DIGBY WELLS
ENVIRONMENTAL

H2 Energy Power Station

Surface Water Assessment Scoping Report

Project Number:
SAV4334

Prepared for:
H2 Clean Energy (Pty) Ltd
On behalf of
Savannah Environmental Consultant (PTY) LTD

November 2016

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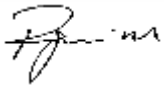
Mashudu Rafundisani	Report Writer		November 2016
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1 INTRODUCTION

Digby Wells Environmental (hereafter Digby Wells) has been appointed by Savannah Environmental (Pty) Ltd to undertake a surface water assessment for the proposed development of the 600 MW H2 Energy Power Station and associated infrastructure near KwaMhlanga, in Mpumalanga Province.

1.1 Project Description and Location

The proposed project area is located approximately 9 km south of KwaMhlanga, and approximately 800 m north of the Palesa Coal Mine in the Thembisile Hani Local Municipality of the Nkangala District in Mpumalanga Province. The regional and local setting maps are shown on Figure 1-1 and Figure 1-2.

The project site comprises the following properties:

Description:	SG 21 Code	Parcel
Portion 21 of the Farm Hartebeestspruit No. 434	T0JR00000000043400021	21/434
Portion 22 of the Farm Hartebeestspruit No. 434	T0JR00000000043400022	22/434
Portion 23 of the Farm Hartebeestspruit No. 434	T0JR00000000043400023	23/434

The H2 Energy Power Station is proposed to make use of Supercritical (SC) or Ultra-supercritical (USC) Pulverised Coal (PC) or Circulating Fluidised Bed (CFB) boiler technology. It will have a total generation capacity of up to 600 MW. It will have up to 2 emission stacks 80 m in height. The project will utilise direct or indirect dry cooling, and dry ashing methods.

Coal required for the project will be sourced from the existing Palesa Coal Mine, located approximately 1 km south of the project site.

Electricity generated by the project will feed into and supplement the national electricity grid. Power line route alternatives will be determined based on the final project layout and grid connection point. These will be assessed through a separate application for Authorisation.

The main infrastructure components associated with the project include:

- An overland coal conveyor.
- Raw materials loading and offloading, storage areas, and handling facilities.
- A coal crusher (and screening plant in the case of PC technology).

- Power generation units.
- Ash dump.
- Water infrastructure including a raw water storage dam, wastewater treatment plant (WWTP) and stormwater runoff dams.
- A substation/switching yard.
- Office and maintenance area/s and buildings.
- Access roads.

An integrated Application for Environmental Authorisation in order to obtain EA in accordance with the National Environmental Management Act (No. 107 of 1998) (NEMA) and the 2014 EIA Regulations; and a Waste Management License (WML) in accordance with the National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA) and the List of Waste Management Activities will be undertaken for the project. The proposed infrastructure will be placed within the demarcated project boundary shown in Figure 1-2 and a detailed infrastructure layout will be provided in the EIA phase of this study.

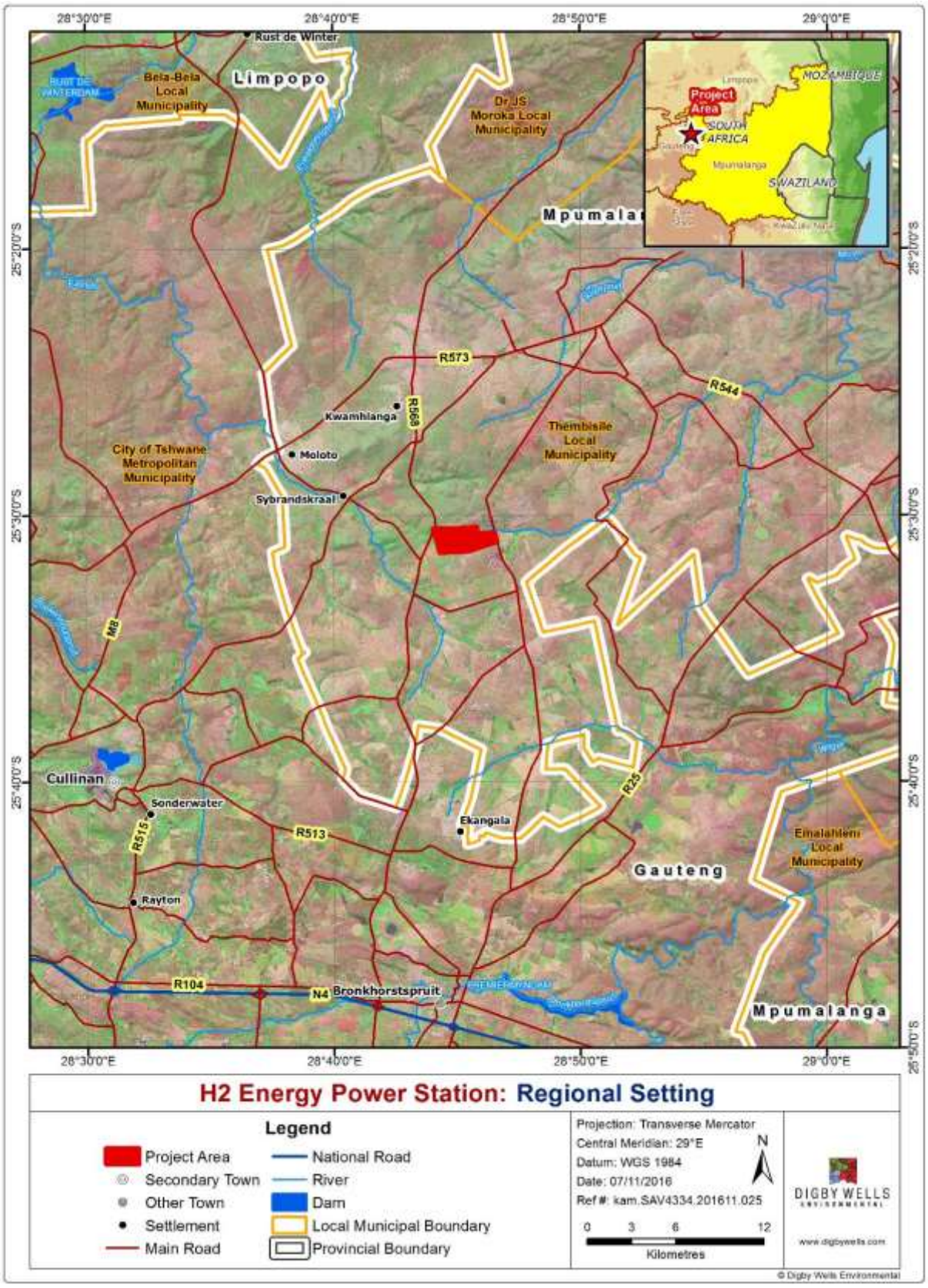

Figure 1-1: Regional Setting

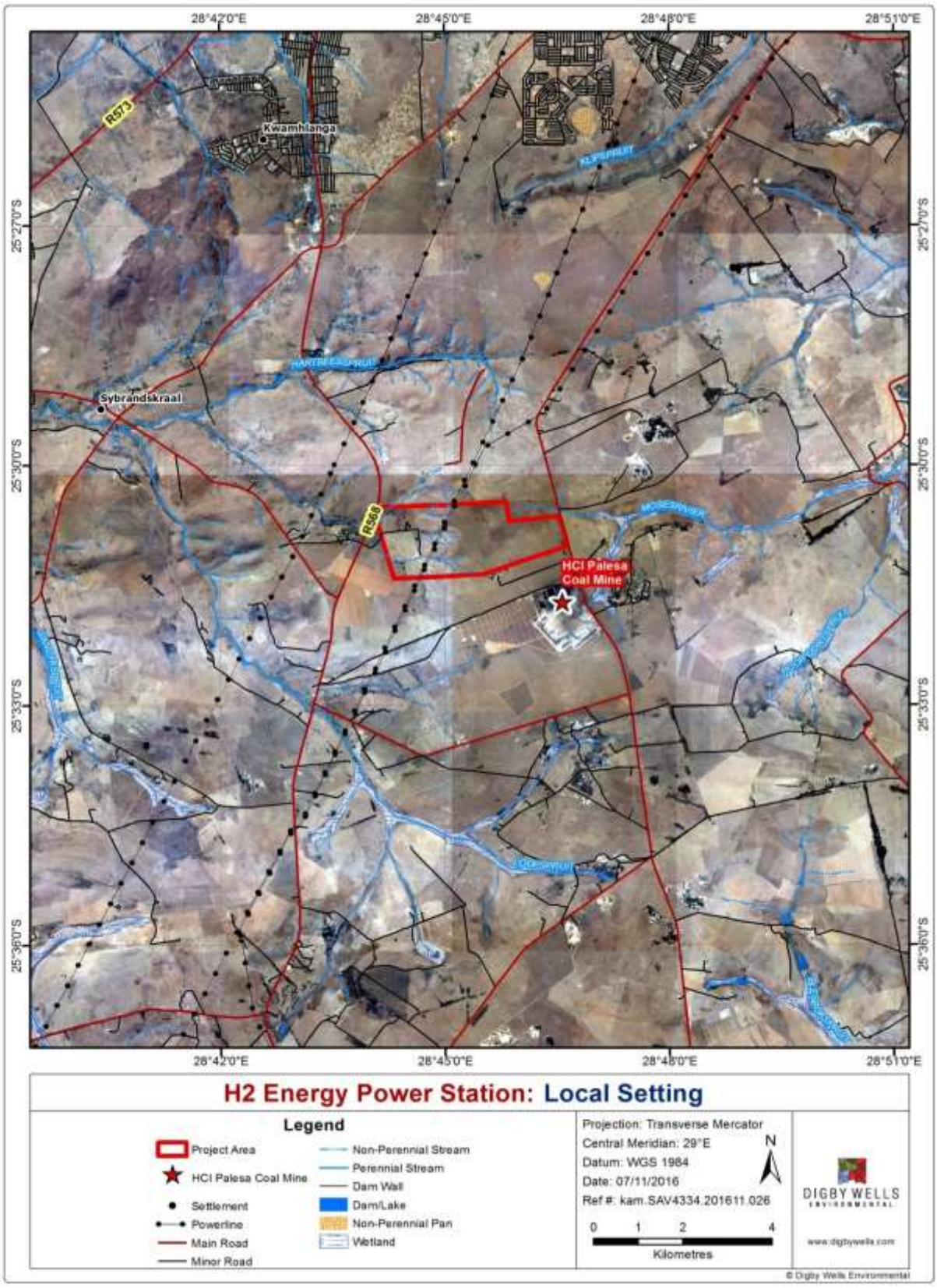

Figure 1-2: Local Setting

2 BASELINE ENVIRONMENT

2.1.1 Surface Water Hydrology

South Africa is divided into 9 Water Management Areas (WMA) (Revised National Water Resource Strategy, 2012), managed by their own water boards. Each of the WMAs is made up of quaternary catchments which relate to the drainage regions of South Africa, ranging from A to X (excluding O). These drainage regions are subdivided into four known divisions based on size. For example, the letter A represents the primary drainage catchment; A2 represents the secondary catchment; A21 represents the tertiary catchment and A21D represents the quaternary catchment which is the lowest subdivision in the Water Resources of South Africa, 2012 manual. Each of the quaternary catchments has associated hydrological parameters.

The project area is located in the B31B and B32G quaternary catchments of the upper drainage of the Olifants River WMA(02) as revised in the 2016 WMA boundary descriptions (government gazette No. 1056). This is shown in Figure 2-1. The surface water attributes of the affected quaternary catchment namely Mean Annual Precipitation (MAP), Mean Annual Runoff (MAR), and Mean Annual Evaporation (MAE) were obtained from the Water Resources of South Africa 2012 Study (WR2012) and are summarised in Table 2-1.

Table 2-1: Summary of the surface water attributes of the B31B and B32G quaternary catchment

Catchment	Area (km^2)	MAP (mm)	MAR (mcm)	MAE (mm)
B31B	385	640	11.19	1800
B32G	968	639	24.75	1850

*million cubic meters

The B31B and B32G quaternary catchments have a net area of 385 km^2 and 968 km^2 which receive an average of 640 and 639 mm of rainfall per annum whilst the evaporation rate is an average of 1800 mm and 1850 per annum respectively.

Within the B31B quaternary, there is one perennial river, namely Hartbeespruit (located approximately 3.5 km from the project area) draining the catchment from the southern to north-western side of the quaternary catchment. Several non-perennial streams and drainage lines exist within this quaternary and few within the demarcated project area.

In B32G quaternary catchment, Moses River is the major perennial stream draining the catchment. This river originates in the north-eastern corner of the project area and flows in a north-easterly direction. The Moses River is joined by various tributaries before it joins

the Olifants River near Hereford in the Limpopo Province approximately 100 km north-east of the project area. These rivers and drainages can be seen in Figure 1-2.

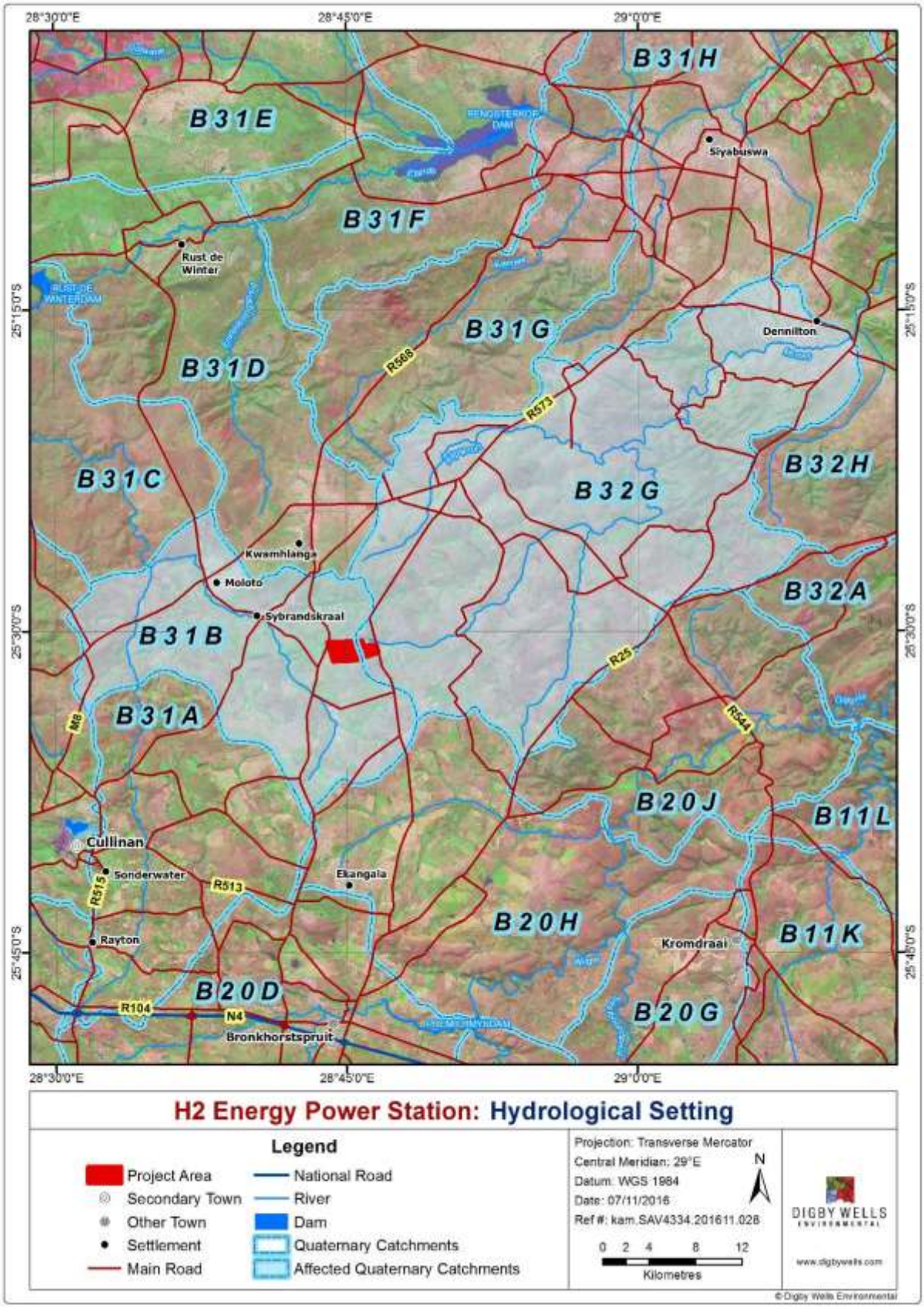

Figure 2-1: Hydrological Setting

2.1.2 Climate

The project area falls in the Highveld climatic zone which is characterised by calm, stable and dry conditions in the winter months, which are conducive to the formation of temperature inversions, i.e. an increase in temperature with height. This section provides the monthly climatic data conditions (rainfall and evaporation) of the rainfall and evaporation zones in which the project area is located.

2.1.2.1 Rainfall

Table 2-2 presents the average monthly rainfall for the quaternary catchments B31B and B32G. This is based on the averages of monthly rainfall data from a period of 1920 to 2009.

Table 2-2: Summary of rainfall data extracted from the WR2012

Month	MAP (mm)	
	B31B	B32G
January	114.1	109.0
February	86.2	87.9
March	78.0	75.4
April	41.1	38.6
May	15.4	15.3
June	6.0	5.6
July	4.4	4.6
August	5.5	5.4
September	16.6	18.0
October	62.7	60.7
November	105.5	109.6
December	104.6	109.0
MAP	**640**	**639**

From the rainfall data above, higher rainfalls in the B31B (105.5 mm, 104.6 mm and 114.1 mm) were recorded for the months of November, December and January respectively whilst the minimum rainfall was recorded in August for both the catchments. In general, this area receives rainfall an average of 640 mm and 639 mm per annum for B31B and B32G respectively.

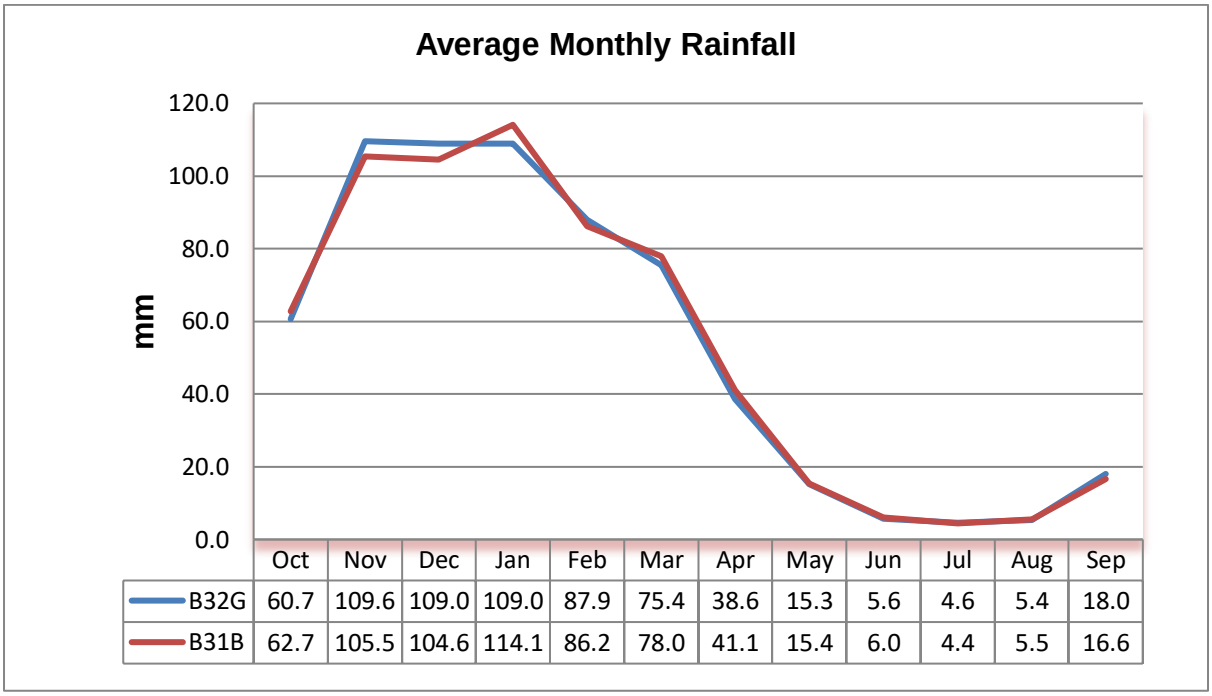

Figure 2-2: Summary of the average monthly rainfall for the two quaternaries

2.1.2.2 Evaporation

Monthly evaporation data was obtained from the WR2012 manual. The evaporation obtained is based on Symons Pan evaporation measurements and needs to be converted to lake evaporation. This is due to the Symons Pan being located below the ground surface and painted black which results in the temperature in the water being higher than that of a natural open water body. The Symons Pan figure is then multiplied by a lake evaporation factor to obtain the adopted lake evaporation figure which presents the monthly evaporation rates of a natural open water body. This was calculated to be a total average of 1513 mm and 1554 mm per annum. Table 2-3 is a summary of the average monthly evaporation for the B31B and B32G quaternary.

Table 2-3: Summary of evaporation data

Months	Lake Evaporation Factor	Lake Evaporation (mm)	
		B31B	B32G
January	0.84	166.3	170.8
February	0.9	145.3	149.2
March	0.9	143.4	147.3
April	0.9	110.2	113.2
May	0.9	91.8	94.3

Months	Lake Evaporation Factor	Lake Evaporation (mm)	
		B31B	B32G
June	0.9	72.8	74.8
July	0.8	77.8	80.0
August	0.8	100.6	103.3
September	0.8	130.3	133.9
October	0.8	157.2	161.5
November	0.82	150.1	154.2
December	0.83	167.3	171.9
Total	**N/A**	**1513**	**1554**

In this area, higher evaporation rates are experienced during the months of October, November, December and January whilst low evaporation rates occur in May, June and July.

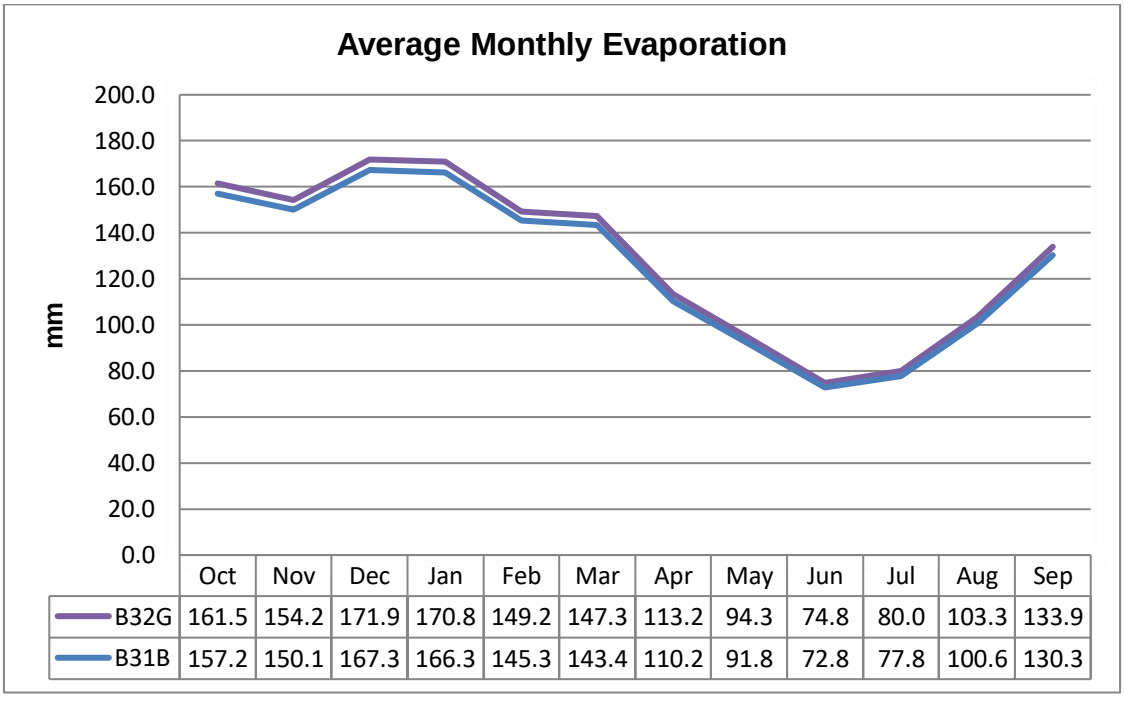

Figure 2-3: Summary of the average monthly evaporation for the two quaternaries

3 LAND AND WATER USES

The predominant present land use in the wider area is agriculture and mining, whilst the main use of surface water in the area is for domestic and agricultural (livestock watering) purposes.

4 POTENTIAL SURFACE WATER IMPACTS

The proposed development of the 600 MW H2 Energy Power Station and associated infrastructure may possibly have an impact on the nearby surface water resources. The identified potential surface water impacts are provided in the table below.

Table 4-1: Identified potential Impacts

Impact: Siltation impact on the surface water resource (i.e. Moses River) due to runoff from exposed soils as a result of removal of vegetation reports. Exposed soils are susceptible to erosion during rainfall events **Desktop Sensitivity Analysis of the Site:** The project area lies in between the watershed/catchment divide, with a number of drainage lines originating in both sides of the two quaternary catchments			
Issue	**Nature of Impact**	**Extent Impact**	**No-Go Areas**
Siltation of the stream as runoff from site enters these streams	This may to deterioration of water quality	Local	Nearby perennial river (Loopspruit and Moses River)
***Description of expected significance of* impact** This impact is more likely to occur during construction phase as a result of vegetation removal, however, very less runoff is expected to be produced out of the area as it situated in the watershed which in turn have very limited runoff producing catchment area. Expected silts will possibly settle down within a limited distance from the site, therefore expected impact may only affect the immediate surrounding Rivers. This impact can be managed or mitigated with the appropriate measure in place.			
Gaps in knowledge & recommendations for further study Site assessment needs to be done to verify and confirm the hydrological characteristics of the area. This will help to further identify potential impact and the necessary mitigation or management measures.			

Impact:

Contamination of the Moses River and Loopspruit when dirty runoff emanating from the project site enter into these watercourse

Desktop Sensitivity Analysis of the Site:

There are some drainage lines originating within and near the project boundary. Runoff from these eventually reports into the above mentioned watercourses, so these non-perennial drainage lines are moderately sensitive as the can be a conduit of dirty runoff.

Issue	Nature of Impact	Extent Impact	No-Go Areas
Contamination of rivers runoff from site enters these streams	This will lead to deterioration of water quality	Municipal	major drainage lines and nearby perennial rivers

***Description of expected significance of* impact**

This impact is more likely to occur as result of activities during construction phase and operational phase. Although less runoff is expected to be produced out of the area as it situated in the watershed which in turn have very limited runoff producing catchment area. Contaminated water may have significant impact on the aquatic habitat and the suitability of water for use by downstream users. This impact can be managed or mitigated with the appropriate measure in place.

Gaps in knowledge & recommendations for further study

Site assessment needs to be done to verify and confirm the hydrological characteristics of the area. Should there be flow on the affected drainages, samples will be collected for analysis to determine the baseline water quality prior to commencement of the project; and this will help to further identify potential impact and the necessary mitigation or management measures.

Impact: Reduction of catchment yield due to containment of dirty water runoff within the stormwater runoff dams **Desktop Sensitivity Analysis of the Site:** The project area lies in between the watershed/catchment divide, with a number of drainage lines originating in both sides of the two quaternary catchments, these are the conduits of runoff into the main stream			
Issue	**Nature of Impact**	**Extent Impact**	**No-Go Areas**
Reduction of catchment yield	Downstream water users and the aquatic habitat rely on the availability water within the river. Reduction of runoff may impact on the recharge in these rivers	Local	major drainage lines and nearby perennial rivers
***Description of expected significance of* impact** This impact is will occur for as long as the project is undergoing. It is mentioned that less runoff is expected to be produced from the project area as it situated in the watershed which in turn have very limited runoff producing catchment area. Impact will likely be of low significance			
Gaps in knowledge & recommendations for further study Calculations to determine the amount of runoff loss will be undertaken to help with determining the significance of the impact.			

5 TERMS OF REFERENCE FOR EIA PHASE STUDY

A detailed surface water impact assessment will be conducted to assess and identify potential impacts that may arise from the proposed development of the 600 MW H2 Energy Power Station and associated infrastructure.

The surface water impact assessment will be conducted in line with the Department of Water and Sanitation (DWS) Best Practice Guideline for Impact Prediction and is guided by the 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

The objectives of this surface water impact assessment include:

- Site assessment to verify the hydrological characteristics of the project area and surrounds;
- Develop a conceptual storm water management plan to ensure separation of clean and dirty water; and
- Conduct a detailed impact assessment to determine the potential surface water impacts that could emanate from the project and its associated activities.

5.2 Methodology

5.2.1 Site Assessment

A one day site visit will be undertaken to assess and verify the onsite hydrological characteristics to enable for the identification of potential contamination sources, pathways and environmental receptors.

5.2.2 Stormwater management plan

A stormwater management plan will be developed in accordance with the Government Notice 704 (GN 704) of the National Water Act 1998 (Act 36 of 1998) (NWA), which relates specifically to the separation of clean and dirty water within mining or related activities. The following tasks will be completed:

- Delineation of clean and dirty catchment areas;
- Calculation of the 1:50 year peak flows originating from clean and dirty water catchments; and
- Conceptual placement of clean and dirty water structures will be indicated on a plan.

5.2.3 Impact Assessment

Detailed surface water impact assessment will include:

- Defining potential surface water impacts that could result from the proposed project and its associated activities. Once impacts have been identified, a rating system that takes into consideration the intensity, duration, spatial scale and probability of the impacts will be applied to determine the significance of the identified impacts;
- Recommending mitigation measures to prevent and/or minimise the identified potential surface water impacts over the life of project; and
- Recommending a monitoring program and Environmental Management Programme (EMPr) that will be used as a tool to detect any surface water impact.

5.3 Project Specialist

The surface water specialists that will be involved in the project is Mr Mashudu Rafundisani. Mashudu is a Surface Water Consultant (Hydrologist) with over 3 years working experience

in the Water Geo-Sciences Department in Digby Wells Environmental. He holds an Honours Degree in Environmental Management from the University of Venda (South Africa). Mashudu has completed numerous surface water specialist studies which includes, but not limited to; floodline modelling using HEC-RAS software, development of Storm Water Management Plans, Water and Salt Balances, Sampling and analysis/interpretation of surface water quality, surface water specialist studies for input on EIA/EMPs and BAR, Integrated Water and Waste Management Plans (IWWMP), Water Use Licence Applications (IWULA) and auditing. He has working experience on projects within South Africa, Mali, Ivory Coast, Malawi and other parts of Africa.

6 REFERENCES

Department of Water and Sanitation notice 509 of 2016. General authorisation in terms of section 39 of the NATIONAL WATER ACT, 1998 (ACT NO. 36 OF 1998) for water uses as defined in section 21(c) or section 21(i)

National Water Act (NWA), 1998 (Act No. 36 of 1998);

Department of Water and Sanitation, Government gazette, notice 1056 of 16 SEPTEMBER 2016

WR2012, "*Water Resources of South Africa, 2012 Study (WR2012)*", Water Research Commission, Pretoria.