUMALANGA PROVINCE

DEA EIA Reference Number:

14/12/16/3/3/3/53

And

NEAS Ref Number: DEA/EIA/0001417/2012

Date:

November 2014

Report Version:

FINAL

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DOCUMENT DESCRIPTION

Client:	Eskom Holdings SOC Limited
Project name:	Environmental Impact Assessment for the Proposed Continuous of Ash Disposal Facilities at Majuba Power Station, Mpumalanga Province
Report type:	Draft Environmental Impact Assessment Report
Lidwala Project number:	12014KNK
Document number:	Document 1
Authority Reference:	DEA - 14/12/16/3/3/3/53 NEAS - DEA/EIA/0001417/2012
Version:	Final
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EXECUTIVE SUMMARY

1 INTRODUCTION

1.1 Project Background

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.

The coal-fired power generation process results in large quantities of ash, which are disposed of in a dry ash disposal facility (**Figure 1**). This process involves ash being transported from the power station by conveyors and disposed of on an ash disposal facility by means of a stacker.

The proposed development has the following specifications:

Capacity of airspace of 190 million m3; and
Ground footprint of 800 ha: 15 – 65 year

This ash disposal facility will be able to accommodate the ashing requirements of the power station for the next 46 years, to 2060 (these timelines are based on an annual ash production rate of 4.2 million tonnes). All land within a 12km radius of the power station was assessed to identify suitable alternatives for the proposed continuous ash disposal facility, as per the EIA regulations.

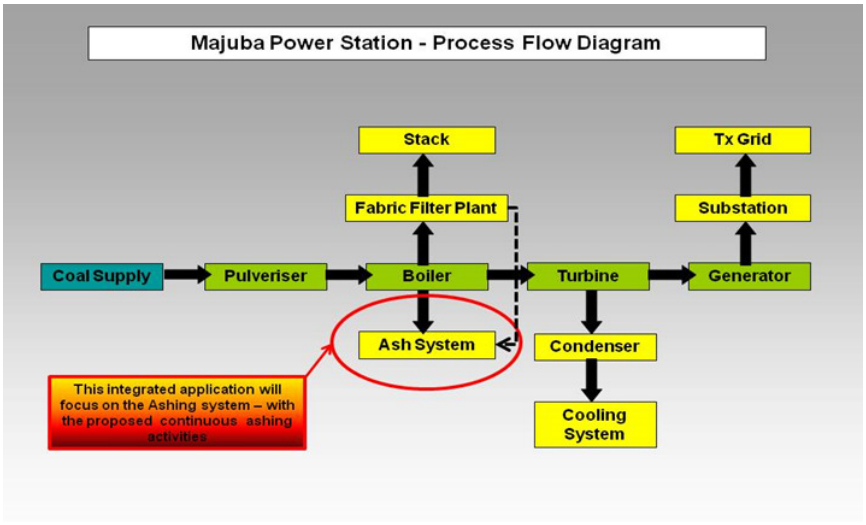

Figure 1: An overview of the activities on site and where this project fits within the process

1.2 Description of the Study Area

Majuba Power Station is located approximately 16 km southwest (SW) of Amersfoort and approximately 40km north-northwest (NNW) of Volksrust in the Mpumalanga Province. The power station falls within the Pixley Ka Seme Local Municipality which falls within the Gert Sibande District Municipality.

A greater part of the study area has agricultural, mining and power generation activities. The proposed study area, utilised in the screening study is a 12 km radius from the source of ash, being the Majuba Power Station Site (**Figure 2 and 3**).

Figure 2: Majuba Power Station forms the centre point of the study area.

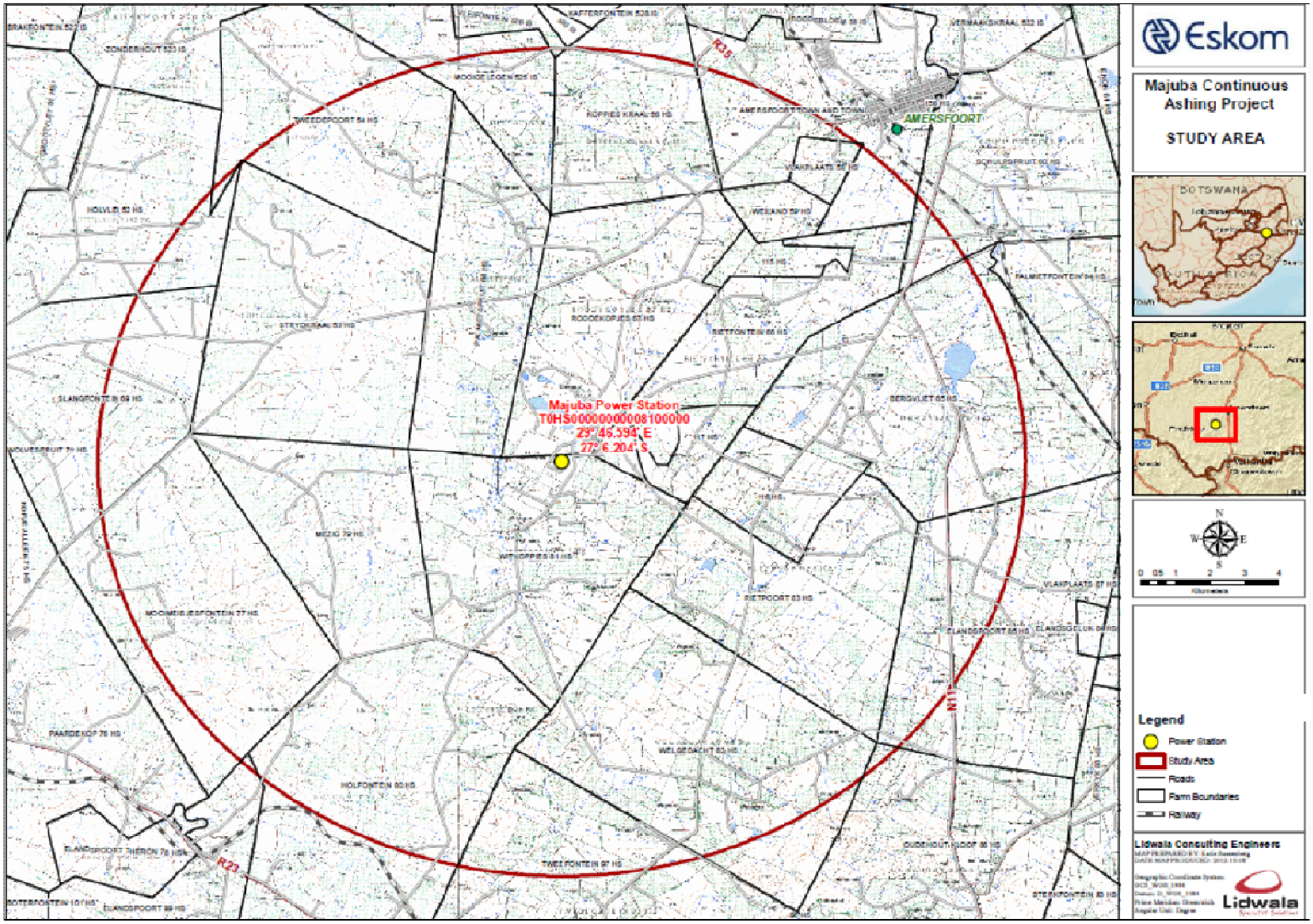

Figure 3: The greater study area overlaid onto a topographical map background

2 PROCESS TO DATE

The Environmental Impact Assessment (EIA) process for the proposed continuous 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
- Consultation and engagement.

More detail on the above is available in **Chapter 3**.

The Draft EIA Report was released for public review and comment from **21 July 2014 to 01 September 2014**. 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. Issues raised by I&APs during the public participation process were documented and 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 Affairs (DWA), and the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) are noted as key commenting authorities. For a comprehensive list see **Chapter 2**.

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 is 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 Majuba Dry continuous Ash Disposal Facility 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 strong undulating character typical of the Mpumalanga province with hills and koppies to the south and east. The natural topography of the area has been disturbed as a result of various mining, agricultural and power generation 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. Severe frost and snow are sometimes experienced. The area also falls within the mist belt.
According to data from the Majuba monitoring station for 2009 – 2011, the mean annual precipitation is approximately 760 mm/year. The study area falls within a summer rainfall region, with over 85% of the annual rainfall occurring during the October to March period. Between October 2011 and March 2012, monthly rainfall ranged between 21 and 128 mm.

Majuba Power Station falls within the Carboniferous to early Jurassic aged Karoo Supergroup. Sediments in this part of Mpumalanga Province fall within the Permian Ecca group which comprises of a total of 16 formations. The study area is underlain by Karoo Supergroup sedimentary rocks of the Vryheid and Volksrust Formations of the Ecca Group. These are largely comprised of sandstone, mudstone, shale, siltstone, and coal seams. The Volksrust Formation is predominantly argillaceous unit with interfingers with the overlying Beaufort Group and underlying Vryheid Formation. Considerable intrusive Karoo dolerite is also mapped in the area.

The study area corresponds to the Grassland Biome as defined by Mucina & Rutherford (VegMap, 2006). This unit is found in the eastern, precipitation-rich regions of the Highveld. Grasslands of these parts are regarded 'sour grasslands'. The following ecological types are represented within the 12km radius (Figure 6.11):

- **Amersfoort Highveld Clay Grassland**- The conservation status is regarded as 'Vulnerable'; none is formally protected. Some 25% of this vegetation type is transformed, predominantly by cultivation (22%). The area is not suited to forestation. Silver and black wattle and Salix babylonica invade drainage areas
- **Bloemfontein Karroid Shrubland**- . None is conserved in statutory conservation areas, but small portions are found on the premises of the Free State National Botanical Garden in Bloemfontein; a 'Least Threatened' status is currently afforded

- **Eastern Temperate Freshwater Wetlands**- A 'Vulnerable' conservation status is ascribed to this unit. Some 15% has been transformed to cultivated land, urban areas or plantations.
- **Soweto Highveld Grassland-**This vegetation type is regarded 'Endangered' with a target of 24%. Only a handful of patches are statutorily conserved, including Waldrift, Krugersdorp, Leeuwkuil, Suikerboschrand and Rolfe's Pan Nature Reserve
- **Wakkerstroom Montane Grassland-** A status of 'Least Threatened' is afforded to these parts; although less than 1% is statutorily conserved in the Paardeplaats Nature Reserve

The study area falls over five quaternary catchments in the Upper Vaal Water Management Area (WMA) with the Majuba Power Station located in C11J .The study area in relation to the National Freshwater Ecosystem Priority Areas (NFEPA) and the Mpumalanga Biodiversity Conservation Plan. Portions of the study area are located in a Freshwater Ecosystem Priority Area (FEPA) and these systems were identified as being in a good condition (NFEPA – Nel et al., 2011) and therefore need to be maintained in order to contribute to the biodiversity of the area. The remainder of the study area is located in an Upstream Management Area. Anthropogenic activities taking place in these areas need to be monitored in order to prevent the degradation of FEPAs and Fish Support Areas located downstream. According to the MBCP (Ferrrar & Lötter, 2007) the study area is located in an "Ecosystem Maintenance" sub-catchment.

The characterisation of the rivers located within the study area showed that with the exception of the Skulpspruit (order two river) all of the remaining associated systems are order one rivers/streams. The Witbankspruit (running along the eastern boundary of the Majuba Power Station), Skulpspruit and the Markgraafspruit are all perennial with the remainder of the systems being classed as non-perennial. Numerous smaller streams are shown in the 1:50 000 river coverage. Non perennial rivers located in drier climates hold different characteristics to those located in wetter climates and function differently to their perennial counterparts (Rossouw et al., 2005). They therefore require focused attention with regards to ecosystem management.

Groundwater storage and transport in the unweathered Volksrust 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 Volksrust Formation is considered to be a minor aquifer, with some abstractions of local importance. A minor aquifer is a moderately-yielding aquifer system of variable water quality. Although these aquifers

seldom produce large quantities of water, they are important for local supplies and in supplying base flow to rivers.

The cultural landscape qualities of the study area essentially consist of a rural setup. In this setup the human occupation is made up of a pre-colonial element consisting of limited Stone Age occupation and a Late Iron Age occupation, as well as a much later colonial (farmer) component

The visual character of the Majuba Power Station and its associated infrastructure is shaped by a unique combination of the following features:

- Grassland;
- An undulating topography with isolated koppies and ridges;
- Perennial and non-perennial streams and isolated dams;
- Cultivated land;
- Majuba Power Station and associated infrastructure (being a visually dominant feature in the area);
- Mining areas;
- Dispersed farmsteads, and
- Roads, including the N11 national road from Amersfoort to Volksrust, arterial routes (R23, R35) and a number of access roads to farms in the region.

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 in the event that mitigation measures are not implemented as required:

- Ash Disposal Facility
  - Agricultural land
    - Loss of agricultural land
  - Surface water
    - Loss in direct wetland integrity and functioning due to erosion
    - Altered Hydrology
    - Impacts on wetland vegetation and disturbance of wetland habitat
  - Biodiversity
    - Loss of species of conservation (Flora and Fauna)
    - Habitat destruction
  - Heritage
    - Destruction of Heritage sites and features

A total of seven (7) impacts related to the construction of the dry ash disposal facility 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 reduced significantly.

With regards to the construction of the pipeline there were 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 majority of the impacts identified, associated with the operational phase 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 event that mitigation measures are not implemented as required:

- Ash Disposal Facility
- Agriculture
  - Loss of agricultural land
- Surface Water
  - Loss of water resources down stream
  - Changes in natural surface water flow patterns
- Heritage
  - Destruction of heritage sites and features
- Biodiversity
  - Impacts on ecological connectivity and ecosystem functioning
  - Indirect impacts on surrounding habitat
- Social
  - Continued generation of electricity for the national grid (Positive)

With regards to dry ash disposal facility a total of four (6) 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 pipeline there were 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

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

- Biodiversity
  - Displacement of fauna species, human-animal conflicts & interactions
  - Impacts on ecological connectivity and ecosystem functioning

Visual

  - Permanent transformation of the landscape

With regards to dry ash disposal facility a total of four (3) 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.

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:

- 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
    - Groundwater
        - Deterioration of groundwater quality due to leachate from ash disposal facility

With regards to the ash disposal facility a total of five (5) 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

The following was concluded from the air quality impact assessment:

- Particulate matter, categorised as dust fall-out, PM10 and PM2.5, was identified as the pollutants of concern.
- Annual average ground-level concentrations of PM10 and PM2.5 simulated by dispersion modelling did not exceed ambient standards.
- Daily limits for PM10 and PM2.5 are expected to be exceeded only within the near vicinity of the facility boundary. Compliance with daily NAAQS (i.e. fewer than 4 days exceeding the applicable limit value) is likely to be achievable with the recommended mitigation measures: rehabilitation and/or dust suppression.
- Effective and continuous application of the mitigation measures will be essential to maintaining compliance with the NAAQS.
- Alternatives Extended A, or individual sites C and D (or the combination of C and D), are the most preferred sites.

5.5.2 Ground Water

The main impact on groundwater of the proposed ash disposal facility (or combination of facilities) is likely to be a reduction in water quality beneath the chosen site, and in the vicinity of the site. If toxic or persistent pollutants are disposed of onto the ash disposal facility then local groundwater pollution will be more serious (it is acknowledged that Eskom do not intend to do this). The numerical model results suggest that the movement of leachate away from the ash disposal facility as a groundwater plume should take place relatively slowly, with plume extents being generally less than 1 km from the ash disposal facility after 150 years. Another impact is the anticipated water table mounding beneath the site and the potential alteration of local groundwater flow directions. The main way to mitigate these impacts is to maintain the ash disposal facility in good condition (especially the drainage system, including toe drains and return water facilities) and to ensure that only ash is disposed of. Runoff water contaminated by the ash leaking into surface drainage systems has the potential to contaminate groundwater at some distance from the ash disposal facility. Once the ash disposal facility is fully decommissioned, topsoil installation and re-vegetation done during operation should be maintained and consolidated to minimise infiltration and to improve runoff quality, and the drainage system maintained to reduce downward movement of leachate from the base of the ash disposal facility. Groundwater monitoring from suitable boreholes as well as the

monitoring of surface water should be done during all phases of ash disposal facility operation, and after closure. If required the numerical model could be updated with new monitoring data.

From a groundwater point of view, none of the five individual alternative ash disposal facility sites has a clear advantage over the others. Sites A and B are marginally preferred since they do not cross a surface water divide. Alternative site A already has existing monitoring infrastructure down-gradient, and considering that there is already pollution present in the vicinity of alternative site A, this may be the best option.

5.5.3 Surface Water

Conservation preference is often given to systems purely on the bases of their PES. However, larger wetland systems, draining bigger catchments warrant conservation preference, especially if they are longitudinal systems. Wetlands 3, 7, 16 and 29 have been identified as more important wetlands. The most significant perceived impacts will result in a loss in downstream functional integrity and water pollution in these systems. The severity and probability of these impacts relate predominantly to the extent of impairment to Wetlands 3, 7, 16 and 29. This being said, smaller more isolated systems which retain a good PES are also important and residual impacts to these systems should be avoided as far as possible.

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 associates with the decommissioning phase (rehabilitation). Indirect as well as direct impacts are mostly restricted to the site and immediate surrounds.

The implementation of generic and site specific 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, and should they be mitigated for as per this report and the use of the Construction EMP.
- Should any of the focal species be found to be nesting, breeding or roosting on the site, during any future phase, the EWT should be contacted for further instruction.

5.5.6 Visual

The visual quality of the receiving environment has been modified by views of the power station and associated infrastructure, which includes the existing ash disposal facility south of the power station. The power station dominates views in the foreground and middle ground, with the ash disposal facility less visible and largely integrated into the topography of the area.

The severity of impact is influenced by the perception of viewers, which is assumed to be neutral. The visual absorption capacity of the environment is assessed to be sufficient to integrate the facility into the existing landscape, provided the continued rehabilitation of the facility is implemented as a mitigation measure.

5.5.7 Heritage

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

The following heritage sites were identified in the study area:

- A number of old farmstead and associated outbuildings occur sporadically over the larger area. Central to all is the farmhouse with associated outbuildings and in some cases, associated features such as stock enclosures, sheep dips, etc. located some distance away.
- A number of farm labourer homesteads occur sporadically on some of the alternatives.

- A number of informal cemeteries/burial sites occur sporadically over the larger area.

According to present understanding, some of the identified sites, features or objects of cultural significance would be impacted on by the proposed development. Fortunately, all the identified sites are judged to have Grade III heritage significance and would therefore not prevent the proposed development from continuing on any of the five alternatives as well as in the proposed conveyor routes

Based on an analysis of available information and the field survey, it is our opinion that all five Alternatives would be suitable for the development of the continuous ash disposal facility as well as the proposed conveyor routes.

6 WASTE MANAGEMENT LICENSE REPORT

An Ash classification assessment has been performed according to the DEA's Waste Classification and Management Regulations – August 2013. Based upon this, the liner type has been identified and this was incorporated into the Conceptual Design.

Although the DEA's Waste Classification and Management Regulations (August 2013), waste classification system is currently the official waste classification system, the ash sample was also classified in terms of the DWA Minimum Requirements as this was the applicable system at the time of the Ash Classification study. The classification in terms of the Minimum Requirements have been summarised and provided as background.

Based on the analytical results obtained from the distilled water leach and total concentration analyses performed on the ash, the ash sample is classified as a Type 3 waste requiring disposal on a waste disposal facility with a Class C barrier system provided there are no site specific risks that require a more conservative barrier system. Please see the Specialist Ash Classification report for further detail **Appendix K**.

The Type 3 waste classification was the result of the Leachate Concentration (LC) value of chromium VI and molybdenum concentrations exceeding their respective LC0 values, and the Total Concentration (TC) values of arsenic (As), barium (Ba), molybdenum (Mo) and fluoride (F) exceeding their respective TC0 concentration values (**Chapter 10**).

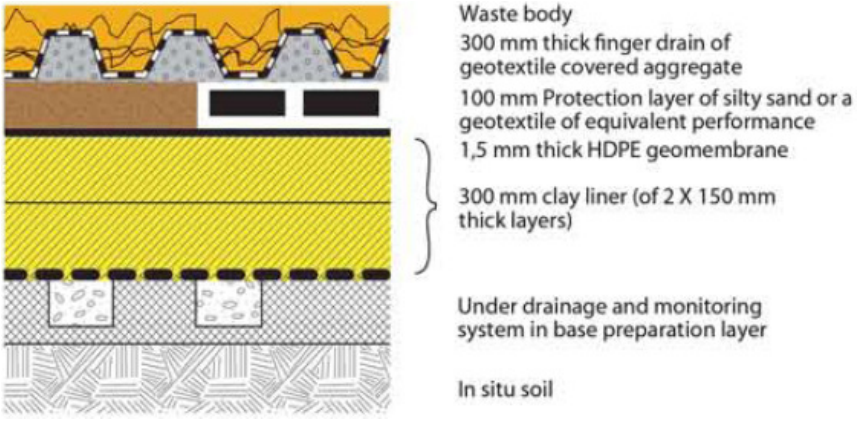

Figure 4: Class C Liner System

As a results of certain practical limitations Eskom would like to apply for an extension for the implementation of the Class c liner system until 2019. The detailed motivation for this request as well as the implementation plan are included as (**Appendix X**).

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Environmental Impact Statement

The impact assessment phase of this project identified and assessed the potential impacts that the proposed continuous ash disposal facility and associated infrastructure may have on the proposed site and on the surrounding areas. Through this assessment, mitigation measures have been suggested 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, was focused strongly on feasible and reasonable alternatives that meet the requirements of the proposed project. The determination of the preferred alternative was based solely on Environmental considerations.

In terms of the 'no go' option, it was concluded that if the proposed continuous 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 shut down the power station due to the lack of area for ash disposal, causing a long term reduction in electricity supply. It is important to note that the additional power output from Majuba Power Station is still required to meet the national demand irrespective of the newly-build facilities (Medupi and Kusile).

A more detailed discussion of the alternatives relative to this project is included in **Chapter 7**.

Most of the impacts with high significance during the construction phase could be mitigated to medium and low during the operational and de-commissioning phase. It is critical that the proposed mitigation measures be included in any possible authorisation.

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.

In the view of the EAP, that once final, 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 continuous Ash Disposal Facility for the Majuba Power Station.

This EIA provides an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed continuous ashing facility for the Majuba 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.

The surface water study indicated that the wetlands associated with the study area are in a modified to largely modified state. In light of the present ecological state (PES), retained functionality, EIS and environmental least cost associated with Extended Alternative A, 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. This statement and opinion is support by the EAP provided that the activity is authorised through the Department of Water Affairs (Water Use Licence).

In order to achieve appropriate environmental management standards and ensure that the mitigation from 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 D. This EMPr must 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 Majuba Power Station, Mpumalanga Province

Draft Environmental Impact Assessment Report

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