Mutsho Power Project

Aquatics Scoping Report

Project Number:

SAV4689

Prepared for:

Mutsho Power (Pty) Ltd
On behalf of Savannah Environmental (Pty) Ltd

August 2017

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Project Name:	**Mutsho Power Project**
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1 INTRODUCTION

Digby Wells Environmental (hereafter Digby Wells) has been appointed by Savannah Environmental (Pty) Ltd (Savannah) as the independent Environmental Assessment Practitioner (EAP) for the Mutsho Power Project to prepare an Aquatics Scoping Report. This document is a scoping phase report to summarise the current baseline conditions from available data and the time of reporting and to propose the scope of work and methodology to be followed for the EIA phase.

1.1 Project Description and Location

The proposed project area is situated in the magisterial district of Vhembe, in the Limpopo Province, approximately 40 km north of the town Makhado and 7 km south-west of the town Mopane as seen in Figure 1-1.

Once developed, the proposed plant would form part of the Department of Energy's (DoE's) Coal Baseload Independent Power Producer (IPP) Procurement Programme (CBIPPPP).

Due to lack of detailed or specific project description information at this stage, it is assumed that the facility comprise either a conventional Pulverised Coal (PC) (with Flue Gas Desulphurisation (FGD)), or Circulating Fluidised Bed (CFB) coal-fired power plant.

The type of infrastructure required for the coal-fired power plant would ultimately be dependent on the type of technology selected for implementation. For the purposes of this report, it is assumed that a coal-fired power plant would typically comprise of the following key components and associated infrastructure:

- Power island consisting of:
  - Pulverised Coal (PC) with Flue Gas Desulphurisation (FGD), or Circulating Fluidised Bed (CFB) boiler technology.
  - Electrostatic Precipitator (ESP) / Bag filtration systems and Flue / smoke stacks.
  - Direct or indirect air cooling systems.
  - Balance of plant components (including steam turbines and generators etc.).
- Coal and limestone rail spur and / or road offloading systems.
- Coal crusher (for CFB); or coal milling plant (for PC).
- Strategic and working coal stockpiles.
- Limestone storage and handling area (for use with CFB or PC technology).
- Ammonia storage and handling area (for use in flue gas clean up with PC technology).
- Ash dump.
- Water infrastructure. This could include:
  - Raw water storage dams.

- Water supply pipelines and booster stations.
- Pollution control dams.
- Water treatment plant (WTP).
- Wastewater treatment plant (WWTP).
- Stormwater management systems.

- HV yard and substation components with HV overhead transmission lines connecting to Eskom infrastructure.
- Control room, office / administration, workshop, storage and logistics buildings.
- Upgrading of external roads and establishment of internal access roads.
- Security fencing and lighting.

A footprint of approximately 600 ha would be required for the power station and associated infrastructure. The type of technology selected for implementation would ultimately have influence on the project layout and development footprint (i.e. the area of land required for development). While the power generation components require limited space, supporting areas for the establishment of coal and other raw material stockpiles, and an ash dump increase the development footprint. The outcomes of the Site Screening Assessment are therefore expected to be applicable to the siting of a new CFB of PC (with FGD) power plant, or alternatively a more advanced and lower impact alternative. The selection of alternative technologies and optimisation of the layout during the project design phase therefore presents the opportunity for impacts associated with the project on the receiving environment and sensitive receptors to be reduced.

Therefore, this report serves solely as an aquatic scoping report where a detailed impact assessment will be conducted once the type of technology and infrastructure layout has been finalised.

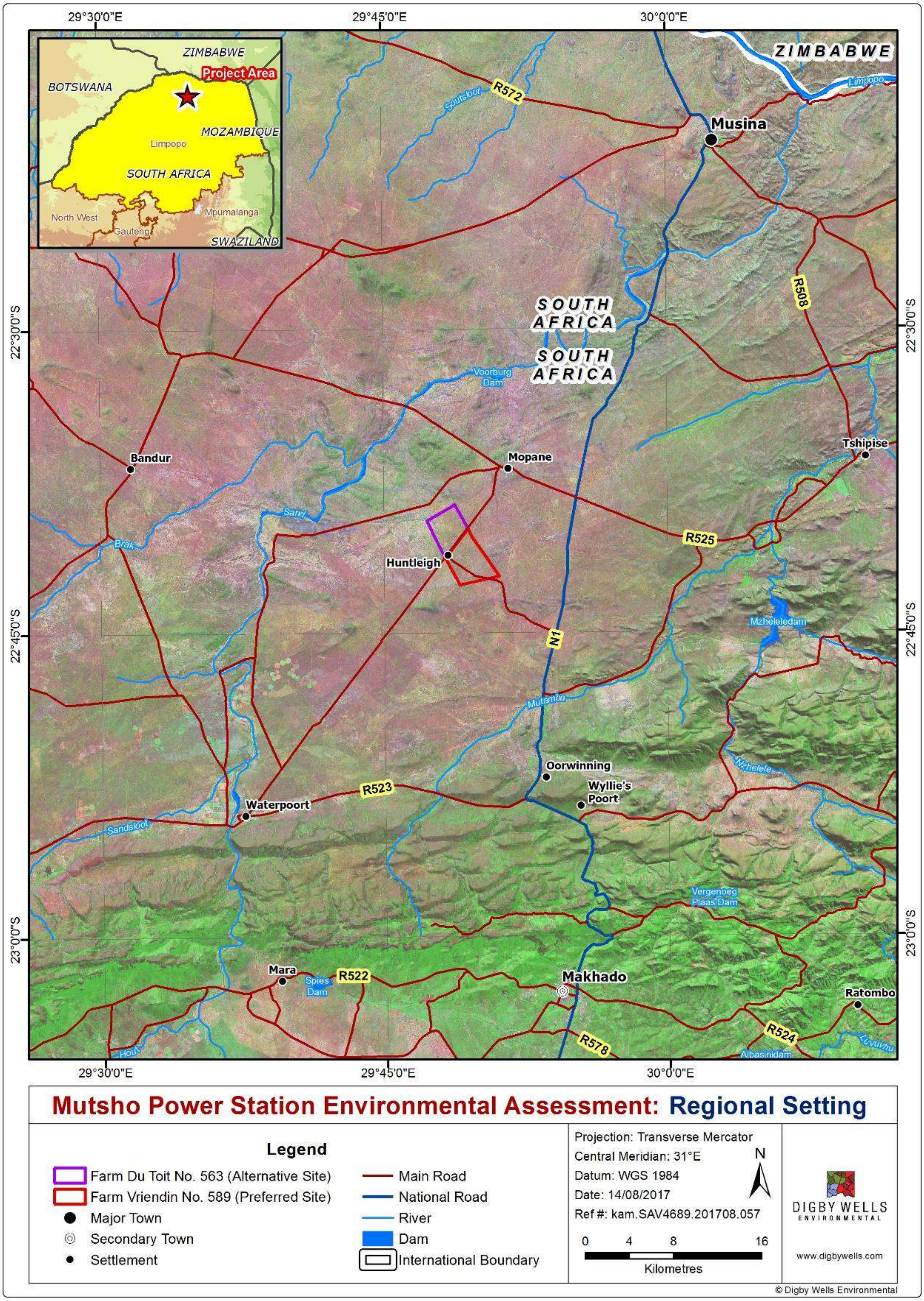

Figure 1-1: Proposed location of the Mutsho Power Project

2 BASELINE ENVIRONMENT

2.1 Location and Potentially Affected Rivers

The project area is located in the A71K quaternary catchment of lower drainage of the Limpopo River Water Management Area (WMA) as revised in the 2012 WMA boundary descriptions. The A71K quaternary catchment has a net area of 1669 km^2 which receives an average of 305 mm rainfall per annum with an average potential evaporation rate of 2000 mm per annum as stipulated by the Water Resources of South Africa 2012 Study (WR2012). The above natural inflows and outflows leads to a negative environmental balance for most open water sources.

The primary drainage feature associated with the proposed project is a perennial river, namely the Sand River, which falls within the Sub-Quaternary-Reach (SQR) A71K-00031 which is inside the A71K quaternary catchment of the Limpopo WMA. The reach of concern is approximately 43.15 km in length draining from the southern side to north-eastern side of the quaternary catchment. Several non-perennial streams and drainage lines exist within this quaternary and there appears to be few within the demarcated project area.

The catchment area of the Project lies in the upper reaches of tributaries of the Sand River and therefore rainfall and seepage from the project area will influence the A71K-00031 SQR. It is important to note that the perennial river associated with the proposed project is categorised as a National Freshwater Ecosystem Priority Area (NFEPA) river where conservation of the reach is vital.

The quaternary catchment and SQR of concern are highlighted in the below image (Figure 2-1).

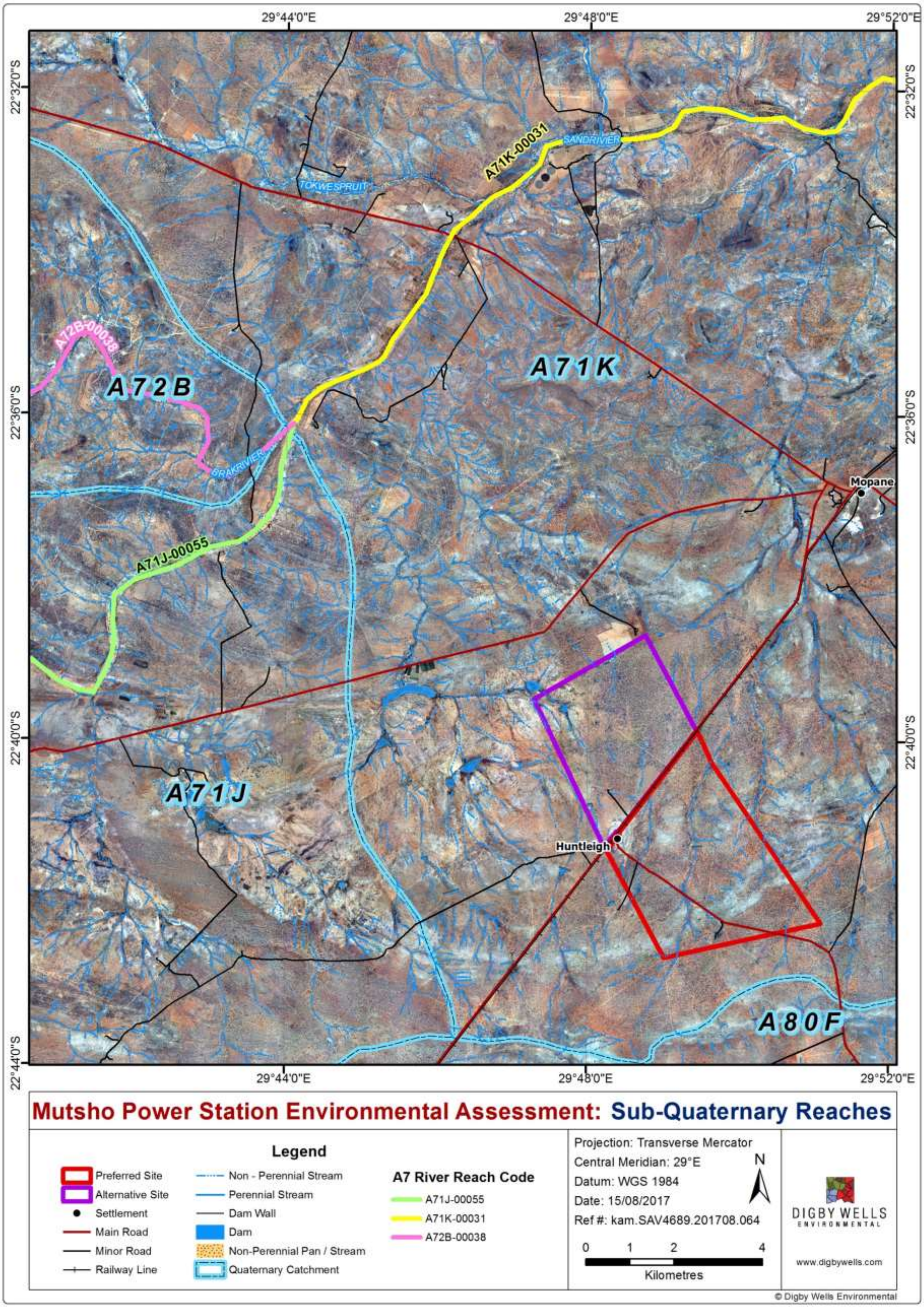

Figure 2-1: Demarcation of the quaternary reach and SQR of concern

2.2 Basic Aquatic Habitat Features

The typical habitat of the Sand River within the A71K-00031 SQR is dominated by sandy substrates within a wide seasonal channel (mostly alluvial) with anastomosing sections, pools and shallow areas. Low flows are also expected in the reach due to abstraction occurring upstream for irrigation purposes. As a result, in stream vegetation appears to be limited with marginal vegetation comprising mainly of woody vegetation.

2.3 Biological Response Indicators

According to the Department of Water Affairs (DWA, 2013), a total of 33 macroinvertebrate families and a total of 18 fish species are expected to be present in the SQR (A71K-00031). The expected macroinvertebrate taxa are provided in Table 2-1 with the expected fish species in Table 2-2.

Table 2-1: Expected macroinvertebrates in the A71K-00031 SQR (DWA, 2013)

Family names	Family names	Family names
Turbellaria	Belostomatidae	Dytiscidae
Oligochaeta	Corixidae	Gyrinidae
Hirudinea	Gerridae	Ceratopogonidae
Potamonautidae	Hydrometridae	Chironomidae
Atyidae	Naucoridae	Culicidae
Baetidae	Nepidae	Muscidae
Caenidae	Notonectidae	Tabanidae
Ceonagrionidae	Pleidae	Tipulidae
Aeshnidae	Veliidae	Ancylidae
Gomphidae	Hydropsychidae	Lymnaeidae
Libellulidae	Leptoceridae	Physidae

The above macroinvertebrate taxa range from the lowest sensitivity score of 1 (oligochaeta and culicidae) to a high of 8 (atyidae and aeshnidae).

Table 2-2: Expected fish species in the A71K-00031 SQR (DWA, 2013)

Fish Species	Common Name	Conservation Value (IUCN)
Labeobarbus marequensis	Lowveld largescale Yellowfish	Least Concern
Barbus mattozi	Papermouth	Least Concern
Barbus paludinosus	Straightfin Barb	Least Concern
Barbus toppini	East Coast Barb	Least Concern
Barbus trimaculatus	Threespot barb	Least Concern
Barbus unitaeniatus	Longbeard Barb	Least Concern
Barbus viviparus	Bowstripe Barb	Least Concern
Clarias gariepinus	African Catfish	Least Concern
Chiloglanis paratus	Sawfin Suckermouth	Least Concern
Labeo cylindricus	Redeye Labeo	Least Concern
Labeo molybdinus	Leaden Labeo	Least Concern
Labeo rosae	Rednose Labeo	Least Concern
Labeo ruddi	Silver Labeo	Least Concern
Micralestes acutidens	Sharptooth Tetra	Least Concern
Mesobola brevianalis	River Sardine	Least Concern
Oreochromis mossambicus	Mozambique Tilapia	Near Threatened
Pseudocrenilabrus philander	Southern Mouthbrooder	N/A
Schilbe intermedius	Butter Catfish	Least Concern

The majority of the expected fish species for the SQR are categorised, according to the IUCN Red List of Threatened Species, as least concern. However, the species *Oreochromis mossambicus* is categorised as near threatened due mainly to hybridization with the rapidly spreading *Oreochromis niloticus* (Nile Tilapia).

2.4 Ecological Status

A desktop summary for the Present Ecological Status (PES) of the Sand River (A71K-00031) is provided in the table below (Table 2-3).

Table 2-3: SQR desktop data showing Present Ecological Status (PES), Ecological Importance (EI), Ecological Sensitivity (ES) and the recommended ecological category for the Sand River (DWA, 2013)

SQR code	A71K-00031
River name	Sand
Class description	Moderately modified
PES	**C**
EI	High
ES	Moderate
Recommended ecological category	**B**

The PES, according to the DWA (2013), is categorised as moderately modified (Class C). This modified status appears to be attributed to specific impacts identified by the Department of Water Affairs (2012), categorised as follows:

- **Small:** agricultural fields, algal growth, bed and channel disturbance, farm dams, erosion, overgrazing/trampling, inundation, irrigation, sedimentation and vegetation removal;
- **Moderate:** abstraction, chicken farms, mining, roads and runoff/effluent from irrigation;
- **Large:** grazing (land-use);
- **Serious:** none; and
- **Critical:** none.

The EI class for the reach is categorised as high. This appears to be due to the presence of a number of ecologically important biota such as the near threatened *Oreochromis mossambicus.*

The ES class for the reach is categorised as moderate. This categorisation appears to be a result of the presence of a number of flow dependent species, such as *Chiloglanis paratus* and *Labeo molybdinus*, which are also sensitive to physio-chemical changes in the river.

3 POTENTIAL IMPACTS

The project activities will include the following:

- **Construction**
  - Site establishment;
  - Site clearing, including the removal of topsoil and vegetation;
  - Construction of the coal-fired power station infrastructure; and

  - Temporary storage of hazardous products, including fuel, as well as waste and sewage.

- **Operation**
  - Operation of the power plant infrastructures;
  - Water use and storage on-site; and
  - Storage, handling and treatment of hazardous products (including fuel) and general waste.

- **Decommissioning**
  - Demolition and removal of all infrastructure, including transporting materials off site;
  - Ash dump;
  - Rehabilitation, including spreading of soil, re-vegetation and profiling or contouring;
  - Storage, handling and treatment of hazardous products (including fuel, explosives and oil) and waste; and
  - Post-closure monitoring and rehabilitation.

3.1 Impacts Identified

The aquatic impacts were assessed considering the construction, operation and decommissioning phases of the life of project. The following tables outline the potential aquatic related impacts for the three above listed phases of the project.

Table 3-1: Identified Potential Impacts during the construction phase

Impact: Site clearing and construction of project specific infrastructure, including the temporary storage of hazardous products. **Desktop Sensitivity Analysis of the Site:** Site is considered arid consisting of large areas of bare soil with limited amounts of vegetation. Thus, highly sensitive to vegetation removal and impacts associated with the removal of topsoil.			
Issue	**Nature of Impact**	**Extent Impact**	**Impacted Areas**
Physical riparian vegetation and topsoil removal	Water quality and habitat quantity and quality	Highly localised with possible downstream impacts	Localised areas where construction needs to take place as well as possible residual impacts affecting water quality locally as well as downstream.
Construction of infrastructure in and nearby water courses	Water quality, quantity and flow related impacts which may impact habitat quality and quantity	Highly localised initial impacts and possible downstream impacts	Initial impacts are highly localised, especially visible with flow alteration depending on location of the infrastructure.
Working with hazardous products (fuel, oil and other contaminants) including general waste near associated water courses	Water quality	Local and possible downstream impacts	Localised areas where the construction needs to take place, possibly affecting local water quality as well as downstream water quality
***Description of expected significance of* impact** **This impact appears to be significant due to the already arid conditions and limited vegetation of the project area as well as the already modified status (class C) of the Sand River. Thus, further degradation of riparian habitat and water quality and quantity will severely impact the associated aquatic ecology.**			

Table 3-2: Identified Potential Impacts during the operations phase

Impact: Operation of project infrastructure, including the use of harmful products and waste on site, affecting associated water courses as well as the use and storage of water on site. **Desktop Sensitivity Analysis of the Site:** Associated water courses are considered as non-perennial with already limited flow. Thus, sensitive to water quantity related impacts especially to the use of the associated river systems as a water source. The SQR of concern (which is a NFEPA river) is classified as highly sensitive due to the presence of a number of sensitive taxa which have highly specific flow and physio-chemical preferences.			
Issue	**Nature of Impact**	**Extent Impact**	**Impacted Areas**
Operation of power plant infrastructures including the stockpiling of various materials (ash, topsoil, coal and limestone)	Impacts to water quality and quantity reporting to the receiving environment which may impact habitat quality and quantity	Local and possible downstream impacts	Localised areas where operation needs to take place as well as possible residual impacts affecting water quality and quantity downstream. It is important to note that these impacts will relate to the positioning of infrastructure of aquatic importance. E.g. pollution control dams will have greater impacts if positioned in drainage lines.
Water use and storage on site	Water quality, quantity and flow related impacts which may impact habitat quality and quantity	Localised and possible downstream impacts	This impact depends on which specific water bodies are intended to be used as a water source. However, the impacted areas appear to be localised but could result in downstream related impacts due to the project's situation in appear tributaries of the Sand River.
Working with hazardous products (fuel, oil and other contaminants) near associated water courses	Water quality	Local and possible downstream impacts	Localised areas where the construction needs to take place, possibly affecting local water quality as well as downstream water quality

Impact: Operation of project infrastructure, including the use of harmful products and waste on site, affecting associated water courses as well as the use and storage of water on site. **Desktop Sensitivity Analysis of the Site:** Associated water courses are considered as non-perennial with already limited flow. Thus, sensitive to water quantity related impacts especially to the use of the associated river systems as a water source. The SQR of concern (which is a NFEPA river) is classified as highly sensitive due to the presence of a number of sensitive taxa which have highly specific flow and physio-chemical preferences.			
Issue	**Nature of Impact**	**Extent Impact**	**Impacted Areas**
***Description of expected significance of* impact** This overall impact appears to be limited due to expected poor flow conditions for the water courses associated with the project area. However, due to the presence of sensitive and ecologically important taxa, the significance impacts may have on the aquatic ecology may be regarded as high, depending on the actual flow of tributaries from the project area.			

Table 3-3: Identified Potential Impacts during the decommissioning phase

Impact: Disturbance to aquatic ecology during physical activities occurring when decommissioning as well as potential impacts to water quality. **Desktop Sensitivity Analysis of the Site:** Site is considered arid consisting of large areas of bare soil susceptible to erosion. Thus, project area appears to be sensitive to further activities especially after the life of the project.			
Issue	**Nature of Impact**	**Extent Impact**	**Impacted Areas**
Disturbance to aquatic environment as a result of physical activities taking place, such as vehicle operation and clearing of infrastructure.	Water quality and habitat quantity and quality	Highly localised with possible downstream impacts	Riparian zones are expected to be impacted the most on a local scale with possible downstream impacts depending on the flow of the water courses during the specific decommissioning activities
Rehabilitation of ash dump and stockpiles and the redistribution of vegetation and soils near water course	Water quality	Local impacts with possible downstream impacts	Local areas may be affected due to sedimentation which may lead to flow modifications and water quality related impacts downstream of the disturbances
Working with hazardous products (fuel, oil and other contaminants) near associated water courses	Water quality	Local and possible downstream impacts	Localised areas where the construction needs to take place, possibly affecting local water quality as well as downstream water quality
***Description of expected significance of* impact** This impact appears to be of significance due to the dry and barren conditions of the project area. However, the spread of the aquatic related impacts are expected to be limited due to the dry water courses conditions.			

Table 3-4: Identified Potential Project Risks

Potential Project Risk (Unplanned Occurrences)	**Aspect Potentially Impacted**	**Project Phase**
Accidental hydrocarbon spillage from construction vehicles	Impacts on the associated water courses water quality	Construction, operation and decommissioning
Improper hazardous chemicals and sewage storage or disposal	Can contaminate or pollute associated water courses	Construction and operation
Paved areas and road construction	Increased surface runoff that will increase evaporation and erosion leading to habitat and water quality related impacts in the associated river systems	Construction and operation

4 MITIGATION AND MINIMISATION MEASURES

Possible mitigation and minimisation measures for each of the three project phases are listed below:

4.1 Construction phase

- Mitigation measures:
    - No-go options applicable where watercourses are to be avoided.
    - Placement of infrastructure as far as possible from riverine areas; e.g. stockpiles, waste storage facilities and the ash dump as far as possible from river systems.
    - Limit the amount of vegetation clearing where possible.
    - Divert natural/clean water that may flow through or near the project area.
- Minimisation Measures:
    - Riverine areas that are avoided must be clearly demarcated and assigned a protection buffer of at least 100m where all activities should be prevented to minimise impacts
    - Construction activities must be monitored by an aquatic ecologist according to a provided monitoring programme.
    - Construction phase to take place during the dry seasons to minimise/prevent erosion and limit possible runoff of contaminants.

4.2 Operation phase

- Mitigation measures:
    - No-go options applicable where watercourses are to be avoided.
    - Placement of operating infrastructure as far as possible from riverine areas; e.g. stockpiles, waste storage facilities and the ash dump as far as possible from river systems.
    - Contain all dirty water runoff for reuse and limit entry into the associated water courses.
    - Divert natural/clean water that may flow through or near the project area.
- Minimisation Measures:
    - Lining of the ash dump and all water storage dams.
    - Implement dry ash disposal (as suggested in the project description) to limit water use as the catchment is considered as dry.

- Concurrent rehabilitation of the ash dump by placing top soil and planting with grass and trees.
- Managing the shape of the ash dump to ensure that runoff is maximised and rainfall ponding is minimised.
- Avoid the disturbance of deposited ash as much as possible to allow the formation of pozzolanic surface.
- Operational activities must be monitored by an aquatic ecologist according to a provided monitoring programme.

4.3 Decommissioning phase

- Mitigation measures:
  - Limit spread of sediment and stockpiled material.
  - Avoid disturbing sensitive, eroded areas when decommissioning.
  - Contain hazardous products and waste correctly when working near the water courses.
- Minimisation measures:
  - Rehabilitation to stockpiled areas and ash dump with the creation of silt traps if flow or nearby water courses is sufficient
  - Decommissioning activities must be monitored by an aquatic ecologist according to a provided monitoring programme.

5 TERMS OF REFERENCE AND PLAN OF STUDY

A detailed aquatic impact assessment will be conducted to assess and identify potential impacts that may arise from the proposed Mutsho Power Project and the associated activities/infrastructure. The impact assessment will make use of a rating system adopted by Digby Wells that takes into consideration the intensity, duration, spatial scale and probability of the impacts.

The aquatic impact assessment will be conducted in line with the DWS Best Practice Guideline for Impact Prediction and is guided by following legislative requirements:

- National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- National Water Act (Act 36 of 1998) (NWA); and
- NWA amendment of Regulation 704 (GN R 704) of 1999.

5.1 Objectives of the Study

The objectives include the assessment of the potential impact and mitigation plans of the proposed IPP on the associated aquatic environment. The report will be compiled in support of obtaining the relevant environmental authorisations for the project to go ahead.

5.2 Methodology for the Aquatic Impact Assessment

5.2.1 Survey Periods

Two surveys will be completed for this proposed study. Survey periods would be completed once during the high flow period and once during the low flow period.

5.2.2 Visual Assessment

The visual assessment would include the photographing of each site during the survey. The captured photographs would then be compared to previous surveys and conclusions on habitat quality would be drawn from this.

5.2.3 Water Quality (In situ)

Water quality analysis would be completed for the project utilising a calibrated water quality meter (EXTECH, DO700). The following constituents would be analysed (*In situ*)*:* pH, Temperature (Cº), Conductivity (EC) (µS/cm), Total Dissolved Salts (mg/l), Dissolved oxygen concentration and saturation percentage.

All water quality results would then be compared to the Aquatic Ecosystem Water Quality Guidelines stipulated in DWAF (1996).

5.2.4 Habitat Indicators

5.2.4.1 General Habitat Assessment

Due to the reliance and adaptations of aquatic biota to specific habitats, the availability and diversity of habitat is important to consider for aquatic assessments (Barbour *et al*., 1996). Habitat quality and availability assessments are therefore usually conducted alongside biological assessments involving fish and macroinvertebrates. Aquatic habitat (habitat) will be assessed through the detailed description of each site utilising various methods set out by Bain and Stevenson (1990), Vannote *et al*. (1980), Gerber and Gabriel (2002). Rough flow estimates will be completed using calibrated flow meters. Clarity will also be measured using a clarity tube. Habitat will be assessed and characterized according to section D of the "Procedure for Rapid Determination of Resource Directed Measures for River Ecosystems (1999)".

The Intermediate Habitat Integrity Assessment (IHIA) model will be used to assess the integrity of the habitats from a riparian and in-stream perspective. The habitat integrity of a river refers to the maintenance of a balanced composition of physico-chemical and habitat characteristics on a temporal and spatial scale that are comparable to the characteristics of natural habitats of the region (Kleynhans, 1996).

This model compares current conditions with reference conditions that are expected to havebeen present. Specification of the reference condition follows an impact based approach where the intensity and extent of anthropogenic changes are used to interpret the impact on the habitat integrity of the system.

To accomplish this, information on abiotic changes that can potentially influence river habitat integrity are obtained from surveys or available data sources. These changes are all related and interpreted in terms of modification of the drivers of the system, namely hydrology, geomorphology and physico-chemical conditions and how these changes would impact on the natural riverine habitats.

5.2.4.2 Integrated Habitat Assessment System (Version 2)

The Integrated Habitat Assessment System (IHAS) was specifically designed to be used in conjunction with the SASS5, benthic macroinvertebrate assessments. The IHAS assesses the availability of the biotopes at each site and expresses the availability and suitability of habitat for macroinvertebrates, this is determined as a percentage, where 100% represents "ideal" habitat availability.

5.2.5 Response Indicators

5.2.5.1 South African Scoring System (Version 5) (SASS5)

The SASS5 is the current index being used to assess the status of riverine macroinvertebrates in South Africa. According to Dickens and Graham (2002), the index is based on the presence of aquatic invertebrate families and the perceived sensitivity to water quality changes of these families. Different families exhibit different sensitivities to pollution, these sensitivities range from highly tolerant families (e.g. Muscidae and Psychodidae) to highly sensitive families (e.g. Oligoneuridae). SASS results are expressed both as an index score (SASS score) and the Average Score Per recorded Taxon (ASPT value).

All SASS5 and ASPT scores are compared with the SASS5 Data Interpretation Guidelines (Dallas, 2007) for the relevant ecoregion. This method seeks to develop biological bands depicting the various ecological states and is derived from data contained within the Rivers Database and supplemented with other data not yet in the database.

Sampled invertebrates will then be identified using the Aquatic Invertebrates of South African Rivers Illustrations book, by Gerber and Gabriel (2002). Identification of organisms will be made to family level (Thirion *et al*., 1995; Dickens & Graham, 2002; Gerber & Gabriel, 2002).

Specialists completing the SASS5 sampling, assessment and interpretation are accredited by the Department of Water and Sanitation (DWS) and currently hold valid SASS5 certificates and can be provided if requested.

5.2.5.2 Macroinvertebrate Response Assessment Index (MIRAI)

The aim of the MIRAI is to provide a habitat-based cause-and-effect foundation to interpret the deviation of the aquatic invertebrate community from the reference condition. This does not preclude the calculation of SASS scores if required (Thirion, 2007). The four major components of a stream system that determine productivity for aquatic organisms are as follows:

- Flow regime;
- Physical habitat structure;
- Water quality; and
- Energy inputs from the watershed Riparian vegetation assessment.

5.2.5.3 *Fish Response Assessment Index (FRAI)*

Cast netting and electroshocking techniques will be extensively used to capture the majority of the fish species present. All fish captured will be identified and counted in field and released alive at the point of capture.

Fish species will be identified using the Skelton (2001). The expected fish species list will be developed from the literature survey and include sources such as (Kleynhans *et al*.; 2007) and Skelton (2001).

5.2.6 Overall Present Ecological Status

Following the completion of the various biological indexes, the overall Present Ecological Status (PES) will be defined.

5.2.7 Impact Assessment

The impact assessment will include:

- Defining potential aquatic ecology impacts that could result from the proposed coal-fired power station and its associated activities;
- Recommending mitigation measures to prevent and/or minimise the identified potential impacts over the life of project; and
- Recommending monitoring program that will be used as a tool to detect any impact to aquatic ecology.

5.2.8 Reporting

All information, data, maps and interpretations will be compiled into a detailed technical report that is the final deliverable of the aquatic specialist investigation of the project EIA, with conclusions and recommendations on risks, mitigation and monitoring requirements as stipulated by the authorities.

The site specific Aquatic Impact Assessment methodology and risk rating that will be used is the same as described in the EIA and is in accordance with the corresponding regulations.

An aquatic monitoring plan will be compiled based on the conditions and activities on site and will include the location of the monitoring sites, frequency of monitoring, list of chemical parameters to be monitored, sampling methodology, description of data capturing and reporting requirements.

5.3 Project Team

The project team is comprised of the following Digby Wells staff members:

- Nathan Cook will be completing the aquatic ecology study for this project. He is a certified SASS5 practitioner with a BSc in environmental sciences. Nathan has completed numerous aquatic ecology assessments in South Africa and has surveyed in Senegal, West Africa, as well as in the Zambezi and Chobe rivers in Botswana, Zambia and Namibia. He has a good technical understanding on the variable conditions within South African rivers as well as their biological compositions, especially in the Highveld Lower ecoregion.
- Daniel Otto will be overseeing the project and has over 20 years of experience in energy and mining related projects. Danie manages the Technical Divisions at Digby Wells and holds an M.Sc in Environmental Management with B.Sc Hons (Limnology, Geomorphology, GIS and Environmental Management) and B.Sc (Botany and Geography & Environmental Management). He is a biogeomorphologist that specialises in ecology of wetlands. He has been a registered Professional Natural Scientist (Pr. Sci. Nat. Environmental Science: 400321/12) since 2002

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