ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT SUMMARY

FOR

MEDUPI FLUE GAS DESULPHURISATION (FGD) RETROFIT PROJECT

COUNTRY – SOUTH AFRICA

JUNE 2018
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>NEMA</td>
<td>National Environmental Management Act</td>
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<tr>
<td>NEMA</td>
<td>National Environmental Management Act, No 107 of 1998</td>
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<td>NEM:AQA</td>
<td>National Environmental Management: Air Quality Act, No 39 of 2004</td>
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<tr>
<td>NWMS</td>
<td>National Waste Management Strategy</td>
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<td>NSS</td>
<td>Natural Scientific Services</td>
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<td>NSRs</td>
<td>Noise Sensitive Receptors</td>
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<tr>
<td>SOx</td>
<td>oxides of sulphur</td>
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<tr>
<td>PCD</td>
<td>Pollution Control Dam</td>
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<td>PES</td>
<td>Present Ecological State</td>
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<td>ROD</td>
<td>Record of Decision</td>
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<td>SWP</td>
<td>Save Working Procedures</td>
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<td>SEWs</td>
<td>Semi-Ephemeral Washes</td>
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<tr>
<td>SDBIPs</td>
<td>Service Delivery and Budget Implementation Plans</td>
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<td>SIA</td>
<td>Social Impact Assessment</td>
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<td>SLM</td>
<td>Sound Level Meter</td>
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<td>SACNASP</td>
<td>South African Council for Natural Scientific Professionals</td>
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<td>SANS</td>
<td>South African National Standards</td>
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<td>SAWS</td>
<td>South African Weather Services</td>
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<td>SDF</td>
<td>Spatial Development Framework</td>
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<td>SWMS</td>
<td>Storm Water Management System</td>
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<td>SIP</td>
<td>Strategic Infrastructure Projects</td>
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<td>SO2</td>
<td>sulphur dioxide</td>
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<td>SO3</td>
<td>sulphur trioxide</td>
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<td>ToR</td>
<td>Terms of Reference</td>
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<td>PM10</td>
<td>Thoracic particulate matter with an aerodynamic diameter of equal to or less than 10 µm</td>
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<tr>
<td>t/a</td>
<td>tons per annum</td>
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<td>TOC</td>
<td>Total Organic Carbon</td>
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<td>TIA</td>
<td>Traffic Impact Assessment</td>
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<td>TFR</td>
<td>Transnet Freight Rail</td>
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<td>VIA</td>
<td>Visual Impact Assessment</td>
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<td>V</td>
<td>volt</td>
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<td>WDF</td>
<td>Waste Disposal Facility</td>
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<td>WML</td>
<td>Waste Management License</td>
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<td>WWHC</td>
<td>Waste Water Hydrocyclone</td>
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<td>WWTP</td>
<td>Waste Water Treatment Plant</td>
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<td>WMA</td>
<td>Water Management Area</td>
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<td>WRCS</td>
<td>Water Resource Classification System</td>
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<td>WULA</td>
<td>Water Use License Application</td>
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<td>WBPA</td>
<td>Waterberg-Bojanala Priority Area</td>
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<td>WFGD</td>
<td>Wet Flue Gas Desulphurisation</td>
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<td>WHO</td>
<td>World Health Organisation</td>
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1.0 INTRODUCTION
Medupi Power Station is a greenfield coal-fired power station that forms part of the Eskom New Build Programme. Medupi Power Station has an installed generation capacity of 6 x 800 MW units and utilizes a supercritical boiler and turbine technology designed to operate at higher temperatures and pressures, which allows for better efficiency of the power station. The result is an improvement of approximately 2 percentage points on the plant efficiency which equates to a reduced coal consumption of approximately 1 million tons per annum.

Electricity is generated in coal-fired power stations through combustion of coal. Coal is composed, primarily, of carbon along with variable quantities of other elements, chiefly hydrogen, sulphur, oxygen, and nitrogen. When coal is burned, the sulphur combines with oxygen to form, amongst other, sulphur dioxide (SO2) and sulphur trioxide (SO3). Due to the detrimental impact of high SO2 concentrations associated with coal fired-power stations stringent air quality regulations have been implemented worldwide to combat the emissions sulphur oxides (SOx).

Flue Gas Desulfurization (FGD) is a technology used to remove SO2 from flue gases of fossil- fuel power plants, and from the emissions of other sulphur oxide emitting processes. Medupi Power Station is designed and constructed to be wet FGD ready, utilizing limestone as a sorbent as per its Environmental Authorization.

Project description
The development site is located within the existing Medupi Power Station footprint. The proposed project will comprise the installation of Wet Process FGD system with a Gas-cooler at the Medupi PS, and will be procured under the following packages:

• Supply of equipment for six Absorber Units (one per unit of Medupi PS),
• Limestone Slurry Preparation, and for Gypsum Dewatering (CP-1);
• Civil Works and Installation of equipment under CP-1 ( CP-2);
• Supply and Installation of Distributed Control System –DCS (CP-3);
• Supply and Installation of Power Supply System (CP-4)
• Supply and Installation of Waste Water Treatment Plant (CP-5)
• Rail and Materials Handling Systems for Limestone Supply and Gypsum Disposal ( CP-
• Civil Works for CP3, CP4, CP5, CP6 (CP-7)
• Engineering and Construction Supervision Services (CP8)

The FGD units will be installed in a cluster arrangement with 3 FGD units linked to one stack/chimney of the Medupi PS. The Medupi PS is designed with two stacks/chimneys. Each FGD unit will be placed between the ash removal system (filter bag) and the stack. The proposed Medupi FGD system does not only encompass the construction and operation of the FGD plant, but also include a number of associated services and infrastructure aimed at managing the transportation and handling of input material required to make the system work. The FGD process also deals with the management of waste and by-products resulting from the operation of the FGD plant and associated infrastructure.

2.0 POLICY LEGAL AND ADMINISTRATIVE FRAMEWORK

The proposed project interventions are classified as Category 1 in accordance with the Bank’s Integrated Safeguards System and the Environmental and Social Assessment Procedures. The design, implementation and monitoring and evaluation modalities for the project have been informed by the Bank’s environmental and social policies and guidelines. Considerations are premised on expectations for assessing and addressing environmental and social impacts in line with the Bank’s Integrated Safeguards System (ISS -2013). The overarching goal of the Banks ISS is to preserve and enhance the ecological capital and life-support systems across the continent. Based on the projects planned activities and the fact that the project will not trigger involuntary resettlement, only OS1, OS3, OS4, and OS5 out of the five Operational Safeguards (OS) embedded in the ISS are considered and triggered, and these are;

• Operational Safeguard 1: Environmental and social assessment, which is the overarching Operational Safeguard that mainstreams environmental and social considerations in all Bank operations. As a category 1, a full ESIA is required for this project.
• **Operational Safeguard 3:** Biodiversity, renewable resources and ecosystem services which reflects the objectives of the Convention on Biological Diversity to conserve biological diversity and promote the sustainable management and use of natural resources.

• **Operational Safeguard 4:** Pollution prevention and control, hazardous materials and resource efficiency, which is intended to achieve high quality environmental performance, efficient and sustainable use of natural resources, over the life of a project

• **Operational Safeguard 5:** Labour conditions, health and safety that basically protects workers right.

### 2.2. National Policy, Legal and Administrative Framework

Over the years South Africa has undertaken several legal and institutional reforms to improve the country ability to manage the environment and ensure a sustainable development process. A detailed analysis of the countries Policy, Legal and Administrative Framework, relevant to this project is included in the full EIR which was submitted to the Bank for consideration and clearance. This part of the ESA summary is intended to provide a brief account of key environmental legislation which may have bearing on the proposed project. Attention is paid to the National Environmental Management Act, No 107 of 1998 (NEMA). NEMA is regarded as South Africa’s Environmental Management Framework Act. Also included is an overview of sector specific environmental acts which govern specific elements or project activities and the relevance on the proposed project will also be provided.

**The Constitution of the Republic of South Africa, 1996 (Act No. 108 Of 1996):** The Constitution of the Republic of South Africa, 1996 is the Supreme Law in South Africa. The Bill of Rights is included in Chapter 2 of the Constitution. The Environmental Right is set out in Section 24 of the Constitution and states that everyone has the right to an environment that is not harmful to their health or well-being; and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures while promoting justifiable economic and social development.

**National Environmental Management Act, 1998 (Act No. 107 of 1998):** The National Environmental Management Act, No. 107 of 1998 (NEMA), as amended, is the primary statute which gives effect to Section 24 of the Constitution. The Environmental Right contained in Section 24 of the Constitution also places responsibility on the EAP, Applicant and Competent Authority to ensure that this right is not infringed upon. The Sector Guidelines for Environmental Impact Assessment (2010) (Government Notice 6541) describe several responsibilities which are placed on the EAP, Applicant and Competent Authority to ensure conformance with the statutory Environmental Right.

**Environmental Impact Assessment Regulations, 2010:** Because the Medupi FGD project was initiated and registered with the DEA in 2013, the EIA was carried out in accordance with the (then active) EIA Regulations of 2010. This set of regulations (GN R 543 – 545) has subsequently been repealed by the EIA Regulations of 2014 (GN R982 – 985), as amended by GNR 325 - 327 (2017). Appendix A of the DEIR contains the amended EIA Application Form for the Medupi FGD project. The Medupi FGD complex includes activities which triggered activities listed in the EIA Regulations Listing Notice 2 (GN R 545), therefore requiring Environmental Authorization before they may be initiated. The proposed activities prompt a full Scoping and Environmental Impact Reporting Process.

**National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004):** The National Environmental Management Air Quality Act, No 39 of 2004 (NEM:AQA) is focused on holistic and integrated effects-based air quality management. It aims to manage adverse impacts of air pollution on the ambient environment and sets standards for pollutant levels in ambient air. At the same time it sets emission standards to minimize the amount of pollution that enters the environment.

**Minimum Emission Standards:** Activities associated with the MPS trigger the Listed Activity - Category 1: Combustion Installations in terms of Government Gazette No. 37054 published on 22 November 2013, under the NEM:AQA. Additional Listed Activities that will be undertaken at the Medupi Power Station include Subcategory 2.4: Storage and Handling of Petroleum Products and Subcategory 5.1: Storage and Handling of Coal and Ore, and has also been licensed under the existing AEL. The minimum emissions standards it is understood that the MPS would have to comply with “existing plant” standards until 1 April 2020, where the more stringent “new plant” standards would be applicable, i.e. compliance with SO2 levels below 500mg/Nm³ under normal conditions of 10% O2, 273 K and 101.3 kPa.

**National Ambient Air Quality Standards for Criteria Pollutants:** The air quality guidelines and standards are fundamental to effective air quality management, providing the link between the source
of atmospheric emissions and the user of that air at the downstream receptor site. The ambient air quality standards are intended to provide safe hourly, daily and annual exposure levels for the majority of the population, including the very young and the elderly, throughout an individual’s lifetime. The National Ambient Air Quality Standards (NAAQS) were determined based on international best practice for PM$_{2.5}$, PM$_{10}$, SO$_2$, NO$_2$, carbon monoxide (CO), ozone (O$_3$), lead (Pb) and benzene (C$_6$H$_6$).

**Waterberg-Bojanala Priority Area:** The Medupi Power Station falls within the Waterberg-Bojanala Priority Area. Under the NEM:AQA, airshed priority areas can be declared where there is concern of elevated atmospheric pollutant concentrations within the area. The DEA identified the potential of an airshed priority area in the vicinity of the Waterberg District Municipality (Government Gazette, Number 33600; 8 October 2010). This was later expanded to include the Bojanala Platinum District Municipality, North-West Province (Government Gazette, Number 34631; 30 September 2011) and the Waterberg-Bojanala Priority Area (WBPA) was officially declared on 15th June 2012 (Government Gazette, Number 35435).

**The National Environmental Management Waste Act, 2008 (Act No. 59 of 2008):** All Waste Management Activities are regulated by the National Environmental Management Waste Act, No. 59 of 2008 (NEM:WA), as amended, and the regulations thereunder. In order to regulate waste management activities and to ensure that they do not adversely impact on human health and the environment, the NEM:WA introduced a licensing process for the assessment and authorization of waste management activities which will be adhered to by this project.

**The National Water Act, 1998 (Act No. 36 of 1998):** The activities associated with the proposed Medupi FGD Retrofit project trigger a number Water Uses that are defined in Section 21 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) (refer to Table 5-3). Accordingly, these Water Uses may not be undertaken without being granted a Water Use License from the DWS.
2.3. Additional Legislative Requirements

Several additional legislation and guidelines may have a bearing on the proposed Medupi FGD Retrofit project. Although authorization in terms of these various acts may not necessarily be mandatory the requirements of these acts have been considered.

<table>
<thead>
<tr>
<th>Act, Policies, Programmes and Guidelines</th>
<th>Relevance to project</th>
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<tbody>
<tr>
<td>National Heritage Resources Act, 1999 (Act No. 25 of 1999)</td>
<td>Relevant sections include Section 34: Structures. Structures which are older than 60 years may not be demolished without a permit issued by the relevant provincial Heritage Resources Authority. No structures older than 60 years were recorded in the Heritage Impact Study.</td>
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<td>National Heritage Resources Act, 1999 (Act No. 25 of 1999)</td>
<td>Relevant sections include Section 35: Archaeology, palaeontology and meteorites. The findings of the Heritage Impact Study indicated that the possibility of finding fossils of a specific assemblage zone either in outcrops or in bedrock on the site could not be ruled out. It is likely that the fossils may be present on the site and the probability of finding fossils during the excavation phase is high. Any archaeological or paleontological objects that are found on the site, must be reported to the provincial Heritage Resources Authority. The discovered archaeological or paleontological objects may not be removed from its original position and damaged, destroyed or altered prior to a permit being issued by the heritage resources authority.</td>
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<tr>
<td>National Heritage Resources Act, 1999 (Act No. 25 of 1999)</td>
<td>Relevant sections include Section 36: Burial grounds and graves. Any graves that are discovered may not be destroyed, damaged, altered, exhumed or removed from its original position without a permit issued by SAHRA or a provincial heritage resources authority.</td>
</tr>
<tr>
<td>National Heritage Resources Act, 1999 (Act No. 25 of 1999)</td>
<td>Relevant sections include Section 38(1)(c): Heritage Resource Management. As the proposed development area may exceed 5000 m², with the submission of the Heritage Impact Assessment to SAHRA, the responsible heritage resources authority has been notified of the project and provided with information relating to the project. Authorization to proceed with the development is required from SAHRA.</td>
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<tr>
<td>Hazardous Substance Act, 1973 (Act No. 15 of 1973)</td>
<td>Provides for the definition, classification, use, operation, modification, disposal or dumping of hazardous substances, e.g. the storage and handling of diesel on site.</td>
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<td>National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)</td>
<td>Relevant sections include Section 53(1) and Section 53(2). The National Environmental Management: Biodiversity Act, No 10 of 2004 (NEM:BA) is aimed at protecting threatened ecosystems amongst other. This list is</td>
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<tr>
<td>Act, Policies, Programmes and Guidelines</td>
<td>Relevance to project</td>
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<td>National Environmental Management Protected Areas Act, 2003 (Act. 57 of 2003)</td>
<td>The NEM:PA Act is focused on the protection and conservation of ecologically viable areas representative of South Africa’s biological diversity and its natural landscapes and seascapes, and addresses, inter alia: The protection and conservation of ecologically viable areas representative of South Africa’s biological diversity and its natural landscapes and seascapes; The establishment of a national register of all national, provincial and local protected areas; The management of those areas in accordance with national standards; Inter-governmental co-operation and public consultation in matters concerning protected areas.</td>
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<td>Water Services Act, 1997 (Act 108 of 1997)</td>
<td>This Act provides for, among other things, the effective water resource management and conservation.</td>
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<tr>
<td>Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)</td>
<td>Relevant sections include Section 6. Provisions included in the act regarding the implementation of control measures for alien and invasive plant species must be adhered to. This act furthermore allows the control and prevention of veld fires through prescribed control measures.</td>
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<tr>
<td>National Forests Act (No 84 of 1998) and regulations</td>
<td>Relevant sections include Section 7. No person may cut, disturb, damage or destroy any indigenous, living tree in a natural forest, except in terms of a license issued under section 7(4) or section 23; or an exemption from the provisions of this subsection published by the Minister in the Gazette. Relevant sections include Sections 12-16. These sections deal with protected trees, with the Minister having the power to declare a particular tree, a particular group of trees, a particular woodland, or trees belonging to a particular species, to be a protected tree, group of trees, woodland or species. In terms of section 15, no person may cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a license granted by the Minister.</td>
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<td>Infrastructure Development Act, 2014 (Act No. 23 of 2014)</td>
<td>Relevant sections include Sections 7 – 8, and Schedule 1 and 3. This Act provide for the facilitation and co-ordination of public infrastructure development of significant economic or social importance to the Republic, and to ensure that infrastructure development in the Republic is given priority in planning, approval and implementation. This Act identifies the development of power generation facilities as Strategic Infrastructure Projects (SIP) that must be fast-tracked to ensure realization of socio-economic benefits.</td>
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<tr>
<td>National Road Traffic Act (Act No. 85 of 1993) (NRTA) and National Road Traffic Regulations, 2000 (GN R225, 17 March 2000) (NRTR)</td>
<td>Relevant sections include Chapter VIII of NRNR. Notwithstanding the conformance relating to driver fitness, vehicle fitness, adherence to road traffic signals and vehicle load transport regulations, Chapter VIII of the NRTR stipulated regulations for the transportation of dangerous goods and substances by road. Fuel, chemicals and hazardous substances will be transported to and from the MPS during construction and operation phases.</td>
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<tr>
<td>Act/Plan/Strategy</td>
<td>Description</td>
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<td>Fencing Act (No 31 of 1963)</td>
<td>Relevant sections include 17. Any person erecting a boundary fence may clean any bush along the line of the fence up to 1.5 meters on each side thereof and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to protection of flora.</td>
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<tr>
<td>Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)</td>
<td>Relevant sections include Section 8. General duties of employers to their employees. Relevant sections include Section 9. General duties of employers and self-employed persons to person other than their employees.</td>
</tr>
<tr>
<td>Hazardous Substances Act (No 15 of 1973) and regulations</td>
<td>Regulates the classification, use, operation, modification, disposal or dumping of hazardous substances.</td>
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<td>National Development Plan 2030 (NDP)</td>
<td>The National Development Plan aims to eliminate poverty and reduce inequality by 2030, through amongst others, accelerated economic growth. Security in power supply is critical for this to happen therefore development of the Medupi Power Station is key.</td>
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<tr>
<td>NEM:WA: National Waste Management Strategy (GN 344 of 4 May 2012)</td>
<td>The objects of the NEM:WA and National Waste Management Strategy (NWMS) are structured around the steps in the waste management hierarchy, which is the overall approach that informs waste management in South Africa. The waste management hierarchy consists of options for waste management during the lifecycle of waste, arranged in descending order of priority: waste avoidance and reduction, re-use and recycling, recovery, and treatment and disposal as the last resort. It is therefore necessary to consider the re-use and recycling of all waste produced by MPS, especially marketable waste such as precious metal.</td>
</tr>
<tr>
<td>Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003)</td>
<td>This Act repealed the former Lebowa, Gazankulu, Venda and Northern Province Acts and the Nature Conservation Ordinance (Ordinance 12 of 1983). It provides the lists for Protected and Specially Protected species under Schedule 2, 3 and 12 as well as the stipulation for permit applications to remove these species. In addition it gives protection measures for the terrestrial and aquatic biota and systems. Schedule 9 lists aquatic plant species that are prohibited in the province.</td>
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<tr>
<td>Lephalale Local Municipality Final Integrated Development Plan (IDP) 2017/2018</td>
<td>The Integrated Development Planning is regarded as a tool for municipal planning and budgeting to enable municipalities to deliberate on developmental issues identified by communities. The Lephalale LM IDP recognizes the vast socio-economic benefits that could be generated from the development and operation of the MPS. However, the development of the power station has also put tremendous pressure on the Municipality for the provision of more potable water, electricity, expansion of waste water treatment systems, and provision of acceptable transportation routes.</td>
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<td>Lephalale Local Municipality Draft Spatial Development Framework (SDF) – May 2017</td>
<td>The Lephalale LM Draft SDF recognizes the importance of the construction of the MPS and has highlighted the need to develop a multi modal transport network to optimize the movement of people and goods between nodes in the province to amongst other, the MPS.</td>
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<td>Document</td>
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<td>Lephalale Local Municipality By-laws</td>
<td>Relevant bylaws include Waste Management By-law and Waste Management By-laws Offences and Fines.</td>
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<tr>
<td>White Paper on Environmental Management Policy for South Africa (1998)</td>
<td>Through this Policy, Government undertakes to give effect to the many rights in the Constitution that relate to the environment.</td>
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<tr>
<td>National Biodiversity Strategy and Action Plan (NBSAP)</td>
<td>The development of the NBSAP is part of South Africa’s obligations as a signatory to the CBD, and was compiled by the Department of Environmental Resources.</td>
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<td>National Aquatic Ecosystem Health Monitoring Program (NAEHMP) &amp; River Health Program (RHP)</td>
<td>The NAEHMP is a national programme managed by DWS’s Resource Quality Services with support from the Water Research Commission (WRC), the Council for Scientific and Industrial Research (CSIR) and various regional and provincial authorities. The overall purpose of the NAEHMP is to provide ecological information for South African rivers and the broader aquatic ecosystems required to support the rational management of these systems. The best-known component of the NAEHMP is the RHP.</td>
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<td>National Freshwater Ecosystem Priority Areas (NFEPA)</td>
<td>The NFEPA project is a multi-partner project between CSIR, South African National Biodiversity Institute (SANBI), Water Research Commission (WRC), Department of Water Affairs (DWA), Department of Environmental Affairs (DEA), Worldwide Fund for Nature (WWF), South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks).</td>
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<tr>
<td>National Water Resource Strategy (NWRS) 2</td>
<td>The NWRS2 (DWA 2013) builds on the first NWRS published in 2004. The purpose of the NWRS2 is to ensure that national water resources are protected, used, developed, conserved, managed and controlled in an efficient and sustainable manner towards achieving South Africa’s development priorities in an equitable manner over the next five to 10 years.</td>
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<td>Limpopo Conservation Plan version 2, 2013</td>
<td>This conservation plan is consistent with NEMA principles and the NEMBA. It is designed to support integrated development planning and sustainable development by identifying an efficient set of CBAs that are required to meet national and provincial biodiversity objectives, in a configuration that is least conflicting with other land uses and activities. Where alternatives are available, the CBAs are designed to avoid conflict with existing IDPs, EMFs and SDFs in the region by favoring the selection of sites that are least conflicting with other land-uses.</td>
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3.0. THE NEED AND JUSTIFICATION OF THE PROJECT

The objective of retrofitting the Flue Gas Desulfurization (FGD) at Medupi is to achieve sustainable improvement in ambient air quality in the Limpopo Province through a reduction of SO2 emissions from the Medupi PS in line with the Government policy to meet the energy needs of South Africa in an environmentally sustainable manner.

The installation of the FGD will bring the Medupi PS into compliance with national emissions standards, as well as with the Bank’s pollution abatement guidelines for solid fuel-fired power plants. The Bank intervention would assist Government and Eskom to achieve this objective. In addition, the FGD project would enable knowledge and technology transfer, which could lead to manufacturing of FGD equipment, and job creation. The gypsum by-product of the FGD system will fill the existing supply deficit for its use in the construction industry. The proposed project is consistent with the Bank strategy to promote growth that is socially inclusive and environmentally sustainable. The project directly addresses one of the complaints that form part of the ongoing Medupi Independent Review Mechanism process. The complaint stated that “Communities living near the Medupi plant will bear the burden of hidden costs, including health impacts from air pollution, elevated Sulphur dioxide (SO2), levels, and mercury residues in their water, air and land; constrained access to water; and livelihood impacts from degradation of land and water in the largely agrarian area”. The project will not only reduce SO2 emissions but through the proposed installation of gas cooler also result in water savings in a region that is otherwise water scarce. In the meantime preliminary project activities and arrangement of finance has commenced on the Makolo Water Augmentation Scheme following the Government disbursement of funding (R30 million) for the social component. The project will supply water to operate the last three FGD units. The updated schedule shows availability of water one month ahead of installation.

4.0 PROJECT ALTERNATIVES

4.1 FGD Technology Alternatives

Eskom commissioned a cost benefit analysis of the Wet FGD, Dry FGD – Circulating Fluidized Bed (CFB) technology, and Wet FGD with flue gas cooling technology. This report was finalized on 9 January 2018 and the reader is encouraged to seek more information as included as Appendix C-1 to the main Environmental Impact Report. Conclusions from the analysis are summarized in the following sections.

**Wet FGD (WFGD):** The Wet FGD has a long history of application to fossil fuel power plants in units of all sizes, and remains the predominant process utilized today. It has high removal efficiency on high sulphur coals and only requires a single absorber vessel per boiler. There is generally a wastewater stream created that will require further processing. The amount of water used in Wet FGD is higher than a Dry FGD-CFB technology. A further benefit of the implementation of WFGD technology is that it has the potential to contribute to the broader socio-economic development of Lephalale and its surrounding areas due to WFGD flexibility of using lower quality limestone that can be sourced from areas closer to the power station, which is not the case with the DFGD systems. The WFGD technology also has the advantage of being adaptable to water use efficiency technology including the dry cooling technology and zero liquid effluent discharge policy that has been initiated by ESKOM. Once completed Medupi will be the largest dry-cooled power plant in the world. The implementation of dry cooling reduces the water consumption from approximately 2 l/kWh to 0.14 l/kWh.

**Dry FGD-CFB (DFGD):** The Dry FGD-CFB has been used extensively around the world and is based on using a mix of lime, water, and fly ash-laden flue gas in a reactor to remove the sulphur dioxides from the boiler flue gas stream. There is no waste water stream created by this process, however the fly ash generated in the process will require disposal to landfill. This technology is limited to power plant sizes of 450MW and is best suited for medium Sulphur coals. While the DFGD technology is marginally more water efficient than the WFGD, the DFGD technology has a higher (9%) capital cost and higher (53%) operational cost when compared to the WFGD.

**Wet FGD with Flue Gas Cooling Technology:** The implementation of WFGD with flue gas cooling has the potential to reduce the water consumption associated with WFGD. However, this will pose significant practical challenges in terms of the operations and maintenance needs of the gas cooler infrastructure as indicated through a benchmarking exercise against 3 other power stations in Europe and China. In addition...
to higher capital costs, the flue gas cooling technology will also reduce the power output from the power plants and invariably increase the CO2 per megawatt output of the plant. For these reasons, the WFGD with flue gas cooling and the DFGD are not considered as feasible options at Medupi.

The alternative analysis therefore concluded that the installation of WFGD without gas cooler technology as the only feasible alternative suitable for the conditions at Medupi Power Station.

4.2. Design and layout alternatives: Rail yard
The placement of the rail yard infrastructure and associated infrastructure is constrained by the space available at the proposed location. The design and layout of the proposed rail yard has therefore already been optimized to maximize the use of available space while dealing with the alignment constraints of connecting to existing and already operational infrastructure. As such no design or layout alternatives could be considered for the proposed rail yard infrastructure and associated infrastructure.

5.0. DESCRIPTION OF THE PROJECT ENVIRONMENT
An overview of the receiving environment is summarized in the sections below. It must however be noted that the FGD retrofit activities, besides the proposed area where the rail yard and associated structures will be constructed, will occur predominantly within an impacted footprint of MPS. A bird’s eye view of the construction at the MPS is provided in Figure 1 below. Construction has, however, progressed at the MPS since this photograph was taken.

![Figure 1: Photograph of the construction of the MPS](image)

5.1. Natural Environment

5.1.1. Climate
The climatic regime of the Lephalale area is characterized by hot summers and mild winters. The long-term annual average rainfall is 485 mm, of which 420 mm falls between October and March. The area experiences high temperatures, especially in the summer months, where daily maxima of >40°C are common. The annual evaporation in the area is approximately 2281 mm. Frost is rare (Bohlweki Environmental; 2006). The climate within the Lephalale Municipality and Limpopo Province in general results in a negative climatic water balance, and very little water for utilization by industry, mining, agricultural and domestic land use.
The local geology of the area can be subdivided into a northern and southern type. The Matimba Power station and all its facilities, except for the ash disposal facility, as well as Grootegeluk Mine, lies on Karoo sediments. The existing licensed disposal facility, Medupi Power Station and the Matimba ash dump lie on Waterberg sandstone, just south of the Eenzaamheid fault (Figure 8-6).

The area is classified as having a climatic N-value of almost 5, which indicates that both chemical weathering and mechanical weathering are likely. From the description of the geology of the area it can be expected that residual soils are generally shallow and transported soils vary greatly in thickness.

5.1.2. Soils
The major soil types mapped within the study area reflect the host geology / lithologies of the parent materials, while the topography and climatic conditions that prevail have further influenced the pedogenensis and soils forms present in the area.

Noticeable to the area is the presence of the Permo-Carboniferous Waterberg Coalfield, which forms part of the Karoo Sequence. These coalfields extend approximately 90 km in an east-west alignment and approximately 40 km in a north-south alignment near the northwestern border of the RSA, and also continue into Botswana. This coal deposit is fault bounded along the southern and northern margins and can be classified as a graben or structural trough. The Eenzaamheid Fault forms the southern boundary of the deposit, where the Karoo strata abut with the strata of the Precambrian Waterberg Group.

5.1.3. Land capability
The land capability within the project area consists mainly of arable and grazing land. However, it is also important to note that the pre-development conditions or status quo for the area of concern is one of disturbed industrial. For the most part the site comprises land that has been cleared or disturbed to some degree by the power station development.

5.1.4 Groundwater
Information relating to groundwater resources within the proposed study area was obtained from the Hydrogeological Impact Assessment Study undertaken by Golder Associates Africa (Pty) Ltd (Brink & van der Linde, 2018), including literature sited within the study report. This specialist study report is included in Appendix G-3 to this DEIR.

Regional Groundwater: Two distinct and superimposed groundwater systems are present in the geological formations of the coal fields in South Africa. They are the upper weathered aquifer and the system in the fractured rock below.

The Weathered Aquifer System generally occurs in the top 5-15 m and normally consists of soil and weathered rock. The upper aquifer is associated with the weathered horizon. In boreholes, water may often be found at this horizon. The aquifer is recharged by rainfall.

In a Fractured Aquifer System, grains in the fresh rock below the weathered zone are well cemented, and do not allow significant water flow. All groundwater movement therefore occurs along secondary structures such as fractures, cracks and joints in the rock. These structures are best developed in sandstone and quartzite, hence the better water-yielding properties of the latter rock type. Dolerite sills and dykes are generally impermeable to water movement, except in the weathered state.

Groundwater Quality: An analysis of groundwater monitoring results from 2016 were undertaken and it was found that the water quality of the existing boreholes is largely poor quality, with water quality classes ranging from Class 0 (Ideal water quality) to Class IV (Unacceptable water quality).

Regional Aquifer Recharge: From the published hydrogeological maps (DWAF 1996) the average recharge for the study area is shown as between 10 to 15mm per annum.

Groundwater Levels and Flow Directions: From the available data and previous groundwater studies undertaken in the area, groundwater levels ranged from between 4.41 to 69.98 meters below ground level (mbgl), with the average water level as 30.4mbgl. The groundwater flow from the study area is primarily away from the site, towards the east/south-east and northeast towards the non- perennial Sandloop River.
Surface Water: Information relating to the surface water resources within the proposed study area was obtained from the Surface Water Impact Assessment Study undertaken by Golder Associates Africa (Pty) Ltd (Sithole & Jordaan, 2018), and Biodiversity and Wetland Assessment undertaken by Natural Scientific Services (NSS) (Abell, et al., 2018), including literature sited within these study report. These specialist study reports are included in Appendix G-4 to this DEIR.

5.1.5. Regional Drainage Network

The study area is located within the A42J Quaternary catchment (Figure 8-13) to the south of the Lephala coalfield where numerous mining developments are foreseen predominantly to the north of the Eenzaamheid Fault line. There are no perennial streams originating within the area itself. The closest perennial river is the Mokolo into which the non-perennial Sandloop River drains. The Mokolo flows through A42J to the Limpopo River.

Medupi is situated in the Mokolo catchment, with the non-perennial Sandloop River flowing around the site in an easterly to north easterly direction to confluence with the Mokolo River approximately 16 kilometres downstream of the town of Lephalale. The study site falls in a predominantly flat area of the Limpopo Water Management Area (WMA).

Water uses in the catchment: The water use within the catchment is predominantly agriculture (87%) and industry (13%) related. The Limpopo Province, and in particular, the Lephala area, is a water stressed area with evaporation significantly higher than precipitation. Agricultural and industrial land uses in the municipal area are water intensive. There is therefore a high demand for water from an already water-stressed catchment.

Within the provisions of the National Water Act (Act 39 of 1998 as amended) as stipulated in the National Water Resources Strategy, there is a need to meet the water requirements of

5.1.6. Biodiversity (Terrestrial Ecology) and Wetlands

Information relating to the biodiversity and wetland resources within the proposed study area was obtained from the Biodiversity and Wetland Assessment undertaken by Natural Scientific Services (NSS) (Abell, et al., 2018), including literature sited within these study report.

The study area investigated by NSS largely cover undisturbed areas within the existing MPS footprint, including the farm portion on which the ADF is located, as well as a buffer area of 500m outside the MPS property boundary. However, in this EIA only wetland resources and possible impacts within the proposed rail yard site or FGD infrastructure footprint within the MPS footprint, or within 500m of these sites were considered.

Regional Biodiversity (Terrestrial Ecology) setting: The Study Area is situated in the Mokolo River Catchment area (8387 km2), where the Mokolo River system varies from good to fair health (RHP, 2006). The lower Mokolo River is dominated by hardy, pool dwelling species of fish. It is possible that some species may have been lost due to fragmentation of the river from the Limpopo River. No fish species requiring permanent flow were recorded, but several species that require flowing water for breeding purposes still remain, such as the Large Scale Yellowfish (Labeobarbus marequensis) and other Labeo species. However, no alien fish species were recorded.

5.2. Socio-economic

The study area is situated approximately 15km west of Lephala in the Limpopo Province. The Medupi Power Station is positioned in the area under the jurisdiction of Lephala Local Municipality (LM), which forms part of the Waterberg District Municipality (DM). The Lephala LM covers an area of 19 605km², and consists of 12 wards with 38 villages.

Lephala LM is characterised by a mix of human settlements which vary from formal to informal in townships. Marapong is the closest human settlement to MPS and is located approximately 8.6km north-east of the power station. The second closest location is Onverwacht at approximately 10.5km east of the power station. Lephala Town is third human settlement situated in close proximity to the power station.
and it is located approximately 12.6km east of Medupi and east of Onverwacht. These three human settlements are located north and east of Medupi and the existing ADF with prevailing winds blowing north-south and north-east to south-west towards Thabazimbi and the village of Steenbokpan (located some 27km west of Medupi). This means that Marapong, Onverwacht and Lephalale will likely not be directly significantly affected by emissions from Medupi as determined by the direction of winds and its variables.

Heavy industries include the newly built Medupi Power Station, the existing Matimba Power Station, Grootegeluk coal mine, Sasol and these are all located west of the town of Lephalale within close proximity to Marapong. A number of new mines are in the planning stages and some have already started operating, mining among other resources coal and platinum among other resources. Coal presents the dominant resources currently being mined in Lephalale due to fact that the Waterberg coal reserves represent 40% of South African coal reserves and are mined to support two coal fired power stations in the area and the Sasol coal-to-liquid petrochemical industry. A third power station is planned in the area and is currently undergoing the approval process.

Land uses of Lephalale LM can be described as a mix of agricultural activities, game farming, cattle ranching, industrial activities such as mining, power generation, domestic and industrial water supply. These activities make up 87% of the total land use of Lephalale LM. Lephalale LM and the Waterberg District are characterised by a number of game farms and conservation areas, with the Waterberg Mountains boasting a national conservation status.

5.2.1 Road connectivity
The study area is characterized by a number of secondary roads, with Nelson Mandela Drive cutting across the Town of Lephalale, past Onverwacht towards MPS. In the east, it joins the R510, which links Lephalale to Thabazimbi in the south, west of Mokolo River. Other secondary roads that are linked to the R510 which provide access to Lephalale include the R518 and R33. A railway line from Grootegeluk mine passes east and south of Medupi Power Station and extends westwards south of the existing ADF, then south towards Thabazimbi. This is the only documented railway line within the study area.

5.2.2. Population Dynamics in Lephalale
The Local Economic Development Strategy for Lephalale LM indicate that the population in Lephalale has increased by 45% between 2001 and 2014 from 85 155 to 123 869 (LM IDP, 2016-2017 statistics as cited in (Tomose, et al., 2018). Latest statistics reported in the Integrated Development Plan (IDP) for the LM indicate that total population size is around 140 240 residents (Lephalale LM, 2017).

Population growth in the Lephalale town node is among the highest in the Limpopo Province. The surge in population is also experienced south of Lephalale LM; for example, Thabazimbi has experienced a population increase of 35%. Moogkgopong an increase of 13%, Modimolle an increase of 11%. Bela-Bela an increase of 36% and Mogalakwena recorded an increase 11% in the same period. In Lephalale LM the influx can be directly attributed to the construction of the Medupi built coal fired power station project and associated ancillary infrastructure. An assumption was also made that the overall increase in population in the region could be as a result of projected future projects associated with the Waterberg coal fields e.g. the expansion of the mining industry as well as coal-to-liquid petrochemical industry project such as Sasol Mafutha 1 in Lephalale (Tomose, et al., 2018).

5.2.3. Education and Skills Levels in Lephalale LM
Lephalale LM has a total of 94 various educational facilities spread throughout the municipality. According to the LM’s IDP report (2015-2016), more than 95% of the population is within 30 minutes walking distance to the nearest education facility. Accessibility to schools in the rural areas is relatively good particularly for primary schools. This is not the case with regards to secondary schools as there are still students who stay more than 10km away from the nearest education facility. Access to secondary education has resulted in low numbers of pupils proceeding to tertiary education. The assumption is made that this could be as the result of learners being despondent of traveling long distance to go to school and the cost of public transport resulting in absenteeism and poor learner performance at the end of the year prohibiting them to proceed further with their education.
5.2.4. Community Health and Wellness in Lephalale LM

The World Health Organisation (WHO) in 2012 reported that one in eight deaths in the world is due to air pollution. The pollution is either ambient (outdoor) or indoor. WHO further concluded that 88% of premature deaths in middle and low income countries whose economy is coal based to ambient pollution. South Africa is one of such countries whose economy is coal based economy.

In Lephalale, coal is the main source of pollution throughout its life cycle: from extraction, combustion through to disposal. It contributes to pollution of both ambient and domestic air through a wide range of pollutants such as PM (particulates/dust), SO2, NO2, O3 (Ozone) (Itzkin, 2015, as cited in (Tomose, et al., 2018)). Liquid fossil fuel burnt/used by cars contributes to carbon monoxide (CO), while other known general pollutants include lead and volatile organic compounds.

5.2.5 Economic development in Lephalale LM

The Lephalale LM is currently in the second stage of considerable public sector investment which is estimated at R140 billion over six years. With the anticipated Eskom developments, Coal miners are planning developments to meet the increased demand for coal. One such is the Grootegeluk coal mine owned by Exxaro. As part of its mining expansion programme, Exxaro has announced that it will be constructing a new coalmine named Thabametsi. Exxaro is also targeting the development of a 1 200MW independent power plant to be attached to the new mine.

The new coal mines and power stations could lead to a six-fold increase in households in and around Lephalale. This will create a significant demand for building materials and will have positive implications for retail, service and small industry development and it is predicted that the life expectancy of the economic boom will be 30 years due to the additional power station and all the mining activity.

5.2.6 Employment Rate and Occupation in Lephalale LM

The rate of unemployment in Lephalale is at 22.2%, which is well below the provincial average of 32.4% as per the 2011 national census. Unemployment amongst the youth currently stands at 27%, also below the Limpopo provincial average of 42%. This is due in large measure to local developments associated with Medupi power station and the expansion of coal production from the mines which can be taken to have absorbed a lot of the latent labour force.

Sector employment has changed considerably over the last 2 decades with a noticeable drop in agriculture related employment, contrasted by a noticeable increase in mining related employment opportunities since the early 2000s. This is clearly indicated in Figure 8-27 below.

5.2.7 Water resources

Mokolo Dam is a large dam supplying the Lephalale LM and was constructed in the late 1970s and completed in July 1980 (DWS, 2009, as cited in Tomose, et al., 2018). The aim of the dam was to supply water to Matimba Power Station, Grootegeluk coal mine, Lephalale LM for irrigation purposes downstream of the dam (agricultural activities). Therefore, it can be argued that before 2008 Lephalale LM solely depended on the Mokolo Dam for its water.

Due to the rapid industrial growth and urbanisation, the Mokolo Dam could not meet the water supply to the Lephalale LM post 2008. The Department of Water and Sanitation commissioned the Mokolo Crocodile (West) Water Argumentation Project (MCWAP) to meet future water demands in Lephalale LM.

Ninety two (92%) percent of water infrastructure in the Municipality is over 20 years old, while sixteen percent (16%) of the water service system has been identified as being in poor to very poor condition. Additional challenges that are faced around water infrastructure include: (i) Poor borehole yields in rural areas (ii) Bulk water services in urban areas have reached full utilization (iii) Illegal connections in rural areas (iv) Lack of accountability to water losses (v) Limited availability of ground water in rural areas (vi) Low quality of drinking water in rural areas.
5.2.8 Sanitation services
Sanitation is another social service that is directly linked to the availability of water resources. The assessment of this infrastructure within the project area around Medupi power station has found that 94% of waterborne sanitation infrastructure in the municipality is over 20 years old. About 15% of the sanitation network had been identified as being in very poor condition. The assets have experienced significant deterioration and may be experience impairment in functionality and will require renewal and upgrading (Lephalale Local Municipality, 2014, as cited in Tomose, et al., 2018).

Problems noted around the question of sanitation are that there is a need to redesign the existing sewer networks in Lephalale Town and Onverwacht to reduce the number of pump stations. Further, the area does not have sufficient water resources and infrastructure to accommodate a waterborne sanitation system for all households. More than 50% of households in the municipality are without hygienic toilets

5.2.9 Heritage, Archaeology and Palaeontology
The South African archaeological record covers all the Stone Age periods, Iron Age periods and more recent historical periods. This rich cultural heritage also includes culturally significant places on the landscape that became important to the many varied groups of people that once lived here and whose descendants continue to live here.

Information relating to the heritage, archaeological and palaeontological resources within the proposed study area was obtained from the Heritage Impact Assessment Specialist Report (Tomose & Sutton, 2018) and Palaeontological Impact Assessment Specialist Report (Tomose & Bamford, 2018) undertaken by NGT Holdings, including literature sited within this report.

6.0 ENVIRONMENTAL IMPACT ASSESSMENT AND PROPOSED MITIGATION MEASURES

6.1. Impact Assessment Methodology
Impacts identified during this EIA and mitigation or management measures are proposed to avoid, minimize, reduce or manage potential impacts. In order to ensure uniformity, a standard impact assessment methodology was utilized by all specialists and EAP so that a wide range of impacts can be compared with each other. The impact assessment methodology makes provision for the assessment of impacts against the following criteria, as discussed below. The sections below provide a summary of the identified impacts and corresponding mitigation measures. Details are contained in the main EIR

6.2 Geology and Geotechnical suitability
The geology and geotechnical conditions at the proposed rail yard area and FGD infrastructure within the MPS footprint were considered during the assessment. Based in the available information the geotechnical specialist undertook a qualitative assessment based on professional opinion of the impact of the underlying geology on the proposed infrastructure developments.

FGD system within the MPS footprint

Based on existing information, most notably Golder report reference 12087-8856-1 entitled: Medupi Power Station: Shallow Groundwater Study, dated June 2009, the following ground conditions are apparent within the MPS footprint:

- The site is underlain by a sequence of pebbles, weathered quartzitic conglomerate with fresh variously fractured quartzitic conglomerate at depth.
- The conglomerate is interbedded with bluish grey siltstone bands. The drilling has shown that the siltstone forms discontinuous layers of up to 50cm thick but mostly about 20cm thick.
- Generally surface weathering to shallow depth (<5m) occurs, while in some boreholes a second fractured and associated weathered zone is observed and is normally found between 7 - 14m.
- Some boreholes showed no surface weathering, while boreholes in the extreme north or west, show the presence of deep weathering, up to 21m.
- Water strikes were made in 14 of the 35 boreholes at depths between 6 and 10.5m below surface

The assessment concluded that:
• Standard foundation systems are expected to be applicable, comprising generally shallow foundations.
• Excavatability is expected to be soft to intermediate, with hard rock class (drill and blast) for excavation in moderately weathered or harder rock (location dependent, but generally below about 5m depth).

**Railway yard, including limestone and gypsum handling facilities and associated infrastructure**

A qualitative assessment (professional opinion) of the geotechnical conditions within the rail yard site was undertaken. The following conclusions were reached;

• Excavation of test pits and geophysical surveys across the site encountered medium dense silty sand to between 1.1m and 1.8m, underlain by dense gravel to between 1.5m and 2.4m, underlain by very soft rock quartzite, with TLB refusal at 1.8m on medium hard rock quartzite at one test pit location, and finally refusal on hardpan ferricrete at 2.4m.
• Data and information on two boreholes closest to the rail yard revealed that one borehole was dry while the other supported water levels at 2.6 m below surface. The dry borehole indicates slightly and moderately weathered conglomeratic quartzite in zones below 3.5m depth, becoming fresh from 14.5m depth, whilst the borehole containing water indicated the boundary between slightly to moderately weathered quartzite and fresh quartzite at 16.5m.
• The Limestone Offloading Facility at the railway yard is proposed to be 15m in depth. Based on the above, the following is interpreted:
  • Hard rock (drill and blast) excavation will be required from a depth of about 2m.
  • Dependent on the thickness of the surficial soils and any fill materials over the area, a contingency allowance should be made for encountering rock during the installation of such services or shallow foundations, where hard rock excavation (hydraulic rock hammer or drill and blast) may be necessary.
  • Standard footing systems such as shallow pad and strip footings are expected to be applicable for the area.
  • Deep excavations are expected to require reinforcement and/or stabilisation, particularly at shallow depths. Dependent on the quality of the rock and degree of fracturing, the lower half of the 15m deep excavation may potentially be unreinforced and unstabilised.
  • Groundwater can be expected from a shallow depth in the excavation. The volume of water seepage is expected to be relatively low, and reducing as the excavation proceeds into less fractured rock.

It was concluded, based on available studies and specialist opinion, that no significant geotechnical hazards or fatal flaws were identified. All the geotechnical considerations mentioned can be mitigated in the design of the facilities.

**6.3 Impact Soils and Land Capability**

When considering the potential impacts of the proposed rail yard and FGD infrastructure on the soils and land capability, firstly, it is important to note that the pre-development conditions or status quo for the area of concern is one of disturbed industrial. For the most part the site comprises land that has been cleared or disturbed to some degree by the existing power station development.

*Planning / Pre-development phase: Soils and Land Capability*

No potential impacts on soils or land use were identified during the planning and pre-development phase. The MPS was constructed to be wet FGD ready, therefore alignment of the FGD system, rail yard and associated infrastructure were pre-determined during the planning phases for the power station itself. Although design of the infrastructure is still required to align with existing infrastructure at the MPS, no pre-construction intrusive work was required to inform the designs.

*Construction phase: Soils and Land Capability*

**Impact 1: Loss of utilizable resource (sterilization and erosion), compaction and contamination or salinization**

During construction it is expected that soils within the development area will be stripped, followed by preparation of laydown areas, stockpile areas and preparation of the surface for construction of infrastructure.
**Existing impact:** Most of the proposed development site within the proposed FGD footprint has been stripped of topsoil and transformed for construction purposes, therefore potential loss of topsoil has potentially occurred already. In contrast, a large portion of the rail yard site still has intact vegetation, which will be removed and topsoil stripped during the construction phase.

**Cumulative impact:** Construction activities especially at the rail yard footprint will contribute to the potential loss of topsoil if not managed and mitigated to acceptable levels. The proposed retrofit project will, if improperly managed and without mitigation, have a **definite**, **MODERATE** to **HIGH** negative significance, that will affect the development footprint and its immediate surroundings for the medium to long term (life of the project and possibly beyond), and is **going to occur**.

**Mitigation:** However, with management, the loss, degree of contamination, compaction and erosion of this resource can be mitigated and reduced to a level that is more acceptable. This can be achieved by: (i) Limiting the area of impact to as small a footprint as possible (i) Avoidance of sensitive soil groups (iii) Concurrent rehabilitation of all affected sites that are not required for the operation; (iv) Effective topsoil stripping during the less windy months when the soils are less susceptible to erosion, if possible; (v) Effective cladding of any berms and all soil stockpiles; (vi) Restriction of vehicle movement over unprotected or sensitive areas, this will reduce compaction.

**Residual impact:** The above management procedures will **probably** reduce the negative significance rating and resultant risk impact to a **MODERATE** or **LOW**. Based on the historical activities (disturbed nature of the site) these actions are **very likely to occur**.

**Operational phase:** *Soils and Land Capability*

**Impact 1:** Loss of utilisable resource (sterilization and erosion), compaction and contamination or salinisation

The loss of utilisable soil resources during the operational phase revolve around potential for spillage and contamination of the in-situ and stockpiled materials, contamination due to dirty water run-off and/or contaminated dust deposition/dispersion, the de-nutritification of the stockpiled soils due to excessive through flow and the leaching out of nutrients and metals due to rain water on unconsolidated and poorly protected soils.

**Existing impact:** A positive impact will be the rehabilitation with stockpiled soils of areas where temporary infrastructure was constructed or areas were cleared during the start-up and construction phase.

**Cumulative impact:** This impact relates to the cumulative impact on stockpiled topsoil or insitu soil due to spillages of hazardous substances, compaction due to uncontrolled vehicle and pedestrian traffic, and loss of topsoil due to improperly managed erosion and handling.

In the un-managed scenario these activities will **probably** result in a **MODERATE** to **HIGH** negative significance that will affect the development footprint and adjacent sites for the **medium to long term**. These effects are **very likely to occur**.

The impacts on the soils during the operational phase can be mitigated with well-initiated management procedures including: (i) Minimization of the area that can potentially be impacted (eroded, compacted, sterilized or de-nitrified); (ii) Timeous replacement of the soils so as to minimize/reduce the area of affect and disturbance; (iii) Effective soil cover and adequate protection from wind (dust) and dirty water contamination – vegetate and/or rock cladding; (iv) strict in-house management of all aspects likely to contaminate soil e.g., vehicle servicing, maintenance of all haulage ways, spillage management etc.

**Residual impact:** In the **long term** (Life of the operation and beyond) and if implemented correctly, the above mitigation measures will **probably** reduce the negative impact on the utilizable soil reserves to a significance rating of **MODERATE LOW** in the **medium term**, and is **very likely to occur**.
However, if the soils are not retained/stored and managed, and a workable management plan is not implemented the residual impact will definitely incur additional costs and result in the impacting of secondary areas (Borrow Pits etc.) in order to obtain cover materials etc.

**Decommissioning and closure phase: Soils and Land Capability**

**Impact 1: Net loss of soil volumes and utilisation potential due to change in material status (Physical and Chemical) and loss of nutrient base.**

*Existing impact:* The impacts on the soil resource during the decommissioning and closure phase have both a positive (i.e. reduction in areas of disturbance through rehabilitation and return of soil utilization potential), and a negative effect, through loss of soils, erosion, compaction and contamination of the natural resource.

*Cumulative impact:* The impact will probably remain the net loss of the soil resource if no intervention or mitigating strategy is implemented. The intensity potential will remain MODERATE and negative for the medium to short term for all of the activities if there is no active management (rehabilitation and intervention) in the decommissioning phase, and closure will not be possible. The impacts will be confined to the development area and its adjacent buffer, and is likely to happen.

However, with interventions and well planned management, there will be a MODERATE to HIGH positive intensity potential as the soils are replaced and fertilisation of the soils is implemented after removal of the infrastructure.

Ongoing rehabilitation during the operational and decommissioning phases will bring about a net long-term positive impact on the soils, albeit that the land capability will likely be reduced to grazing status.

*Residual impact:* On closure of the operation the long-term negative impact on the soils will be reduced from a significance ranking of MODERATE to LOW if the management plan set out in the EMPr is effectively implemented. These impacts will be confined to the development site and its adjacent environments, and is very likely to occur.

**6.4 Groundwater**

The groundwater specialist undertook a qualitative assessment (professional opinion) of the potential impact that identified aspects or activities may have on groundwater resources underlying the rail yard and FGD infrastructure study area within the MPS. The qualitative assessment took into consideration the existing groundwater studies that were undertaken during the initial EIA application for the MPS itself, as well as subsequent groundwater studies and monitoring reports that was undertaken within the proposed study area. Qualitative assessments were undertaken for the following aspects / activities:

- Trucking of Type 1 Waste to a Hazardous Disposal Facility
- Construction and operation of the FGD system within the Medupi Power Station Footprint, including all associated infrastructure and processes necessary to support its operation;
- Construction and operation of the railway yard, limestone and gypsum handling facilities, including diesel storage facilities and associated infrastructure between the Medupi Power Station and existing ADF;

**Professional opinion on trucking of Type 1 Waste to a Hazardous Disposal Facility**

For a 5-year period of the operational phase, sludge and salts will be trucked to a licensed hazardous waste disposal site. Possible impacts on the groundwater regime associated with trucking process of type 1 waste, to a licensed hazardous waste disposal site are based on a simplified groundwater risk assessment. The risk rating is based on a possible risk/impact that activities from the trucking process of type 1 waste poses to the groundwater regime. Assessment is based on positive and negative outcome of impact/risk to the groundwater regime.

It is thus concluded, based on the simplified groundwater risk assessment that trucking of type 1 waste to a licensed hazardous waste disposal site is effectively a positive impact on site since the hazardous waste is removed from site in a responsible manner and disposed of at a licenced waste facility licenced for this purpose.
Impact assessment of the FGD system on groundwater resources

The groundwater specialist provided an impact assessment of whether groundwater resources could potentially be impacted with the construction and operation of the FGD system and all associated infrastructure within the MPS footprint. From the aerial view it is evident that the entire Medupi FGD footprint area is disturbed during the construction activities at the power station.

The predicted impact of the FGD system on the groundwater quality, volume and flow is of Low significance during all phases if proposed mitigation measures are implemented successfully. The specialist thus concluded that construction and operation of the FGD system would have a minor change in the volume of water entering groundwater storage (reduced recharge in comparison to status quo conditions) and with negligible changes expected in the groundwater flow regime.

Impact assessment of the rail yard and associated infrastructure on groundwater resources

The groundwater specialist provided an impact assessment of whether groundwater resources could potentially be impacted with the construction and operation of the rail yard, limestone and gypsum handling facilities and all associated infrastructure.

Based on the impact rating in, the specialist concluded that the predicted impact of construction and operation of the rail yard and associated infrastructure on groundwater quality, volume and flow is of Low significance during all phases after the proposed mitigation measures has been successfully implemented.

Proposed mitigation measures for impacts on groundwater

Management and mitigation measures proposed by the specialist include:

- Safe working procedures (SWP) for construction work should be in place to specifically minimize the risk of contamination to the environment and groundwater should a spillage occur.
- Any spillages that occur should be logged in a quantitative manner.
- Any accidental spillage should be cleaned up immediately to limit contamination and if intensity is high, the impact must be reversed with the applicable mitigation and management actions.
- Monthly groundwater monitoring is recommended to form part of the mitigation and management of the existing licensed disposal facility. This monitoring must be included in the monitoring network and will function as an early warning system for contaminant migration (if any).
- Frequent inspection during construction and maintenance of constructed infrastructure must be undertaken.

6.5 Impact on Surface water

Impact assessment of the FGD system, rail yard and associated infrastructure on surface water resources

During consideration of the potential impacts it was important to note that the MPS already has an allocated footprint into which the proposed activities will be constructed. There is, therefore, already an impact on the environment.

Cumulatively, there is no expectation for further impact to the environment because of where the activities are proposed to be located. With mitigation the residual surface water pollution impact will be low due to the probability of dirty water spilling over into the environment from Medupi Power Station. Proper maintenance of the SWMP will reduce the rating to low. Ongoing surface water monitoring is important to ensure that this trend continues, especially during high rainfall events.

With the construction and decommissioning phases an increased pollutant load may be expected due to construction and decommissioning activities. It is furthermore unlikely that a significant reduction in surface water runoff will occur due to the construction of the rail yard and FGD infrastructure within the MPS.

Specialist Opinion on sludge and salts trucking impact

The surface water specialist provided a qualitative assessment (specialist opinion) on the significance of the surface water impacts for the proposed trucking of sludge and salts from MPS proposed temporary hazardous waste storage area in Limpopo Province to an appropriately licensed existing hazardous waste facility outside
of the Medupi Power Station study area. The trucking of salts and sludge from Medupi to the licensed hazardous waste site will pose a medium potential risk impact to the water resources in the study area but will not pose a serious threat to water resources in the region.

**Mitigation and management measures for potential surface water impacts**

- As this will be within the existing footprint, it is unlikely that there will be considerable impacts from the removal of vegetation and/or topsoil during excavation. However, this aspect should be considered and managed to reduce erosion which could cause siltation of the surrounding surface water resources.
- Removal of topsoil should be done systematically, only clearing the necessary areas at a time.
- Ongoing monitoring of the surface water must continue or be
- Monitoring of surface water must be undertaken monthly when water is available or after a rain event.
- To prevent possible pollution of the receiving surface water environment, dirty water containment structures should be designed, constructed, maintained and operated such that they do not spill over more than once in 50 years.
- Water accumulated in the containment facility during the wet season should be used as a priority in the process water circuit to ensure that the capacity requirements are not compromised during periods of heavy and/or extended rainfall.

6.6. Impact on Biodiversity (Terrestrial Ecology) and Wetlands

**Impact assessment of the FGD system, rail yard and associated infrastructure on terrestrial ecology and wetlands**

A number of impacts relating to the potential loss of vegetation species, habitat and fauna mortality during the construction phase were identified and assessed by the biodiversity specialist. During the assessment it was concluded that after successful implementation of the proposed mitigation measures the cumulative impact significance could be reduced with the residual impact being reduced to MODERATE or LOW significance. The fact that the proposed development footprint for the FGD and rail yard was presently disturbed and transformed contributed to the impact significance rating.

Impacts identified relating to the operational phase of the MPS FGD and rail yard is largely a continuation of impacts that emerged during the construction phase. A number of management and mitigation measures to prevent impact on fauna, flora, vegetation habitat and downstream wetland systems have been proposed by the specialist and is presented in the next section.

**Mitigation and management measures for impacts on terrestrial ecology and wetlands**

- All clearing of vegetation needs to occur only within the required construction and operational footprint of the proposed FGD / railway yard area.
- The area of construction should be fenced to prevent encroachment into surrounding vegetation.
- Any bulbous or protected species that can be transplanted must be removed and transplanted to a similar habitat nearby.
- Alien species must be monitored and controlled under the MPS Alien Control Programme.
- Construction crew must be made aware of the alien species that occur on site, specifically Category 1 species and must be trained in the basics for recognition and removal.
- Minimise disturbance footprint and restrict construction and operation activities to within the proposed construction and operational footprint area. The Environmental Officer (EO) must monitor the carrying capacity relative the game within the Railyard area and act accordingly to ensure that there is enough grazing land for the existing game within this area, otherwise implement capture and relocation.
• The mitigation with regards to catchment loss is limited and the residual impact risk remains High. Efforts should be centred on minimizing catchment loss by minimizing the PCD, coal stockpile and other associated infrastructure to as small an area as possible.
• Mitigation of increased faunal mortality require the site to be searched prior to clearing by an appropriately qualified specialist and any less mobile fauna relocated. Maintain existing tortoise road signs and insert new ones where necessary. Continue to enforce speed regulation controls such as speed humps and limits.
• Keep lighting to a minimum during construction but most significantly during operation to limit the impact of increased sensory disturbance to fauna.
• To mitigate impacts from traffic and human activity strict in-house measure regulating vehicle and human movement should be adhered to.

6.7 Impact on Air Quality

Impact assessment of the FGD system, rail yard and associated infrastructure on ambient air quality

During assessment of the air quality impacts, the specialist concluded that the operational phase is considered to be the phase with the largest impact on ambient air quality.

The construction and decommissioning (rehabilitation) phases were considered not likely to impact the ambient air quality more than the existing (status quo) status. As a result only the impact associated with the operational phase of the FGD system, rail yard and associated infrastructure were subjected to quantitative impact assessment.

The proposed Project operations were assessed as the cumulative impact which includes the operations of the Matimba Power Station and the Medupi Power Station including six units with FGD.

The residual impact of the ash disposal facility shows little impact in magnitude at the sensitive receptors (located upwind of the facility) on a daily and annual averaging period providing no change in significance on PM from cumulative to residual operations.

Mitigation and management measures for potential air quality impacts

Considering all potential impacts identified on air quality the specialist proposed the following mitigation and management measures:
• As the proposed Project operations will significantly reduce SO₂ impacts from the Medupi Power Station, it is recommended that the FGD Retrofit Project be implemented.
• The movement of sludge and salt off-site to a licenced facility will contribute to fugitive vehicle entrainment emissions. It is recommended that the access road being used is properly maintained to minimise the impacts from this source.

6.8 Impact on Noise

Impact assessment of the FGD system, rail yard and associated infrastructure on ambient noise levels

During assessment of the noise impacts, the specialist concluded that with noise mitigation, noise levels from the project will be low. The impacts on ambient noise levels relate entirely to the potential increase in noise levels through all phases of the proposed development.

The impact assessment undertaken by the noise specialist rated impact on noise levels during the planning and operational phases as low. The specialist concluded that during these phases the noise levels in the area are representative of suburban districts. Cumulative impacts would be similar to baseline levels during the planning phase, while change in noise levels due to operation is expected to be slight at NSRs.

The specialist identified that during the construction and decommissioning phases the construction and decommissioning activities would result in a Moderate noise impacts, but with noise levels remaining local yet still notable.
The specialist therefore concluded that in the quantification of noise emissions and simulation of noise levels as a result of the proposed project, it was calculated that ambient noise evaluation criteria for human receptors will not be exceeded at NSRs. Therefore, reaction from members of the community within this impact area is not very likely.

**Mitigation and management measures for potential noise level impacts**

- To minimise noise generation, vendors should be required to guarantee optimized equipment design noise levels.
- A mechanism to monitor noise levels, record and respond to complaints and mitigate impacts should be developed.
- In managing transport noise specifically related to trucks, efforts should be directed at:
  - Minimizing individual vehicle engine, transmission and body noise/vibration. This is achieved through the implementation of an equipment maintenance program.
  - Minimize slopes by managing and planning road gradients to avoid the need for excessive acceleration/deceleration.
  - Maintain road surface regularly to avoid corrugations, potholes etc.
  - Avoid unnecessary idling times.
  - Minimizing the need for trucks/equipment to reverse. This will reduce the frequency at which disturbing but necessary reverse warnings will occur.

**6.9 Social**

**Impact assessment of the FGD system, rail yard and associated infrastructure on the social environment**

An Impact assessment of the FGD system, rail yard and associated infrastructure on the social environment was undertaken as an integral part of the ESIA. *The reader is urged to peruse the impacts assessment table in the Social Impact Assessment Report as the specialist furthermore aligned recommendations or mitigation measures with each impact in the table, provided a short motivation to support the impact assessment ratings.*

All impacts identified during the Operational and Decommissioning Phases were considered positive impacts, whereas half of the impacts identified during the construction phase are positive impacts on the surrounding community.

During the Planning / Pre-construction Phase the establishment of spin-off businesses, e.g. B&Bs, to support the construction phase of the Medupi FGD and rail yard was identified as a positive impact that could contribute to the local economy and employment opportunities. However, the publication of the proposed FGD construction project is likely to attract migrant labourers with employment expectations at the MPS.

Positive impacts associated with the Construction Phase of the FGD, rail yard and associated infrastructure revolve around economic and employment opportunities as well as upgrading of infrastructure such as local roads. However, the Construction Phase is also likely to result in increased traffic within the study area, and higher demand on already stressed water allocation for the Lephalale area.

Positive impacts identified during the Operational Phase of the FGD include the improvement of the ambient air quality through the significant reduction of SO₂ due the operational FGD system, a reduction in respiratory related diseases coupled with an overall improvement in the quality of life, the stabilization of the national electricity grid to support amongst other local economic development, and the establishment of business and employment opportunities resulting from the sale of gypsum.

The assessment therefore concluded that the significance of positive social impacts generally exceeds the significance of negative social impacts in the implementation of the FGD system and the railway siding throughout all four stages of the project.

What is believed to be the greatest positive impact or benefit of the installation of the Medupi FGD system, rail yard and associated infrastructure is that it will result in reduced levels of SO₂ in the medium and long term in the region and South Africa.

**Mitigation and management measures for identified impacts**
Proposed mitigation and management measures proposed to enhance positive impacts and minimize negative impacts include:

- Construction activities for the FGD system, rail yard and associated infrastructure should be restricted within the existing Medupi footprint in order to minimize land use impacts on surrounding properties.
- All measures and recommendation proposed by the traffic specialist to reduce traffic impacts must be implemented to reduce social impacts associated with increased traffic volumes.
- Eskom explore alternative water sources to minimize the risk of overly depending to MCWAP Phase 2 for the implementation of the FGD.
- Eskom must improve project public participation and communication strategies in order to strengthen multi-stakeholder engagement and participation in the planning and implementation of the FGD retrofit project.
- Eskom must prioritize the tender for construction of the FGD and retrofitting the FGD within time and budget to ensure compliance with AEL timeframes for SO2 reduction targets.
- Prioritise employment of local people
- The Medupi EMC should further strengthen its multi-stakeholder engagement strategy or adopt new forms of communication This should be done in a manner that does not polarise relations between existing stakeholders.
- Eskom already has several commendable Corporate Social Responsibility initiatives which will benefit this project to enhance the positive social impacts.

6.10 Impact on Heritage, Archaeology and Palaeontology
The Heritage and Palaeontological Impact Assessments did not identify any heritage, archaeological or palaeontological resources within the proposed development footprint for the FGD infrastructure, rail yard and associated infrastructure. Therefore no impacts exist that may have a detrimental impact on any heritage, archaeological or palaeontological resources.

6.11 Traffic Related Impacts

*Impact assessment of the FGD system, rail yard and associated infrastructure on the social environment*

The traffic impact assessment for the traffic impacts it was concluded that by implementing proposed upgrades at major intersections, the Level of Service (LOS) would be increased from LOS F, which is the worst, to at least a LOS of B or A.

No impacts on the road network were anticipated during the Planning / Pre-construction phase, and as a result no impact rating for this phase was determined.

Furthermore it is concluded that all identified impacts were regarded as low once the proposed mitigation measures has been implemented.

6.12. Cost of implementing mitigation measure

Costs of certain items associated with environmental management and monitoring will be an integral part of specific items incorporated in overall project budgets, and no separate budget is necessary to cover these aspects. Marginal costs of the contractor to be incurred in complying with environmental protection clauses in the construction contract are incorporated in unit rates and bill items and will thus be included as construction costs.

7.0 PUBLIC CONSULTATIONS AND DISCLOSURE

7.1 Disclosure of ESIA documents

*At AfDB Level:* The Bank’s policy provision on Disclosure and Access to Information (DAI) is also triggered. It requires that all the stakeholder including all people residing in the given areas of a project have the right to be informed of the proposed development project in their respective areas. This ESIA Summary will be disclosed on the Bank website for 120 days before presentation of the project to the Bank’s Board for approval. This is intended to allow various stakeholders to access its contents and provide feedback where necessary.
Disclosure at national level: The Draft EIR was submitted for public review and comment for a period of 40 days. In accordance with Section 56(6) of the 2010 EIA Regulations, a registered Interested and Affected Party (I&AP) may submit comments on the Draft EIR. Comments on the draft EIR were submitted to Zitholele Consulting, the firm that prepared the report and were incorporated in the final draft which has been summarised.

The Draft Environmental Impact Report (DEIR) was available for stakeholders to comment from Monday, 19 February 2018. The DEIR was distributed to the Organs of State, and copies thereof was availed at strategic public places in the project area

The Interested and Affected Parties (I&APs) had an opportunity at various stages throughout the ESIA process to be informed about the proposed project and to provide input into the consideration of a decision. Public participation during the Scoping Phase was comprehensive and comprised advertising in national, regional and local newspapers, subsequent notifications in regional and local newspapers and holding several key stakeholder meetings. A record of these meetings and the several issues raised by stakeholders are included in the relevant reports and available on the Eskom documents and website for public review and comments.

8.0. MONITORING ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS

The implementation of ESMP’s for all life cycle phases (i.e. construction, operation and de-commissioning) of the proposed project will be a key in achieving the appropriate environmental management standards as detailed for this project. The process of communication and consultation with the community representatives will be maintained as part of the ESMP process, and in particular, during the construction phase.

Different technical people will have responsibility to ensure the implementation of Environmental and Social mitigation measure identified in the ESIA.

Organizational Structure and Responsibility: The Project Manager Medupi Power Station will: (i) Ensure that Eskom and the Contractor are aware of all specifications, legal requirements and Eskom standards and procedures pertaining to the project specifically with regards to the environment (ii) Ensure that all stipulations within the ESMP are communicated and adhered to by Eskom and its Contractor(s) (iii) Monitor the implementation of the ESMP throughout the project by means of site inspections and meetings. This will be documented as part of the site meeting minutes (iv)

Functions and Responsibilities for the Construction Phase: Specific responsibilities of the Project Manager and Site Manager, Medupi Power Station and Environmental Control Officer for the construction phase of this project shall be documented and communicated to all employees. The Environmental Control Officer is independent and reports to an Environmental Management Committee. The Environmental Management Committee consists of representatives of local communities, local municipality and an ecologist. There is a team of environmental managers on site some accountable for the overall project while others are appointed by contractors to ensure compliance with the Environmental Management Plan. The Environmental Control Officer completes monthly compliance reports which are submitted directly to DEAT. Further audits are carried out every six months by an external independent auditor. Monitoring and reporting on the implementation of the EMP will remain an integral part of the African Development Bank’s supervision activities until the completion of the project.

9.0 CONCLUSION

The Environmental Impact Statement provides an account of the key findings of the EIA. Based on the significance ratings assigned to the anticipated environmental impacts, the EAP makes the following conclusions relating to impacts and risks:

Potential impacts on geotechnical aspects, noise levels, heritage, archaeology and palaeontology, and traffic minor and can successfully be mitigated to acceptable levels with proposed mitigation.

Assessment of the proposed air quality impacts has demonstrated what was anticipated, i.e. that implementation of the FGD system would significantly reduce the SO2 emissions at the MPS to very low levels. However, within the MPS operations the FGD system will be a major consumer of water. This however is offset by a water allocation from MCWAP Phase 1 and 2.
The potential impact on local communities and social aspects is an overwhelmingly positive impact. Reduction of SO2 levels is the primary positive impact that will result in better quality of life in the regions. Additionally, indirect positive impacts resulting from growth in the local economy and greater employment opportunities will be significant.

Overall the impact of the installation of the FGD system, rail yard and associated infrastructure will have a Moderate to High impact on the local biodiversity, and to a lesser degree, wetlands in close proximity to the FGD. Although loss to intact vegetation types and habitat will be permanent for the life of the power station, impacts on fauna can be mitigated to more successfully to a greater extent.

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