PROPOSED HYDROPOWER STATION AND ASSOCIATED INFRASTRUCTURE AT BOEGOEBERG DAM ON THE ORANGE RIVER, NEAR GROBLERSHOOP, NORTHERN CAPE.

DEA Reference No:14/12/16/3/3/2/568

DRAFT SCOPING REPORT

July 2013

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Non-technical summary (English)

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PROPOSED HYDROPOWER STATION AND ASSOCIATED INFRASTRUCTURE AT BOEGOEBERG DAM ON THE ORANGE RIVER, NEAR GROBLERSHOOP, NORTHERN CAPE.

DEA REF. NO. 14/12/16/3/3/1/951

NEAS REF. NO. TBA

JULY 2013

Non-Technical Summary of Draft Scoping Report

Purpose of this document

The purpose of this Non-Technical Summary of the Draft Scoping Report (DSR) for the Boegoeberg hydropower station is to provide stakeholders and interested and affected parties (I&APs) with non-technical access to the relevant information and to facilitate active public participation in the decision-making process.

An Environmental Impact Assessment (EIA) identifies and evaluates potential impacts of a proposed project, as well as feasible alternatives. It also recommends potential measures to avoid or reduce negative impacts and enhance positive impacts. The EIA decision-making authority is the Department of Environmental Affairs (DEA). Act (No. 107 of 1998).

Boegoeberg Hydro Electric Power (Pty) Ltd (Boegoeberg Hydro) intends to construct a hydropower facility with an approximate capacity of 10.05 Megawatt (MW) on the Orange River in the Northern Cape. Aurecon South Africa (Pty) Ltd (Aurecon) has been appointed by HydroSA to undertake the environmental process as required in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA), as amended.

Location

The proposed Boegoeberg hydropower station will be situated on the northern bank of the Orange River alongside the Boegoeberg Dam. The infrastructure for the hydropower facility would be located on the farm Zeekoebaart (Remainder of Farm no. 306 and Portion 1 of Farm no. 306), approximately 26km south east of the town of Groblershoop in the Northern Cape (Figure 1). Energy generated by the proposed hydropower station would be evacuated via a proposed High Voltage HV transmission line to the Eskom Fibre Substation 36km south of the site (Figure 1).

Proposed Project

The proposed facility is a run-of-river hydropower scheme capable of producing approximately 10.05MW of electricity utilising two to three turbines of equal size. Run-of-river facilities use conventional hydropower technology to produce electricity by using the natural flow of a river. However the difference between large scale hydropower facilities and that of run-of-river facilities is that only a portion of the rivers flow is diverted to generate electricity.

Electricity is generated when energy from the flowing water is passed through the turbines which then cause a generator to spin creating electricity. The water would then be returned to the river a short distance downstream of the original abstraction (intake) point. There would be no storage of water off-stream and the power station would thus be subject to seasonal river flows and would not operate during low flow periods. The process of generating electricity through a run-of-river hydro plant is shown in Figure 2.

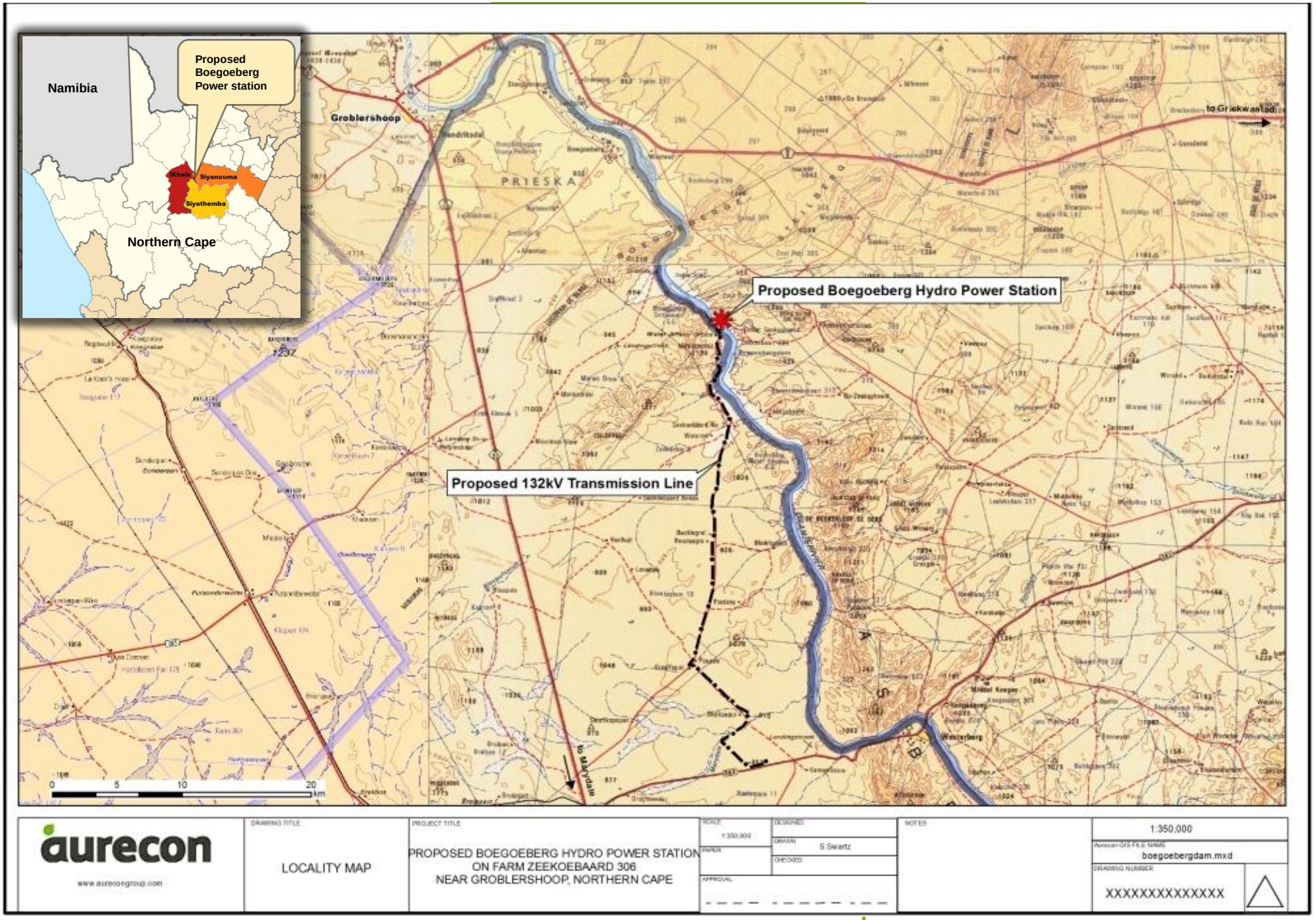

Figure 1: Location of the proposed Boegoeberg Hydropower station (the transmission line will not be more than 132kV but may be less

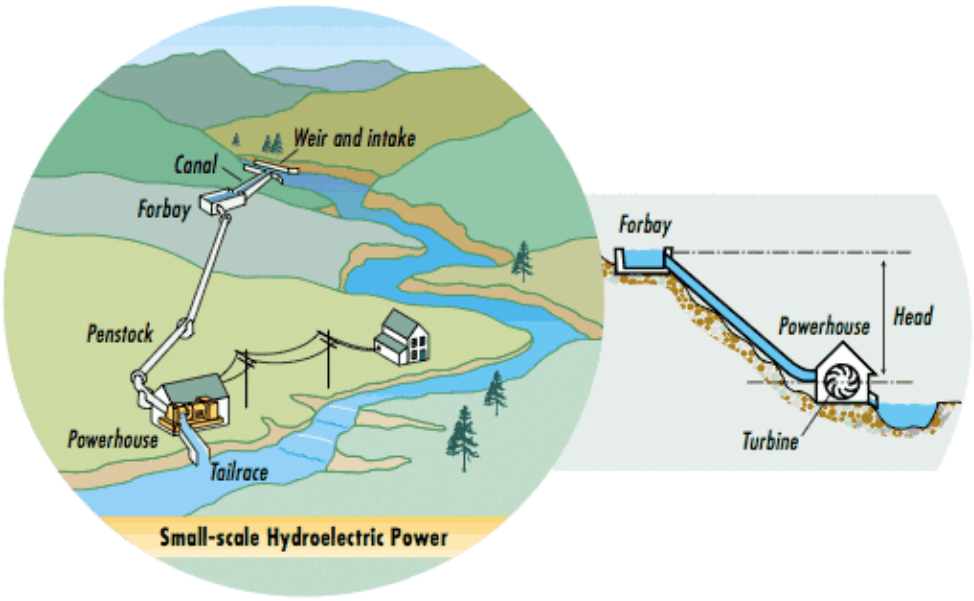

Figure 2 | Illustration of a run-of-river hydropower station

The proposed project would use the existing Boegoeberg Dam to provide water to the in-take structure which would supply the hydropower plant. It is proposed to divert a maximum of 120m^3 of the total flow from the river. This diverted flow would then pass through the hydropower plant infrastructure and be returned to the river some 400m downstream of the weir in-take structure. The dam (refer to Figure 3) would always maintain the full irrigation requirements of the agricultural canal as well as the agreed quantity of water or the Environmental Flow Reserve (EFR)[1], to pass the dam wall. Therefore, only a portion of the surplus water left over once the irrigation canal and EFR have been satisfied would be diverted into an in-take structure (refer to Figure 4) which would regulate the amount of water transferred into the water conveyance infrastructure (i.e. canal/pipeline leading to the powerhouse) . The water would then be channelled through a canal and/or tunnel which would convey the water to the powerhouse (refer to Figure 5), to be used to turn the turbines and generate electricity. The water would then exit into the Orange River from the powerhouse through a tunnel known as the tailrace. The electricity generated would be evacuated through an overhead transmission line of 132kV or less to the Fibre Substation and then into the national grid.

Secondary infrastructure to the hydropower station will also be constructed. This includes a head pond, a transformer bay and access roads.

Figure 3 | Boegoeberg dam.

Figure 4 | Example of an intake structure with trashracks & gate. Note the proposed intake would not have a shed.

[1] Flow required to sustain the aquatic ecology in the river.

Figure 5 | Example of a powerhouse, transformer yard, transmission and tailrace infrastructure. source: http://www.photosensitive.com (Accessed: 28 June 2013)].

Affected Environment

The proposed site of the hydro power plant is situated in the Kheis Local Municipality in the Northern Cape. The transmission servitude will traverse the Siyathemba and Siyancuma Local Municipalities (**Figure 1**). The nearest town of Groblershoop is located approximately 26km north west of the proposed site.

The following photographs (**Figure** to **Figure 6**) are taken from Zeekoebaart and provide an overview of the proposed site and location of infrastructure.

Figure 6 | Photo from right bank of the Orange River at the Boegoeberg dam site.

Figure 5 | Photo of the proposed position of the powerhouse on the Orange River.

Figure 6 | Photo where the proposed channel/pipeline will be excavated from the rock face.

The Northern Cape landscape is characterised by vast arid plains with sparse settlements and rugged terrain. The topography of the general area is relatively flat and interspersed with koppies which descend into to the Orange River basin.

The study area falls within the Nama Karoo Biome which is one of the most arid regions in South Africa. Groblershoop normally receives about 108mm of rain per year, with most rainfall occurring during autumn. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Groblershoop range from 19°C in June to 33°C in January. The average rainfall values per month show Groblershoop receives the lowest rainfall (0mm) in June and the highest (32mm) in March. Vegetation types of the area include Lower Gariep Alluvial Vegetation; Lower Gariep Broken Veld; and Bushmanland Arid Grasslands.

Legal Requirements

Environmental Impact Assessment (EIA) Regulations (Regulations 544, 545 and 546) promulgated in terms of the National Environmental Management Act (NEMA) (No. 107 of 1998) (as amended), identify certain activities, which "*could have a substantial detrimental effect on the environment".* These listed activities require environmental authorisation from the competent environmental authority, i.e. the DEA, prior to commencing.

The proposed project triggers a number of listed activities in terms of NEMA and accordingly requires environmental authorisation from DEA. The activities are activities 9, 10, 11, 18, and 23 of GN No. 544, activity 1 of GN No. 545 and activities 4, 12, 13, 14 and 16 of GN No. 546 published in terms of NEMA. As such authorisation from DEA, via the EIA process (GN No. R543 of 18 June 2010) is necessary.

Aurecon has been appointed to undertake the required environmental authorisation process on HydroSA's behalf.

EIA Process

The EIA process consists of an Initial Application Phase, a Scoping Phase and an EIA Phase. The purpose of the Initial Application Phase is to commence the project via the submission of the relevant department's application forms. The purpose of the Scoping Phase is to identify and describe potential positive and negative environmental impacts, (both socio-economic and biophysical), associated with the proposed projects and to screen feasible alternatives to consider in further detail.

The purpose of the EIA Phase is to comprehensively investigate and assess those alternatives and impacts identified in the Scoping Report and propose mitigation to minimise negative impacts. The acceptance of the Scoping Report and the Plan of Study for EIA by DEA would allow the process to continue to the EIA phase.

The purpose of the EIA Phase is to investigate and assess those alternatives and impacts identified in the Scoping Phase.

Potential environmental impacts associated with the proposed project

A number of potential positive and negative impacts from the proposed project on the biophysical and socio-economic environment have been identified for the construction, operational, and decommissioning phases of the proposed project. These include:

- Construction phase impacts on the biophysical and socio-economic environments:

  - Disturbance of flora and fauna;
  - Impact on heritage resources
  - Sedimentation and erosion of water ways;
  - Impact on local economy (jobs) and social conditions;
  - Visual impact
  - Traffic impacts;
  - Impacts of storage of hazardous substances on site;
  - Impact on agricultural land;
  - Noise impacts (including blasting); and
  - Dust impacts.
- Operational phase impacts on the biophysical environment and socio-economic environments:
  - Impact on flora;
  - Impact on aquatic resources;
  - Visual impacts;
  - Impact on energy production;
  - Impact on local economy and social conditions; and
  - Impact on fauna (including Avifauna).
- Decommissioning phase impacts on the biophysical and socio-economic environments
  - Sedimentation and erosion of water ways;
  - Impacts of storage of hazardous substances on site;
  - Dust impacts;
  - Impact on flora and fauna;
  - Impact on heritage resources;
  - Impact on visual aesthetics;
  - Impact on local economy (employment) and social conditions; and
  - Impact of noise.

These potential impacts will be considered in further detail in the EIA Phase.

The Draft Scoping Report

The draft scoping report consists of seven chapters. An overview of each is provided below

1. Introduction and Background

The purpose of this Chapter is to introduce the project and describe the relevant legal framework within which the project takes place as well as the listed activities in terms of National Environmental Management Act (NEMA) that require authorisation. It further serves to orientate the proposed project in terms of the initial process that was undertaken and the proposed location of the hydropower station and transmission line route near Groblershoop in the Northern Cape.

2. EIA Methodology

The purpose of this Chapter is to provide an overview of the proposed EIA methodology. It describes the proposed public participation process as engagement with the public and stakeholders forms an integral component of the EIA process. The commenting authorities and applicable guidelines are listed. Reference is made to current assumptions and limitations with regards to the proposed hydropower station.

3. The Proposed Activity

The purpose of this Chapter is to describe the proposed activity with specific reference to the construction, operation and decommissioning of the proposed hydropower station and to describe the alternatives that are being considered. Alternatives that are being considered are discussed in terms of location, activity, site layout and technology.

4. Need and Desirability

The purpose of this Chapter is to describe the need and desirability of the proposed hydropower station as it relates to the local context. It answers questions posed by the Department of Environmental Affairs & Development Planning's Need and Desirability Guidelines (2011).

5. Description of the Affected Environment and Potential Impacts

The purpose of this Chapter is to provide a brief description of the affected environment and the potential impacts that could result from the proposed project. Potential impacts on the biophysical and the socio-economic environment during the construction, operation and decommissioning phases are discussed and take consideration of the previous specialist assessments that were undertaken as part of the similar processes in the area. Where additional information is required for detailed assessment in the EIR, recommendations are made as to appointing specialists.

6. Plan Of Study for the EIA

The purpose of this Chapter is to detail the Plan of Study for the EIA Phase to ensure that the impacts are adequately addressed in the EIA Phase. This section furthermore describes the assessment methodology that will be used to determine the significance of the impacts associated with the proposed project on the socio-economic and biophysical environment. Where additional information is required for detailed assessment in the EIR, the ToR for specialist studies are given.

7. Conclusions and Way Forward

The purpose of this Chapter is to briefly summarise and conclude the Draft Scoping Report and describe the way forward.

How You Can Get Involved

Registered I&APs have been notified of the availability of the DSR for comment and will be notified of future opportunities to comment further. This DSR has been lodged on Aurecon's website (www.aurecongroup.com, change "Current Location" to "South Africa" and follow the "Public Participation" link), at the Groblershoop Public Library and at the !Kheis municipality.

I&APs have until **26 August 2013** to submit their written comments on the DSR. Cognisance will be taken of all comments in compiling the final report and the comments, together with the project team and proponent's responses will be included in the final report. All comments received and the responses thereto will be collated in Comments and Response Report (CCR) that will be sent to all I&APs who submitted comment and will also be annexed to the Final Scoping Report (FSR).

Your responsibilities as an I&AP

According to GN No. 543, Section 56 the responsibility of an I&AP is as follows:

a) Comments must be submitted within the approved timeframes or within any extension of a timeframe agreed to by the applicant or Environmental Assessment practitioner (EAP);
b) A copy of any comments submitted directly to DEA must be submitted to the EAP; and
c) Any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application must be declared.

Way Forward

Once the FSR has been completed and all I&AP comments have been incorporated into the report it will be submitted to DEA for their review and comment. DEA will either reject the application or instruct the applicant to proceed to the EIA Phase, either as proposed in the Plan of Study for Environmental Impact Report (EIR), or direct that amendments are made before continuing.

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List of Acronyms

BA	Basic Assessment
CRR	Comments and Responses Report
DEA	Department of Environmental Affairs
DSR	Draft Scoping Report
EIA	Environmental Impact Assessment
EFL	Ecological Flow Requirements
EIR	Environmental Impact Assessment Report
FSR	Final Scoping Report
GN	Government Notice
I&AP	Interested and Affected Party
MW	Megawatts
NEMA	National Environmental Management Act

Nie-tegniese opsomming (Afrikaans)

aurecon

BEOOGDE HIDROKRAGSENTRALE EN VERWANTE INFRASTRUKTUUR BY BOEGOEBERGDAM OP DIE ORANJERIVIER, NABY GROBLERSHOOP, NOORD-KAAP.

DOS VERWYSINGSNR. 14/12/16/3/3/1/951

NEAS VERWYSINGSNR. TBA

JULIE 2013

Nie-tegniese Opsomming van die Konsep Omvangbepalingsverslag

Doel van hierdie dokument

Die doel van hierdie Nie-tegniese Opsomming van die Konsep Omvangbepalingsverslag vir die Boegoeberg Hidrokragsentrale is om rolspelers en belanghebbende en geaffekteerde partye (B&GPe) op 'n maklik-verstaanbare en nie-tegniese manier toegang te bied tot toepaslike inligting en ingeligte openbare deelname aan die besluitnemingsproses te bewerkstellig.

'n Omgewingsinvloedbepaling (OIB) identifiseer en evalueer haalbare alternatiewe en moontlike impakte, asook moontlike maniere om die negatiewe impakte te vermy of te verminder en positiewe impakte te verbeter. Die Departement van Omgewingsake is kragtens die Wet op Nasionale Omgewingsbestuur (Wet Nr. 107 van 1998) die besluitnemende owerheid.

Boegoeberg Hydro Electric Power (Edms) Bpk (Boegoeberg Hydro) is van voorneme om 'n hidrokragsentrale van ongeveer 10.05 Megawatt (MW) op die Oranjerivier in die Noord-Kaap op te rig. Aurecon South Africa (Edms) Bpk (Aurecon) is deur HydroSA aangestel om die verlangde omgewingsproses kragtens die Wet op Nasionale Omgewingsbestuur (Nr. 107 van 1998) (NEMA), soos gewysig, uit te voer.

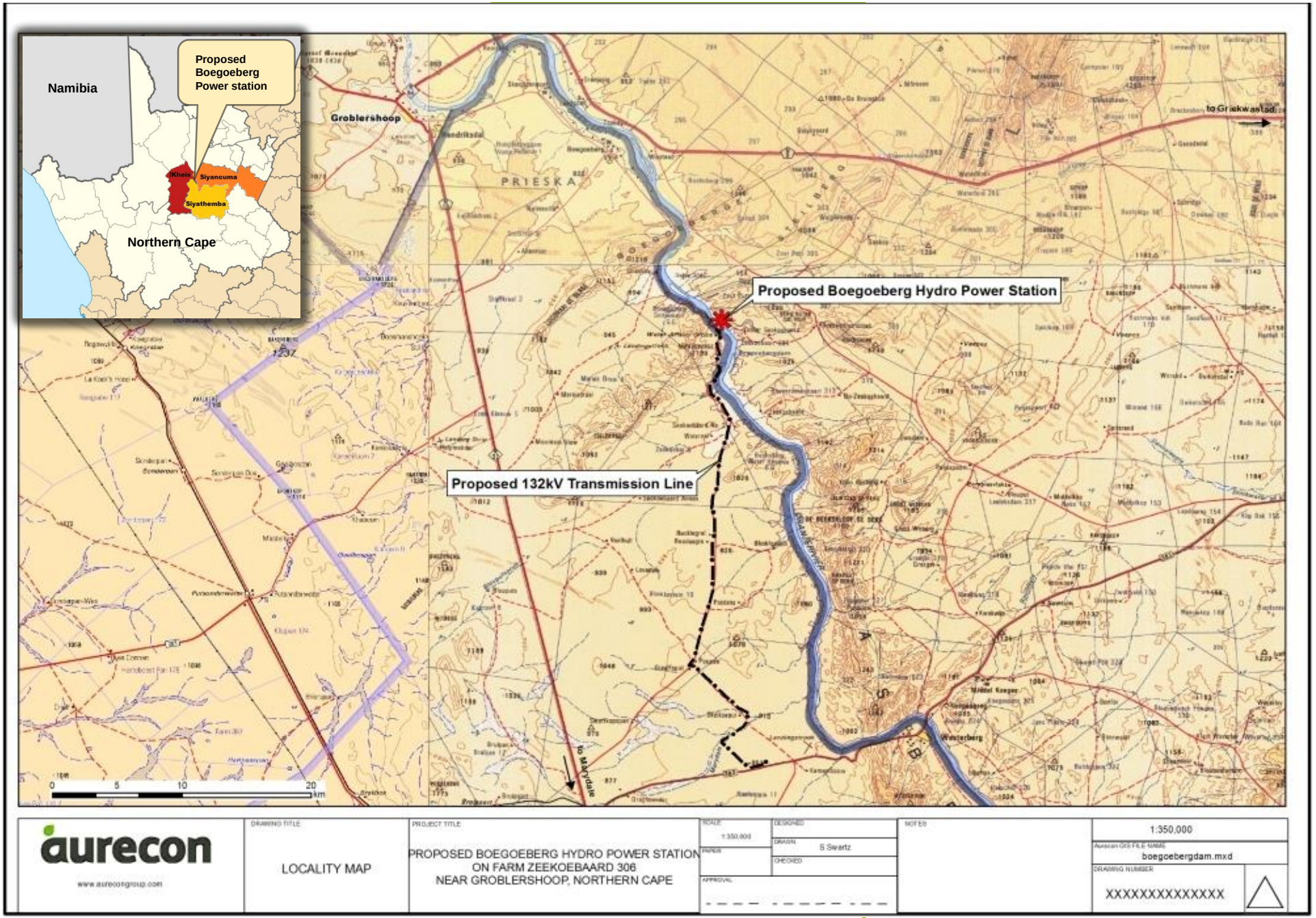
Ligging

Die voorgestelde Boegoeberg hidrokragsentrale sal geleë wees op die noordelike oewer van die Oranjerivier, langs die Boegoebergdam. Die infrastruktuur vir die hidro-aanleg sal geleë wees op die plaas Zeekoebaart (Restant van Plaas nr. 306 en Gedeelte 1 van Plaas nr. 306), ongeveer 26km suid-oos van die dorp Groblershoop in die Noord-Kaap (Figuur 1). Die energie wat deur die voorgestelde hidrokragsentrale opgewek word, sal by wyse van 'n voorgestelde 132kV transmissielyn na die Eskom Vesel-substasie, 36km suid van die terrein, weggeneem word (Figuur 1).

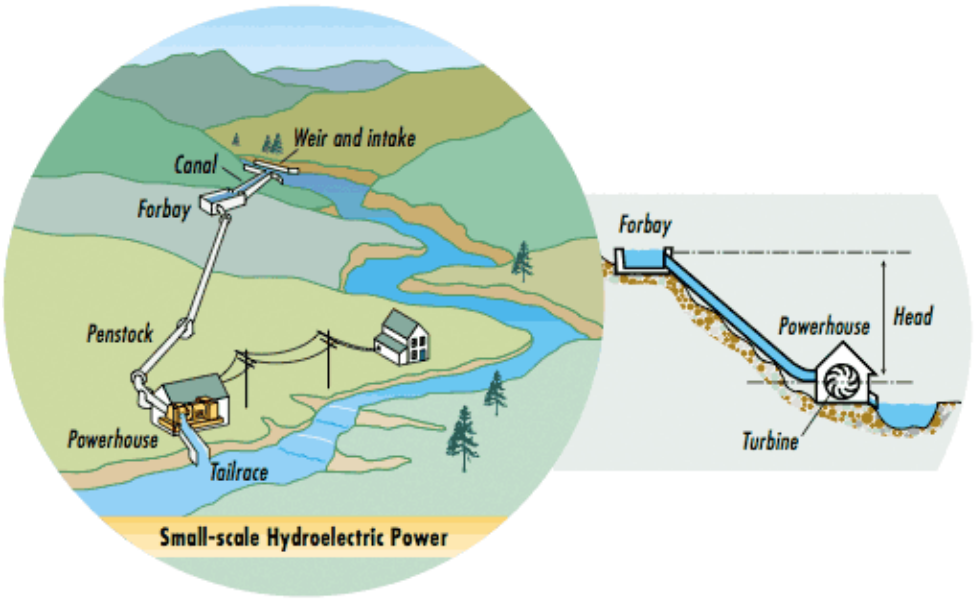
Beoogde Projek

Die beoogde aanleg is 'n vloei-van-rivier hidro-elektriese skema wat by wyse van twee turbines ongeveer 10.05MW elektrisiteit sal kan opwek deur middel van twee of drie turbines van dieselfde grootte. Vloei-van-rivier-aanlegte maak gebruik van die natuurlike vloei van die rivier om elektrisiteit by wyse van konvensionele hidro-elektriese tegnologie op te wek. Die verskil tussen grootskaalse hidrokragsentrales en vloei-van-rivier-aanlegte is dat in laasgenoemde geval slegs 'n gedeelte van die riviervloei weggekeer word om elektrisiteit op te wek.

Elektrisiteit word opgewek deurdat die energie van die water wat deur die turbines vloei veroorsaak dat 'n kragopwekker tol en dus elektrisiteit genereer. Die water word weer 'n klein entjie stroomaf van die oorspronklike onttrekkingspunt (inlaatpunt) in die rivier teruggestort. Geen water word weg van die rivier af gestoor nie. Die kragsentrale is dus onderworpe aan seisoenale riviervloei en sal nie in lae vloeitoestande bedryf word nie. De proses vir die opwekking van elektrisiteit d.m.v. 'n vloei-van-rivier hidro-aanleg, word in Figuur 2 geïllustreer.



Figuur 1: Ligging van die beoogde Boegoeberg Hidrokragsentrale



Figuur 2 | Skets van die vloei-van-rivier hidrokragsentrale

Die beoogde projek sal die bestaande Boegoebergdam benut om water na die inlaatstruktuur weg te keer vir gebruik in die hidro-elektriese aanleg. Daar word voorgestel dat 'n maksimum van 120m^3 van die riviervloei weggekeer word. Hierdie weggekeerde water sal dan deur die infrastruktuur van die hidro-elektriese aanleg geneem word en ongeveer 400m stroomaf van die inlaatstruktuur by die dam in die rivier teruggestort word. Die water wat oor die damwal vloei sal ten alle tye ten volle voldoen aan die landbou besproeiings behoeftes sowel as die omgewingsvloeireserwe (EFR)[1] (sien Figuur 3). Daarom sal slegs 'n gedeelte van die oorblywende water en EFR deurgelaat word(nadat daar voldoen is aan die besproeiings behoeftes en EFR) na die inlaatstruktuur (sien Figuur 4) wat die volume water reguleer wat na die kragsentrale vloei (i.e. die pyplyn na die kragsentrale). Die water sal d.m.v. 'n kanaal en/of pyplyn na die kragsentrale geneem word (sien Figuur 5), en gebruik word om die turbines te laat draai en elektrisiteit op te wek. Die water sal dan d.m.v. 'n tonnel, bekend as die onderloop, na die Oranjerivier teruggeneem word. Die opgewekte elektrisiteit sal by wyse van 'n oorhoofse transmissielyn van 132kV of minder na die Vesel-substasie geneem word, en vandaar na die nasionale netwerk.

Sekondêre infrastruktuur is ook deel van die hidrokragsentrale. Dit sluit in 'n drukhoogtedam, transformatorbaai en toegangspaaie.

Figuur 3 | Boegoebergdam.

Figuur 4 | Voorbeeld van inlaatstruktuur met rommel-opvangers en sluise. (Source:www.ncwater.org.)

[1] Vloei wat nodig is om die akwatiese ekologie in die rivier te behou.

Figuur 5 | Voorbeeld van die kragsentrale, transformatorwerf, transmissielyne en onderloop-infrastruktuur. Bron: http://www.photosensitive.com (Afgelaai: 28 Junie 2013)].

Geaffekteerde Omgewing

Die voorgestelde terrein vir die hidro-elektriese aanleg is geleë in die Kheis Plaaslike Munisipaliteit in die Noord-Kaap. Die serwituut vir die transmissielyne sal oor beide die Siyathemba en Siyancuma Plaaslike Munisipaliteite (**Figuur 1**) loop. Die naaste dorp, Groblershoop, is ongeveer 26km noord-wes van die voorgestelde terrein.

Die volgende foto's (**Figuur 3** tot **Figuur 5**) is vanaf Zeekoebaart geneem en gee 'n idee van die voorgestelde terrein en plasing van die infrastruktuur.

Figuur 3 | Foto vanaf die regteroewer van die Oranjerivier by Boegoebergdam.

Figuur 4 | Foto van die voorgestelde posisie van die kragsentrale op die Oranjerivier.

Figuur 5 | Foto waar die voorgestelde kanaal/pyplyn deur die rotswand gegrawe sal word.

Die Noord-Kaapse landskap word gekenmerk deur uitgestrekte droë vlaktes, verspreide nedersettings en 'n ruwe terrein. Die topografie is oor die algemeen plat, met koppies wat hier en daar voorkom en afloop na die kom van die Oranjerivier.

Die studiegebied val binne die Nama Karoo-bioom, wat een van die mees ariede streke in Suid-Afrika is. Groblershoop ontvang gewoonlik ongeveer 108mm reën per jaar, met die meeste reën wat gedurende herfs val. Die maandelikse verspreiding van die gemiddelde daaglikse temperatuur dui aan dat die gemiddelde middag-temperatuur in Groblershoop wissel van 19°C in Junie tot 33°C in Januarie. Gemiddelde maandelikse reënvalstatistiek dui aan dat Groblershoop se swakte reënval (0mm) in Junie voorkom, en die hoogste (32mm) in Maart. Die tipe plantegroei in die gebied sluit in die Laer Gariep Alluviale Plantegroei; Laer Gariep Gebroke Veld; en Boesmanland Ariede Grasland.

Regsverpligtinge

Die Regulasies vir 'n Omgewingsinvloedbepaling (Regulasies 544, 545 en 546) wat afgekondig is kragtens die Wet op Nasionale Omgewingsbestuur (NEMA) (Nr. 107 van 1998) (soos gewysig), identifiseer sekere aktiwiteite wat 'n "*beduidende negatiewe invloed op die omgewing mag hê".* Hierdie gelyste aktiwiteite is onderhewig aan 'n omgewingsmagtiging deur die bevoegde owerheid, naamlik die DOS, voordat enige werksaamhede kan begin.

Die beoogde projek het 'n aantal NEMA-gelyste aktiwiteite tot gevolg, en verg dus 'n magtiging van die DOS. Die betrokke aktiwiteit is aktiwiteite 9, 10, 11, 18 en 23 in GK Nr. 544, aktiwiteit 1 in GK Nr. 545, en aktiwiteite 4, 12, 13, 14 en 16 in GK Nr. 546 wat in terme van NEMA uitgereik is. 'n Magtiging moet dus by wyse van die OIB-proses (GK Nr. R543 van 18 Junie 2010) vanaf die DOS verkry word.

Aurecon is aangestel om die verlangde omgewingsmagtigingsproses namens HydroSA uit te voer.

OIB-proses

Die OIB-proses bestaan uit 'n Aanvangsfase, 'n Omvangbepalingsfase en 'n OIB-fase. Die doel van die Aanvanklike Aansoekfase is om die projek by wyse van die indiening van die toepaslike aansoekvorms van stapel te stuur. Die doel van die Omvangbepalingsfase is om die moontlike positiewe en negatiewe omgewingsimpakte (beide maatskaplik en biofisies) wat met die beoogde projek verband hou te identifiseer en te omskryf, en moontlike haalbare alternatiewe te vind wat dan meer omvattend ondersoek sal word. Indien die DOS die Omvangbepalingsverslag en Studieplan die OIB aan die einde van die Omvangbepalingsfase goedkeur, kan die proses oorgaan tot die OIB-fase.

Die doel van die OIB-fase is om die alternatiewe en impakte wat tydens die Omvangbepalingsfase geïdentifiseer is, omvattend te ondersoek en te beoordeel, en mitigasiemaatreëls voor te stel wat die negatiewe impakte kan verlaag. Wanneer die DOS die Omvangbepalingsverslag en Studieplan vir die OIB aanvaar, kan daar oorgegaan word na die OIB-fase.

Die doel van die OIB-fase is om alle alternatiewe wat tydens die Omvangbepalingsfasegeïdentifiseer is, te ondersoek en te beoordeel.

Moontlike omgewingsimpakte van die beoogde projek

'n Aantal moontlike positiewe en negatiewe impakte wat die beoogde projek op die biofisiese en sosio-ekonomiese omgewing mag hê, is geïdentifiseer vir die konstruksie-, bedryf- en buitediensstellingsfases van die beoogde projek. Dit sluit in:

- Impakte tydens die konstruksiefase op die biofisiese en sosio-ekonomiese omgewings:
    - Versteuring van flora en fauna;
    - Impak op erfenishulpbronne

- Sedimentasie en erodering van waterlope;
- Impak op plaaslike ekonomie (werksgeleenthede) en maatskaplike toestande;
- Visuele impak
- Verkeersimpakte;
- Impakte van die berging van gevaarhoudende stowwe op terrein;
- Impak op landbougrond;
- Geraasimpakte (skietwerk ingesluit); en
- Impak van stof.

- Impakte tydens die bedryfsfase op die biofisiese en sosio-ekonomiese omgewings:
  - Impak op flora;
  - Impak op akwatiese hulpbronne;
  - Visuele impakte;
  - Impak op kragopwekking;
  - Impak op plaaslike ekonomie en maatskaplike toestande; en
  - Impak op fauna (Avifauna ingesluit).
- Impakte tydens die buitediensstellingsfase op die biofisiese en sosio-ekonomiese omgewings
  - Sedimentasie en erodering van waterlope;
  - Impakte van die berging van gevaarhoudende stowwe op terrein;
  - Impak van stof;
  - Impak op flora en fauna;
  - Impak op erfenishulpbronne;
  - Impak op visuele estetika;
  - Impak op plaaslike ekonomie (werkskepping) en maatskaplike toestande; en
  - Impak van geraas.

Hierdie moontlike impakte sal meer omvattend in die OIB-fase ondersoek word.

Die Konsep Omvangbepalingsverslag

Die konsep omvangbepalingsverslag bestaan uit sewe hoofstukke:

1. Inleiding en Agtergrond

Die doel van hierdie Hoofstuk is om die projek bekend te stel en die toepaslike regsraamwerk te beskryf waarbinne die projek val, sowel as die gelyste aktiwiteite wat in terme van die Wet op Nasionale Omgewingsbestuur (NEMA) gemagtig moet word. Dit oriënteer ook die beoogde projek in terme van die aanvanklike proses wat uitgevoer is, en gee inligting oor die boogde ligging van die hidrokragsentrale en die roete van die transmissielyne naby Groblershoop in die Noord-Kaap.

2. OIB-metodologie

Die doel van hierdie Hoofstuk is om 'n oorsig te gee van die beoogde OIB-metodologie. Dit beskryf die voorgestelde proses van openbare deelname, aangesien skakeling met die publiek en belanghebbendes 'n integrale deel van die OIB-proses is. Die kommentaarlewerende owerhede en toepaslike riglyne word gelys. Daar word verwys na huidige aannames en beperkings wat die beoogde hidrokragsentrale betref.

3. Die Beoogde Aktiwiteit

Die doel van hierdie Hoofstuk is om die voorgestelde aktiwiteit te beskryf, met spesifieke verwysing na die konstruksie, bedryf en buitediensstelling van die beoogde hidrokragsentrale. Dit beskryf ook die alternatiewe wat oorweeg word. Hierdie moontlike alternatiewe word beskryf in terme van ligging, aktiwiteit, uitleg van die terrein, en tegnologie.

4. Behoefte en Wenslikheid

Die doel van hierdie Hoofstuk is om die behoefte en wenslikheid van die beoogde hidrokragsentrale in plaaslike konteks te beskryf. Dit beantwoord vrae wat gestel word in die Departement van

Omgewingsake en Ontwikkelingsbeplanning se riglyne vir behoefte en wenslikheid (2011). Die hoofstuk gee ook ’n kort beskrywing van die beoogde volhoubaarheidsbepaling wat deel van die OIB-verslag sal wees.

5. Beskrywing van die Geaffekteerde Omgewing en Moontlike Impakte

Die doel van hierdie Hoofstuk is om die geaffekteerde omgewing kortliks te beskryf, asook die moontlike impakte van die beoogde projek. Moontlike impakte op die biofisiese en sosio-ekonomiese omgewing tydens die konstruksie-, bedryf- en buitediensstellingsfases word bespreek met inagneming van die bevindinge van deskundiges in die vorige BIB-proses. Waar bykomende inligting nodig is vir omvattende beoordeling in die OIBV, word daar aanbevelings gemaak vir die aanstelling van deskundiges.

6. Studieplan vir die OIB

Die doel van hierdie Hoofstuk is om die Studieplan vir die OIB-fase uiteen te sit en te verseker dat die impakte in die OIB-fase toereikend aangespreek word. Hierdie afdeling beskryf ook die beoordelingsmetodologie wat aangewend sal word om die betekenisvolheid van die impakte van die beoogde projek op die sosio-ekonomiese en biofisiese omgewing te bepaal. Waar bykomende inligting nodig is vir omvattende beoordeling in die OIBV, word die omvang van die spesialisstudies uiteengesit.

7. Gevolgtrekking en Volgende Stappe

Die doel van hierdie Hoofstuk is om die Konsep Omvangbepalingsverslag op te som en die volgende stappe te beskryf.

Hoe jy betrokke kan raak

Geregistreerde B&GPe is kennis gestel van die beskikbaarheid van die KOBV vir kommentaar, en sal op hoogte gehou word van alle toekomstige geleenthede om kommentaar te lewer. Die KOBV is ook beskikbaar op Aurecon se webblad (www.aurecongroup.com, verander “Current Location” na “South Africa” en volg die “Public Participation”-skakel), by die Groblershoop Openbare Biblioteek en by die !Kheis munisipaliteit.

B&GPe het tot **26 Augustus 2013** die geleentheid om geskrewe kommentaar op die KOBV in te dien. Alle kommentaar sal in ag geneem word by die samestelling van die finale verslag, en alle kommentaar, tesame met die projekspan en die applikant se antwoorde daarop, sal opgeneem word in die finale verslag. Alle kommentaar en antwoorde daarop sal vervat word in die Kommentaar- en Antwoordverslag (K&AV) wat aan elke B&GP gestuur sal word wat kommentaar gelewer het, en sal ook ’n bylae tot die Finale Omvangbepalingsverslag (FOBV) wees.

Jou verantwoordelikheid as ’n B&GP

GK Nr. 543, Afdeling 56 beskryf die verantwoordelikheid van ’n B&GP as volg:

a) Kommentaar moet binne die goedgekeurde tydsraamwerk ingedien word, of binne enige uitgestelde tydsraamwerk wat met die applikant of die Omgewingsbeoordelingspraktisyn (OBPr) ooreengekom is;
b) Die OBPr moet ’n afskrif ontvang van enige kommentaar wat direk aan die DOS gestuur word; en
c) Enige direkte sake-, finansiële, persoonlike of ander belang wat ’n B&GP by die goed- of afkeuring van die aansoek mag hê, moet openbaar gemaak word.

Volgende Stappe

Sodra die FOBV voltooi is en alle kommentaar deur B&GPe in die verslag opgeneem is, sal dit vir oorsig en kommentaar by die DOS ingedien word. Die DOS kan die aansoek afkeur, of die applikant opdrag gee om voort te gaan met die OIB-fase – hetsy volgens die voorgestelde Studieplan vir die Omgewingsinvloedbepalingsverslag (OIBV), of versoek dat veranderinge aangebring word voordat daar verder gegaan mag word.

Alle kommentaar moet gestuur word aan:

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Lys van Akronieme

B&GP	Belanghebbende en Geaffekteerde Party
BIB	Basiese Invloedbepaling
DOS	Departement van Omgewingsake
FOBV	Finale Omvangbepalingsverslag
GK	Goewermentskennisgewing
K&AV	Kommentaar- en Antwoordverslag
KOBV	Konsep Omvangbepalingsverslag
MW	Megawatt
NEMA	Wet op Nasionale Omgewingsbestuur
OIB	Omgewingsinvloedbepaling
OIBV	Omgewingsinvloedbepalingsverslag

NEMA requirements for Scoping Reports

aurecon

Regulation	Content as required by NEMA	Page
28(1)(a)	(i) Details of the EAP who prepared the report; and	Section 6.8, Page 87
	(ii) Details of the expertise of the EAP to carry out scoping procedures.	Section 6.8, Page 87
28(1)(b)	A description of the proposed activity.	Section 3.1, page 35
28(1)(c)	A description of any feasible and reasonable alternatives that have been identified.	Section 3.2, page 49
28(1)(d)	A description of the property on which the activity is to be undertaken and the location of the activity on the property.	Section 5.2.1, page 61
28(1)(e)	A description of the environment that may be affected by the activity and the manner in which the activity may be affected by the environment.	Chapter 5, page 61
28(1)(f)	An identification of all legislation and guidelines that have been considered in the preparation of the scoping report.	Section 1.2, page 19 Section 2.4, page 31
28(1)(g)	A description of environmental issues and potential impacts, including cumulative impacts that have been identified.	Chapter 5, page 61
28(1)(h)	Details of the public participation process conducted in terms of regulation 27(a), including –	Annexure B
	(i) The steps that were taken to notify potentially interested and affected parties of the application;	Section 2.2, page 30 Annexure B
	(ii) Proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the proposed application have been displayed, placed or given;	To be included in FSR Annexure B
	(iii) A list of all persons, organisations and organs of state that were registered in terms of regulation 55 as interested and affected parties in relation to the application; and	Annexure B
	(iv) A summary of the issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues.	To be included in FSR
28(1)(n)	A plan of study for environmental impact assessment which sets out the proposed approach to the environmental impact assessment of the application, which must include:	Chapter 6, page 79
	(i) A description of the tasks that will be undertaken as part of the environmental impact assessment process, including any specialist reports or specialised processes, and the manner in which such tasks will be undertaken;	Section 6.2.2 and 6.3, page 80
	(ii) An indication of the stages at which the competent authority	Section 6.7, page 86

	will be consulted;	
	(iii) A description of the proposed method of assessing the environmental issues and alternatives, including the option of not proceeding with the activity; and	Section 6.2.2, page 80
	(iv) Particulars of the public participation process that will be conducted during the environmental impact assessment process.	Section 6.6, page 85
28(1)(o)	Any specific information required by the competent authority.	-
28(1)(p)	Any other matters required in terms of sections 24(4)(a) and (b) of the Act.	-
28(2)	In addition, a scoping report must take into account any guidelines applicable to the kind of activity which is the subject of the application.	Section 2.4, page 31
28(3)	The EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) if the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation (1)(c), exist.	-

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Appendices

Annexure A: Application Form and DEA's letters of acknowledgement

Annexure B: Public Participation Process

- Advertisements
- Site notices
- List of Interested and Affected Parties

Annexure C: Legal policy documents and guidelines

Glossary of Terms

Environment	The surroundings (biophysical, social and economic) within which humans exist and that are made up of i. the land, water and atmosphere of the earth; ii. micro-organisms, plant and animal life; iii. any part or combination of (i) and (ii) and the interrelationships among and between them; and iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing;
Environmental Impact Assessment (EIA)	A study of the environmental consequences of a proposed course of action.
Environmental Impact Report Assessment (EIR)	A report assessing the potential significant impacts as identified during the Scoping Phase.
Environmental impact	An environmental change caused by some human act.
Environmental Management Programme (EMP)	A document that provides procedures for mitigating and monitoring environmental impacts, during the construction, operation and decommissioning phases.
Public Participation Process	A process of involving the public in order to identify needs, address concerns, in order to contribute to more informed decision making relating to a proposed project, programme or development.
Scoping	A procedure for determining the extent of and approach to an EIA, used to focus the EIA to ensure that only the significant issues and reasonable alternatives are examined in detail
Scoping Report	A report describing the issues identified.

Abbreviations

ACO	Archaeology Contracts Office
CBA	Critical Biodiversity Area
CRR	Comments and Response Report
DAFF	Department of Agriculture Forestry and Fisheries
DEA	Department of Environmental Affairs (previously Department of Environmental Affairs and Tourism)
DEA&DP	Department of Environmental Affairs and Development Planning
DEANC	Department of Environmental Affairs and Nature Conservations
DEAT	Department of Environmental Affairs and Tourism
DM	District Municipality
DME	Department of Minerals and Energy
DoE	Department of Energy
DSR	Draft Scoping Report
DWA	Department of Water Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EAPSA	Environmental Assessment Practitioner of South Africa
EIA	Environmental Impact Assessment
EIR	Environmental Impact Assessment Report
EMP	Environmental Management Programme
EMF	Environmental Management Framework
EP	Equator Principles
EPFI	Equator Principles Financial Institutions
ERA	Electricity Regulation Act
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
EIA	Environmental Impact Assessment
EIR	Environmental Impact Assessment Report
FSR	Final Scoping Report
GN	Government Notice

GWh	Gigawatt hours
ha	Hectares
HIA	Heritage Impact Assessment
HV	High Voltage
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IEIM	Integrated Environmental Information Management
IEP	Integrated Energy Plan
IFC	International Finance Corporation
IPAP	Industrial Policy Action Plan
IPP	Independent Power Producer
IRP	Integrated Resource Plan
kV	Kilovolt
LOR	Lower Orange River
LOWMA	Lower Orange Water Management Area
LM	Local Municipality
MW	Megawatts
NCNCA	Northern Cape Nature Conservation Act
NEMA	National Environmental Management Act (No. 107 of 1998) (as amended)
NEM:BA	National Environmental Management: Biodiversity Act
NEM:WA	The National Environmental Management: Waste Act
NERSA	National Energy Regulator of South Africa
NFA	National Forest Act
NHRA	National Heritage Resources Act (No. 25 of 1999)
MPRDA	Mineral and Petroleum Resources Development Act
NRTA	National Road Traffic Act
NWA	National Water Act
REFIT	Renewable Energy Feed-In Tariffs
SABAP	Southern African Bird Atlas Project
SAHRA	South African Heritage Resources Agency

SACNSP	South African Council for Natural Scientific Professions
SDF	Spatial Development Framework
ToR	Terms of Reference
VIA	Visual Impact Assessment
WEF	Wind Energy Facility
WMA	Water Management Area
WML	Waste Management Licence
WULA	Water Use Licence Application

1 INTRODUCTION AND BACKGROUND

The purpose of this Chapter is to introduce the project and describe the relevant legal framework within which the project takes place as well as the listed activities in terms of National Environmental Management Act (NEMA) that require authorisation. It further serves to orientate the proposed project in terms of the initial process that was undertaken and the proposed location of the hydropower station and transmission line route near Boegoeberg dam in the Northern Cape.

1.1 Introduction

Boegoeberg Hydro Electric Power (Pty) Ltd (Boegoeberg Hydro) intends to construct a hydropower facility with an approximate capacity of 10 Megawatt (MW) on the Orange River in the Northern Cape. The proposed Hydropower facility is located approximately 26km south east of the town of Groblershoop in the Northern Cape and can be accessed via the N8 (see

Figure 1). Aurecon South Africa (Pty) Ltd (Aurecon) has been appointed to undertake the requisite environmental process as required in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA), as amended, on behalf of Boegoeberg Hydro.

This Environmental Impact Assessment (EIA) is for the proposed hydropower facility on the farm Zeekoebaart, made up of two portions (Remainder of 306 and Portion 1) (see **Figure 1**).

Table 1. List of farms/ erven on which sites are located and the respective landowners

Farms/ Erven comprising the plant site		
Farm (hydropower station)	**Portion**	**Landowner**
1		RSA
306	2+3	Susara Marthina Geldenhuys

The proposed hydropower station would consist of the following components, which are described in detail in Section 3.1.1:

- An off-take structure above the existing Boegoeberg weir to facilitate the abstraction of water;
- Water conveyance infrastructure comprising a combination of either an open canal , a pipeline and/or culverts to convey the water to the head pond;
- A head pond;
- Steel (or other suitable pipeline material) penstocks to transfer the water to the power chamber;
- A power chamber to house the turbines and generation equipment;
- Outlet channel (tailrace) to return the abstracted water back into the river; downstream of the power chamber;
- A switchroom and transformer yard;
- A high voltage (HV) distribution line to evacuate the power to a nearby Fibre Substation; and
- Access roads to the site.

Energy generated by the proposed hydropower station would be evacuated from the site transformer yard *via* a proposed transmission line of not more than 132 kilovolt (kV) capacity to a nearby Eskom substation (

Figure 1). The overhead transmission line would connect the powerhouse to Fibre Substation where it would feed into the national grid. New gravel access roads of 4m width would be constructed to follow the transmission servitude, where existing roads do not exist for construction and maintenance purposes.

The transmission line will traverse through a number of farms, described further in Section 5.1.

In terms of the NEMA, the proposed project triggers a suite of activities which require authorisation from the competent environmental authority. Since the project is for the generation of energy, and energy projects are dealt with by the national authority, the competent authority is the national Department of Environmental Affairs (DEA). DEA's decision will be based on the outcome of this EIA process.

This report serves to document the Scoping Phase of the EIA process (the EIA process and sequence of documents produced as a result of the process are illustrated in **Figure 2**).

The purpose of this Scoping Report[1] is to provide the background and outline the scope of work proposed to be undertaken in the EIA phase. Accordingly, the Scoping Report:

- Outlines the legal and policy framework;
- Describes the proposed project and its alternatives;
- Describes the Public Participation Process undertaken to date;
- Describes the biophysical and socio-economic context;
- Describes the range of alternatives that require further investigation in the EIA Phase;
- Identifies potential impacts, including cumulative impacts, that will be assessed in the EIA Phase, inclusive of specialist studies that will be undertaken; and
- Details the assessment methodology that will be adopted for the project.

[1] Section 28 of EIA Regulation No. 543 of NEMA lists the content required in a Scoping Report.

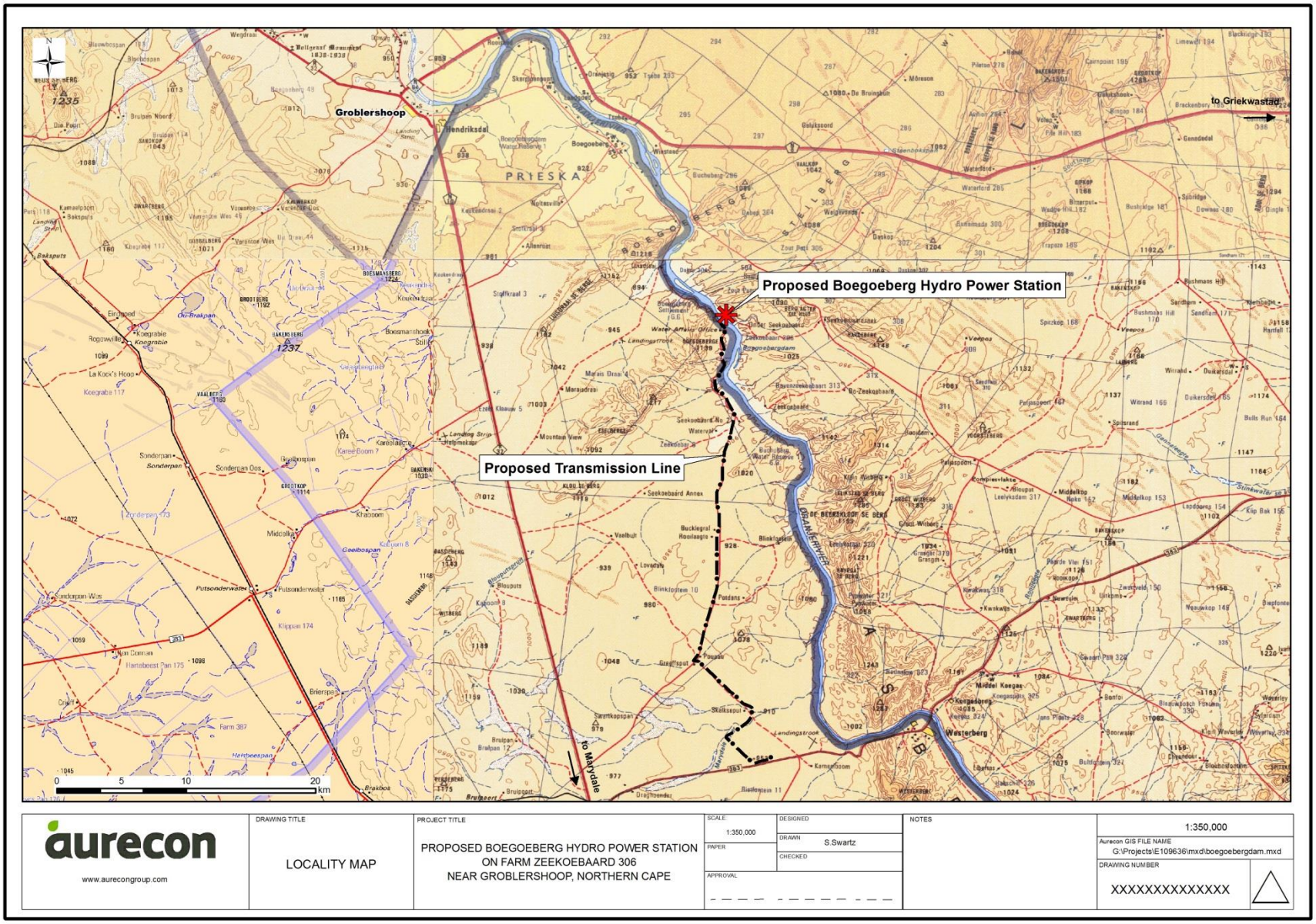

Figure 1 | Locality map of the proposed Boegoeberg Hydropower Plant and associated transmission line.

1.2 Legal Requirements

There are a multitude of legal and policy documents and guidelines to consider when undertaking such a project. An overview of the legislation relevant to the proposed project is provided in **Table 2**, with more detailed information provided in **Annexure B**.

Table 2. Legislation considered in preparation of the Scoping Report

Legal Requirements		
Title of legislation, policy or guideline	**Applicability to the project**	**Administrating Authority**
The Republic of South Africa Constitution Act ("the Constitution") (Act 108 of 1996)	The environmental right contained in Section 24 of the Constitution provides that everyone is entitled to an environment that is not harmful to his or her well-being.	N/A
National Environmental Management Act, Act No. 107 of 1998 (NEMA)	Several listed activities in terms of NEMA GN No. 544, 545 and 546, 18 June 2010, have been triggered and need to be authorised for the proposed hydropower station (also see 1.3).	DEA
National Water Act, Act No. 36 of 1998 (NWA)	The proposed hydropower station will divert water from the Orange River for the generation of electricity. The location of the hydropower station falls within the D81A quaternary catchment and the Lower Orange Department of Water Affairs (DWA) Water Management Area and requires authorisation from DWA for the following activities as listed in section 21 of the NWA: 21 (c) Impeding or diverting flow of water in a watercourse; and 21(i) Altering the bed, banks, course or characteristics of a watercourse.	Department of Water Affairs (DWA)
National Heritage Resources Act, Act No. 25 of 1999 (NHRA)	The development will change the character of a site exceeding 5,000m^2 in extent and includes the construction of an access road and transmission line exceeding 300m in length. As such the Act requires that a Heritage Impact Assessment (HIA) is undertaken for	South African Heritage Resources Agency (SAHRA)

Legal Requirements		
Title of legislation, policy or guideline	**Applicability to the project**	**Administrating Authority**
	the proposed project,	
National Environmental Management: Biodiversity Act, Act No. 10 of 2004 (NEM:BA)	The hydropower station will be located in a Critical Biodiversity Area (CBA) which contains protected species listed in NEM: BA. Permits will be required for removal of such species should the project receive a positive Environmental Authorisation (EA).	Northern Cape Department of Environmental Affairs and Nature Conservation (DEANC)
National Forest Act, Act 84 of 1998 (as amended) (NFA)	Section 12(1)(d) read with s15(1) and s62(2)(c) list protected tree species that may not be cut, destroyed or disturbed without a licence. Should the project be granted a positive EA, the relevant licences will be applied for if any endangered trees, as per those listed in the NFA, are to be cut, destroyed or disturbed.	Department of Agriculture, Forestry and Fisheries (DAFF).
Mineral and Petroleum Resources Development Act, Act No. 28 of 2002 (MPRDA)	Sourcing of material for road construction and foundation purposes (i.e. the use of borrow pits) is regarded as mining and accordingly is subject to the requirements of the Act. In terms of the current project, one section of the Act is particularly relevant As the material would be sourced from two informal borrow pits on the farm, a mining permit would be required from Department of Mineral Resources (DMR).	Department of Mineral Resources (DMR)
Northern Cape Nature Conservation Act Act No. 9 of 2009 (NCNCA)	Numerous sections (specifically Sections 50-51) under NCNCA deal with indigenous and protected plants. A permit in terms of NCNCA will be required if species listed in the Act are located on site and it would be necessary to remove or destroy them.	Northern Cape Department of Environmental Affairs and Nature Conservation (DEANC)
The National Energy Act, Act No. 34 of 2008	In terms of the New Generation Regulations, the Integrated Resource Plan (IRP) has been developed by the Department of	Department of Energy (DoE)

Legal Requirements		
Title of legislation, policy or guideline	**Applicability to the project**	**Administrating Authority**
	Energy (DoE) and sets out the new generation capacity requirement per technology, taking energy efficiency and the demand-side management projects into account. This required, new generation capacity must be met through the technologies and projects listed in the IRP and all Independent Power Producer (IPP) procurement programmes will be undertaken in accordance with the specified capacities and technologies listed in the IRP .	
The National Environmental Management: Waste Act, Act 59 of 2008 (NEM: WA)	If no other alternatives are available and spoil is to be left on site, it might trigger the need for a Waste Management Licence (WML). DEA will be consulted in this regard to confirm if a WML will be required.	Department of Environmental Affairs: Waste (DEA: Waste)
The International Finance Corporation (IFC) performance standards	A certain percentage of the funding for the proposed hydropower station would be sourced from the IFC. As such the IFC performance standards would be applicable to the proposed project.	N/A
Equator Principles (EP)	A certain percentage of the funding for the proposed hydropower station would be sourced from the Equator Principles Financial Institutions (EPFI's). As such the EP would be applicable to the proposed project.	N/A

1.3 Listed Activities in terms of NEMA

This is the primary legislation tasked with management of environmental resources and accordingly, identifies activities that require authorisation prior to commencement. Such activities are detailed in three listing notices, the activities applicable to the proposed project being described in Table 3 below.

Table 3. Listed activities in terms of NEMA GN No. 544, 545 and 546, 18 June 2010, to be authorised for the proposed hydropower station and associated infrastructure

NO.	LISTED ACTIVITIES	ASPECT OF PROJECT
GN No. R544, 18 June 2010		
1	The **construction of facilities or infrastructure for the generation of electricity where**: i. **the electricity output is more than 10 megawatts but less than 20 megawatts**; or ii. the output is 10 megawatts or less but the total extent of the facility covers an area in excess of 1 hectare	The proposed hydropower station would have an electricity output of approximately **10MW**.
9	The **construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water**, sewage or storm water - i. with an internal diameter of 0,36 metres or more; or ii. **with a peak throughput of 120 litres per second or more**, excluding where: a. such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or b. where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.	The project would consist of an off-take structure at the weir and a canal/ tunnel of up to 400m long. The capacity of the canal would be approximately **100 000** to **120 000 litres per second**.
10	The **construction of facilities or infrastructure for the transmission and distribution of electricity:** i. **outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts**; or ii. inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.	The hydropower plant would connect to the Eskom grid at the Fibre Substation via a **transmission line of not more than 132kV capacity.**
la11	The **construction of**: i. canals;	The **footprint** of the proposed hydropower plant, which would be constructed within and **adjacent to the Orange River**, **would exceed 50 square**

NO.	LISTED ACTIVITIES	ASPECT OF PROJECT
	ii. channels; iii. bridges; iv. dams; v. weirs; vi. bulk storm water outlet structures; vii. marinas; viii. jetties exceeding 50 square metres in size; ix. slipways exceeding 50 square metres in size; x. buildings exceeding 50 square metres in size; or **xi. infrastructure or structures covering 50 square metres or more** **where such construction occurs within a watercourse or within 32 metres of a watercourse**, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	**meters**.
18	The **infilling or depositing of any material of more than 5 cubic metres into**, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from i. **a watercourse**; ii. the sea; iii. the seashore; iv. the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater- but excluding where such infilling, depositing, dredging, excavation, removal or moving i. is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or ii. occurs behind the development setback line.	During construction of the proposed hydropower plant **more than 5 cubic metres of material could be removed from the Orange River**. Furthermore **infilling** may be required just upstream of the weir on northern side of the weir pond near the intake structure.
GN No. R546, 18 June 2010		
4	**The construction of a road wider than 4 metres** with a reserve less than 13,5 metres. (a) In Eastern Cape, Free State, KwaZulu-Natal, Limpopo, Mpumalanga and Northern Cape provinces:	**Access roads** to the hydropower station **would be approximately 6m in width**.

NO.	LISTED ACTIVITIES	ASPECT OF PROJECT
	i. In an estuary; ii. **Outside urban areas, in**: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) **Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;** (dd) Sites or areas identified in terms of an International Convention; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ff) Core areas in biosphere reserves; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve; (hh) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined. iii. In urban areas: (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; (cc) seawards of the development setback line or within urban protected areas.	
13	The **clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation**, except where such removal of vegetation is required for: (2) the undertaking of a linear activity falling below the thresholds mentioned in Listing Notice 1 in terms of GN No. 544 of 2010. **Northern Cape** and Western Cape: i. In an estuary; **ii. Outside urban areas, the following**: (aa) A protected area identified in terms of NEMPAA, excluding	The **footprint** of the proposed hydropower station would be greater than **1 ha and would be located in CBA**.

NO.	LISTED ACTIVITIES	ASPECT OF PROJECT
	conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) **Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;** (dd) Sites or areas identified in terms of an International Convention; (ee) Core areas in biosphere reserves; (ff) Areas within10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; (gg) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined.	
14	The **clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation**, except where such removal of vegetation is required for: (a) purposes of agriculture or afforestation inside areas identified in spatial instruments adopted by the competent authority for agriculture or afforestation purposes; (b) the undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the activity is regarded to be excluded from this list; (c) the undertaking of a linear activity falling below the thresholds in Notice 544 of 2010.	The **footprint** of the proposed hydropower station **could be greater than 5 ha and would be located in an area of at least 75 % indigenous vegetation**.
16	The **construction of:** i) jetties exceeding 10 square metres in size; ii) slipways exceeding 10 square metres in size; iii) buildings with a footprint exceeding 10 square metres in size; or **iv) infrastructure covering 10 square metres or more** where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	The footprint of the proposed hydropower plant, which would be constructed within and adjacent to the Orange River, would be greater than 10 square meters.

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2 EIA METHODOLOGY

The purpose of this Chapter is to provide the reader with an overview of the proposed EIA methodology. It describes the proposed Public Participation Process as engagement with the public and stakeholders forms an integral component of the EIA process. The commenting authorities and applicable guidelines are listed. Reference is made to current assumptions and limitations with regards to the proposed hydropower station.

2.1 Approach to the Project

As outlined in Figure 2 there are three distinct phases in the EIA process, namely the Initial Application Phase, the Scoping Phase and the EIA Phase. A description of the activities which have been, and will be, undertaken during each phase is provided in the following sections. Note that this report covers the second phase, *viz.* the Scoping Phase.

2.1.1 Initial Application Phase

The Initial Application Phase entailed the submission of an EIA Application Form, submitted on **13 June 2013** to apply for a Basic Impact Assessment process. The application was submitted along with a cover letter requesting clarification on applicability of activity listing 10 of Listing Notice 2 (NEMA) to the proposed project and the NEMA process to be followed. Acknowledgement of receipt of the EIA Application Form was received from DEA on **4 July 2013**. However DEA rejected this initial application citing that activity listing 10 of Listing Notice 2 was applicable and indicating a new application should be made. The updated application form was submitted on the **4 July 2013,** applying for a Scoping and EIA process. Acknowledgements of receipt of the new EIA Application Form were received from DEA on **12 July 2013**. The Application Form and DEA's letter of acknowledgement are included in **Annexure A**.

Other tasks undertaken include:

- A Letter of Notification (included in **Annexure A**), in English and Afrikaans, was sent to directly affected landowners to inform them of the proposed project and to invite them to register as Interested and Affected Parties (I&APs) on **12 June 2013**.

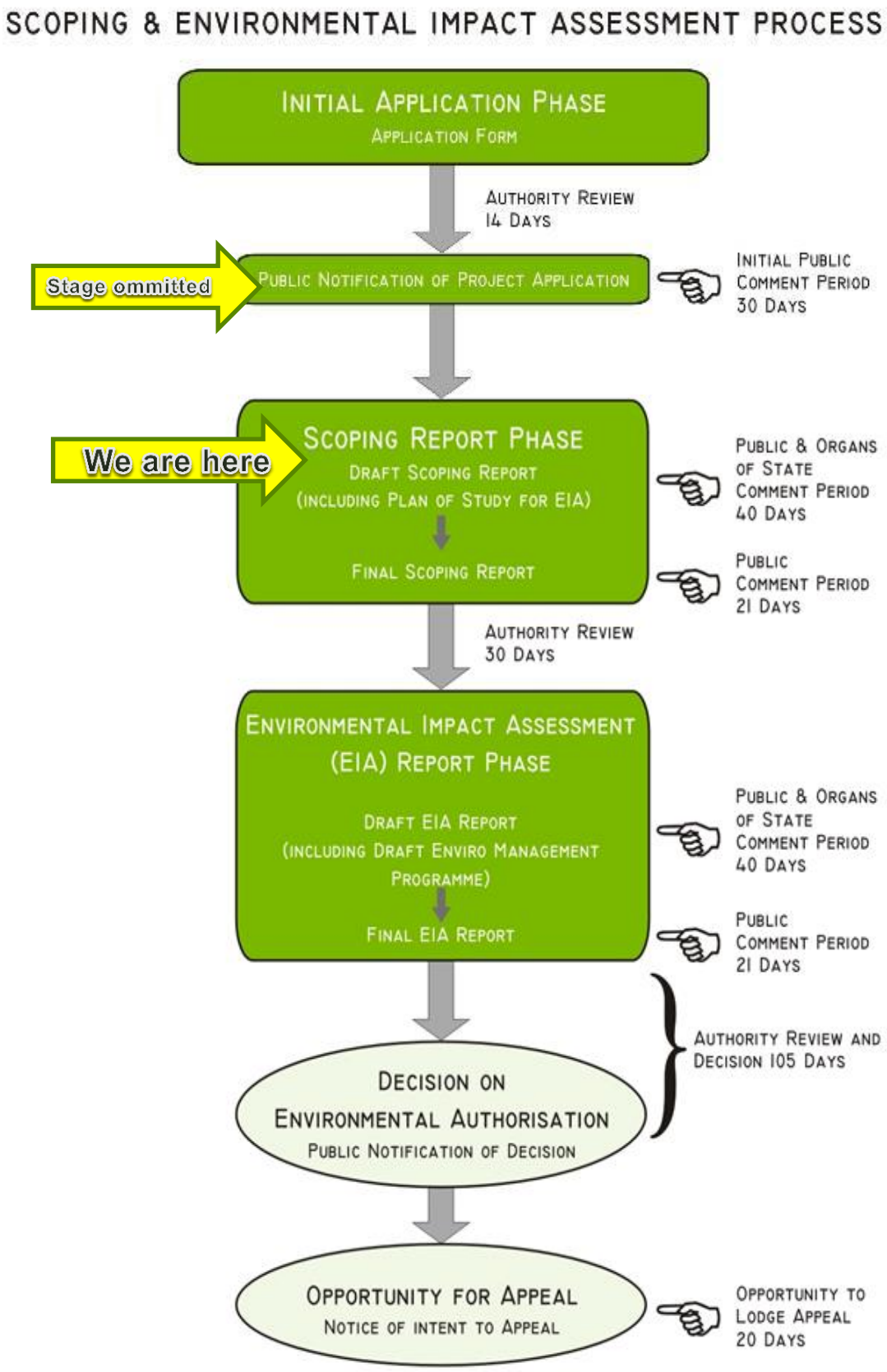

Figure 2 | **The EIA process in terms of NEMA**

2.1.2 The Scoping Phase

Scoping is defined as a procedure for determining the extent of, and approach to, the EIA phase and involves the following key tasks:

- Engagement with relevant authorities and I&APs;
- Identification and selection of feasible alternatives to be taken through to the EIA Phase;
- Identification of significant issues/impacts associated with each feasible alternative to be examined in the EIA Report; and
- Determination of methodology for assessment and specific Terms of Reference (ToR) for any specialist studies required in the EIA Report (Plan of Study for the EIA Report).
- Site notices, in English and Afrikaans, placed at the entrance of the proposed Boegoeberg Hydro Electric Project; Groblershoop Public Library, and !Kheis Local Municipality offices.

To date the Scoping Phase has involved a desktop review of relevant literature, including a review of previous environmental studies in the area. These included, *inter alia*, the following:

- Proposed hydropower station on the Orange River near Kakamas, Northern Cape: Final BAR (Aurecon, 2011);
- Siyathemba IEMP (African EPA, 2007);
- !Kheis Local Municipality Integrated Development Plan (IDP), 2012 - 2017
- Siyanda District Municipality Integrated Development Plan (IDP), 2012/2013 - 2017
- Siyanda District Municipality Environmental Management Framework, 2008
- Vegetation Map of South Africa (Mucina & Rutherford, 2006);
- Proposed hydropower station on the Orange River near RVM, Northern Cape: Draft BAR (Aurecon, 2013);

An inception field trip was held on 21 June 2013 with the Aurecon EIA team, the proponent and the landowners. The purpose of the field trip was to gain an understanding of the key aspects such as:

- Biophysical aspects, including:
    - Terrestrial fauna and flora including avifauna;
    - Surface water resources;
    - Ecologically sensitive areas; and
    - Vegetation types on site.
- Socio-economic aspects, including:
    - Heritage issues;
    - Land use, including agricultural potential
    - Visual aesthetics including the location of the project in terms of roads, topography and proximity to houses;
    - Location of local communities;
    - Dust;
    - Employment opportunities; and
    - Tourism.

The information gathered during the site visit was used in refining the Plan of Study for the EIA process and ToR for the specialist studies which will be undertaken during the EIA Phase.

2.1.2.1 Decision making on the DSR

The Draft Scoping Report (DSR) will be made available to the public for a prerequisite 30 day comment period and a 40 day comment period for the authorities. All comments received during the comment period will be included in a Comments and Responses Report (CRR) and annexed to the

Final Scoping Report (FSR). Once the FSR has been completed, including the CRR, it will be submitted to DEA for review.

The competent authority (DEA) must, within 30 days of receipt of the FSR, or receipt of the required information, reports, or comments or an amended scoping report, consider it, and in writing –

(a) Accept the report and advise the Environmental Assessment Practitioner (EAP) to proceed with the tasks contemplated in the Plan of Study for EIA;
(b) Request the EAP to make such amendments to the report as the component authority may require (request additional information), or
(c) Reject the Scoping Report if it
    i. Does not contain material information required in terms of these regulations, or
    ii. Has not taken into account guidelines applicable in respect of Scoping Reports and Plans of Study for EIA.

2.1.3 The EIA Phase

The Scoping Phase will be followed by the EIA Phase, during which the specialist investigations will occur, and will culminate in a comprehensive EIA Report (EIR) documenting the outcome of the impact assessments. Details of the proposed EIR and the public participation process are provided in Section 6.

2.2 The Public Participation Process

Consultation with the affected stakeholders and the public forms an integral component of this investigation and achieves the following:

- Enables stakeholder groups and I&APs to identify their issues and concerns about the proposed activities, which they feel should be addressed in the EIA process; and
- Create a transparent process and ensures that I&APs are well informed about the project.

As much information as is available has been included upfront inform I&APs and afford them numerous opportunities to review and comment on the proposed project. Currently there are 42 I&APs registered on the project database (see **Annexure B** for a list of I&APs). An outline of the proposed Public Participation Process is given in **Figure 2** as part of the EIA proposed programme.

2.2.1 Identification of Stakeholders

The initial database of I&APs include the directly affected landowners, the adjacent landowners, relevant district and local municipal officials, relevant national and provincial government officials, stakeholders, and environmental and other community organisations in the area. This database will be augmented via chain referral during the EIA process, and will be continually updated as new I&APs are identified throughout the project lifecycle. The provisional list of I&APs is included in **Annexure B**.

2.2.2 Notification of the Public Participation Process

Consultation with all potential I&APs commenced with the notification of the Public Participation Process, as required in terms of the EIA Regulations, which entailed the following:

- Placing advertisements in the following newspapers (refer to **Annexure B** for copies of the advertisements):
    - *Kalahari Bulletin on **18 July 2013***;
    - *Die Volksblad on **17 July 2013.***
- Placing a notice board at the site, the Groblershoop Public Library, and the !Kheis Local Municipality in Groblershoop (**Annexure B**) *on **17 July 2013***;

- Providing written notice to potential I&APs including surrounding landowners, organs of state and relevant authorities on ***17 July 2013***; and
- Requesting potential I&APs to recommend other potential I&APs to include on the database (chain referral process).

Thereafter, the remainder of the communications will be focused on registered I&APs. Consequently, the initial advertising campaign has been broad and thorough and invited the members of the public to register as I&APs.

All issues raised during the comment period of the DSR will be recorded in a CRR, along with responses from the client and consultant. The CRR will be annexed to the FSR and all parties that raised issues will be provided with a copy of the CRR, as stated above.

2.3 Authority Involvement

Authority involvement commenced at the start of the project with the submission of the revised EIA Application Form to DEA to upgrade the proposed project to a full Scoping and EIA process (process described in section 2.1.1). The following authorities have been requested to comment on the DSR:

- DEA;
- Siyathemba Local Municipality;
- Siyancuma Local Municipality;
- !Kheis Local Municipality;
- Siyanda District Municipality;
- DWA;
- DENC;
- Department of Agriculture, Land Reform & Rural Development (Northern Cape);
- SAHRA;
- Northern Cape Provincial Heritage: *Boswa ya Kapa Bokone*;
- Department of Energy (Northern Cape);
- Eskom Holdings Ltd.;
- DoE; and
- DAFF (Northern Cape).

Where the need arises, focus group meetings will be arranged with representatives from the relevant national and provincial departments, local authorities and stakeholders. The purpose of these meetings, if required, would be to ensure that the authorities and stakeholders have a thorough understanding of the proposed hydropower station project and that Aurecon has a clear understanding of the authority and stakeholder requirements. It is anticipated that beyond providing key inputs into the EIA, this authority scoping process will ultimately expedite the process by ensuring that the final documentation satisfies the authority requirements and that the authorities are fully informed with respect to the nature and scope of the proposed Boegoeberg Hydro Electric Project.

2.4 Guidelines

This EIA process is informed by the series of national Environmental Guidelines[2] where applicable and relevant:

- Integrated Environmental Information Management (IEIM), Information Series 5: Companion to the NEMA EIA Regulations of 2010 (DEA, 2010).
- Implementation Guidelines: Sector Guidelines for the EIA Regulations (draft) (DEA, 2010).

[2] Note that these Guidelines have not yet been subjected to the requisite public consultation process as required by Section 74 of R385 of NEMA.

- IEIM, Information Series 2: Scoping (Department of Environmental Affairs and Tourism (DEAT), 2002).
- IEIM, Information Series 3: Stakeholder Engagement (DEAT, 2002)
- IEIM, Information Series 4: Specialist Studies (DEAT, 2002).
- IEIM, Information Series 11: Criteria for determining Alternatives in EIA (DEAT, 2004)
- IEIM, Information Series 12: Environmental Management Plans (DEAT, 2004).
- Integrated Environmental Management Guideline Series, Guideline 4: Public Participation, in support of the EIA Regulations. Unpublished (DEAT, 2005).
- Integrated Environmental Management Guideline Series, Guideline 7: Detailed Guide to Implementation of the Environmental Impact Assessment Regulations. Unpublished (DEAT, 2007).

The following guidelines from the DEA&DP were also taken into consideration:

- Brownlie. 2005. Guideline for involving biodiversity specialists in EIA process (June 2005).
- Winter & Baumann. 2005. Guideline for involving heritage specialists in the EIR process (June 2005).
- Oberholzer. 2005. Guideline for involving visual and aesthetic specialists in the EIR process (June 2005).
- Guideline for Environmental Management Plans (June 2005).
- Guideline for determining the scope of specialist involvement in EIA Processes (June 2005).
- Guideline for the review of specialist input into the EIA Process (June 2005).
- DEA&DP.2011. Guideline on Alternatives, EIA Guideline and Information Document Series. (DEA&DP, October 2011).
- DEA&DP.2011. Guideline on Need and Desirability, EIA Guideline and Information Document Series. (DEA&DP, October 2011).
- DEA&DP.2011. Guideline on Public Participation, EIA Guideline and Information Document Series. (DEA&DP, October 2011).

2.5 Assumptions and Limitations

2.5.1 Assumptions

In undertaking this investigation and compiling the Scoping Report, the following has been assumed:

- The strategic level investigations undertaken by the DoE regarding South Africa's proposed energy mix prior to the commencement of the EIA process are technologically acceptable and robust;
- The information provided by the client is accurate and unbiased; and
- The scope of this investigation is limited to assessing the environmental impacts associated with the proposed hydropower station and connections to the grid. The EIA does not include any infrastructure upgrades which may be required from Eskom to allow capacity in the local grid for the proposed projects.

2.5.2 Gaps in Knowledge

This Scoping Report identifies the potential environmental impacts associated with the proposed activities. However, the scope of impacts presented in this report could change, should new information become available during the EIA Phase. The purpose of this section is therefore to highlight gaps in knowledge when the Scoping Phase of the project was undertaken.

The planning for the proposed project is at a feasibility level and therefore some of the specific details are not available at this stage of the EIA process. This EIA process forms a part of the suite of

feasibility studies and as these studies progress, more information will become available to inform the EIA process. This will require the various authorities, and especially DEA, to issue their comments and ultimately their environmental decision to allow for the type of refinements that typically occur during these feasibility studies and detailed design phase of project. Undertaking the EIA process in parallel with the feasibility study does however have a number of benefits, such as integrating environmental aspects into the layout and design and therefore ultimately encouraging a more environmentally sensitive and sustainable project.

This Scoping Report has identified the potential environmental impacts associated with the proposed activities. However, the scope of impacts presented in this report could change, should new information become available during the EIA Phase. The purpose of this section is therefore to highlight gaps in knowledge when the Scoping Phase of the project was undertaken, these include:

- Total spoil amounts and the corresponding amount to be used for the farms revetments.
- Total amount of wearing course required from borrow pits for access roads.

2.6 Independence

Aurecon nor any of its sub-consultants are subsidiaries of Boegoeberg Hydro, nor is Boegoeberg Hydro a subsidiary to Aurecon. Furthermore, all these parties do not have any interests in secondary or downstream developments that may arise out of the authorisation of the proposed project.

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3 THE PROPOSED ACTIVITY

The purpose of this Chapter is to description of the proposed activity with specific reference to the construction, operation and decommissioning of the hydropower station and to describe the alternatives that are being considered. Alternatives that are being considered are discussed in terms of location, activity, site layout and technology.

3.1 Description of the Proposed Activities

The proposed station Boegoeberg Hydro Electric Project will be located on the farm Zeekoebaart (*Remainder of Farm no. 306 and Portion 1 of Farm no. 306*) located approximately 26km south east of the town of Groblershoop in the Northern Cape.

The proposed facility would be a run-of-river hydropower scheme capable of producing approximately 10.05MW of electricity through two or three Francis turbines, each having equal capacity. Run-of-the-river facilities use conventional hydropower technology to produce electricity by using the natural flow and drop in elevation of a river and diverting the flow and passing it through turbines that spin generators. The flowing water spins the turbines, which take the kinetic energy from the flowing water to generate electricity in the same way that a coal-fired power station creates steam to turn turbines and wind turbines are turned by wind. There would be no storage of water off-stream and the power station would thus be subject to seasonal river flows, and would not operate during low flow periods. The process of generation and distribution of electricity through a run-of- the-river hydro plant is illustrated in **Table 3** and Figure 4. According to Eskom's 2010 financial statements, the average Eskom residential customer uses an approximately 212kWh per month. Current calculations show approximately 900,000KWh hours of energy would be generated by the plant per month with a load factor of between 50 and 70%. It is estimated that the Boegoeberg Hydro Electric Project will generate enough energy to power, on average, 23,000 homes.

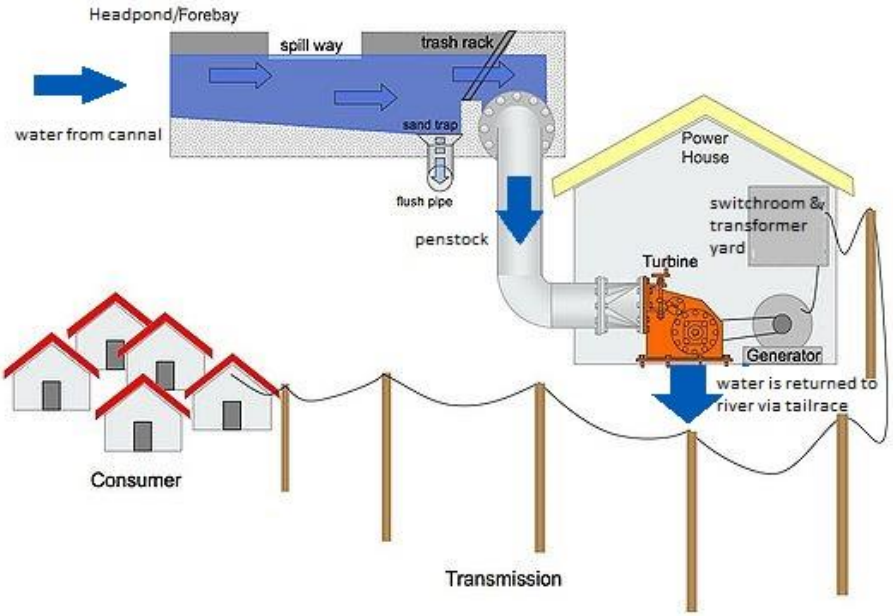


Figure 3 | Illustration of the electricity generation process for a run-of-river hydropower station [Source: https://energypedia.info (Accessed: 28 June 2013)]

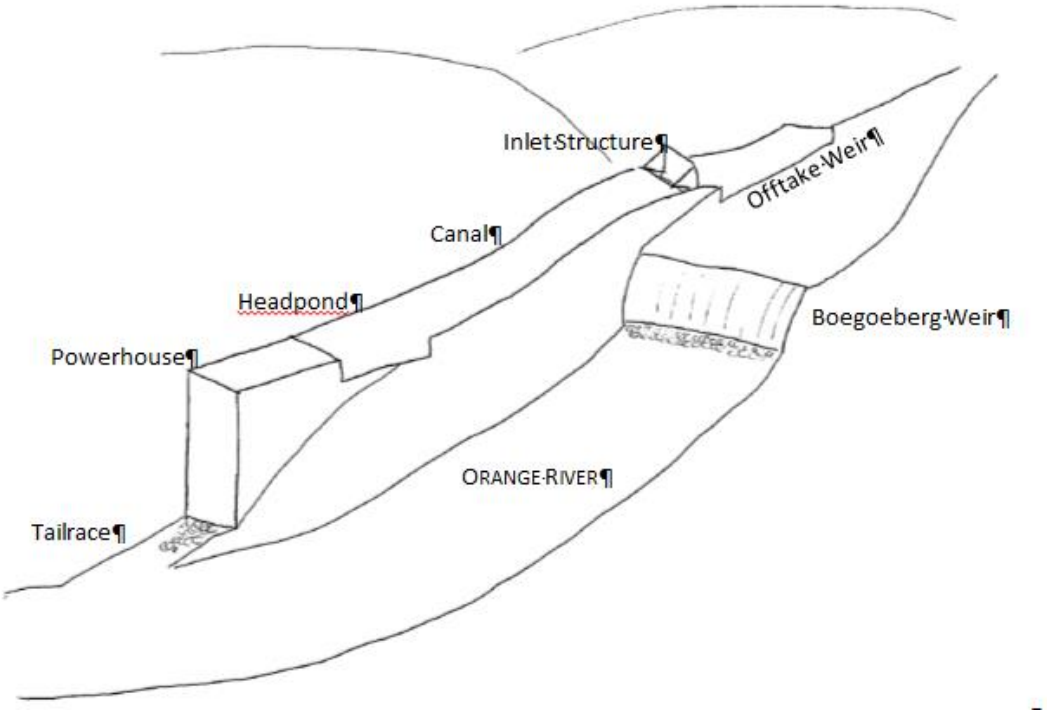


Figure 4. Sketch of the proposed components at Boegoeberg.

3.1.1 Components of the Hydropower Station

This section will in more detail describe each component of the hydropower station.

A run-of-river hydropower station, as proposed, consists of the following main components (refer to **Figure 5** and detailed description below):

- Intake infrastructure
  - The existing Boegoeberg Weir
  - Offtake Weir (below the normal water surface level) constructed in the Boegoeberg Weir pool to regulate flow into the water conveyance infrastructure and provide a physical barrier against the drawdown of water below agreed levels and ensure irrigation flows and environmental flows
  - Inlet structure containing up to two radial gates that close automatically to stop flow to the powerhouse in the event of floods or in situations where water is drawn down below agreed levels;
- Water conveyance infrastructure (i.e. canal or tunnel) to direct water from the river to the power house;
- Head pond/ forebay to temporarily store water so that flow to the powerhouse is regulated, allowing a steady flow to the turbines. The headpond also allows for the extraction of sediment from the water;
- Power station intake structure/ penstock; comprising a sluice, gate or enclosed pipe intake structure which further assists in controlling the transfer of water to the power chamber
- Powerhouse to house the turbines and equipment used to generate electricity; and
- Outlet works/ tailrace to return the abstracted water back into the river, downstream of the power chamber.

Ancillary infrastructure includes access roads for use during construction and for maintenance purposes during operation, transmission line(s) for evacuating the energy produced by the hydropower station to the Eskom national grid, a switchroom, and transformer yard.

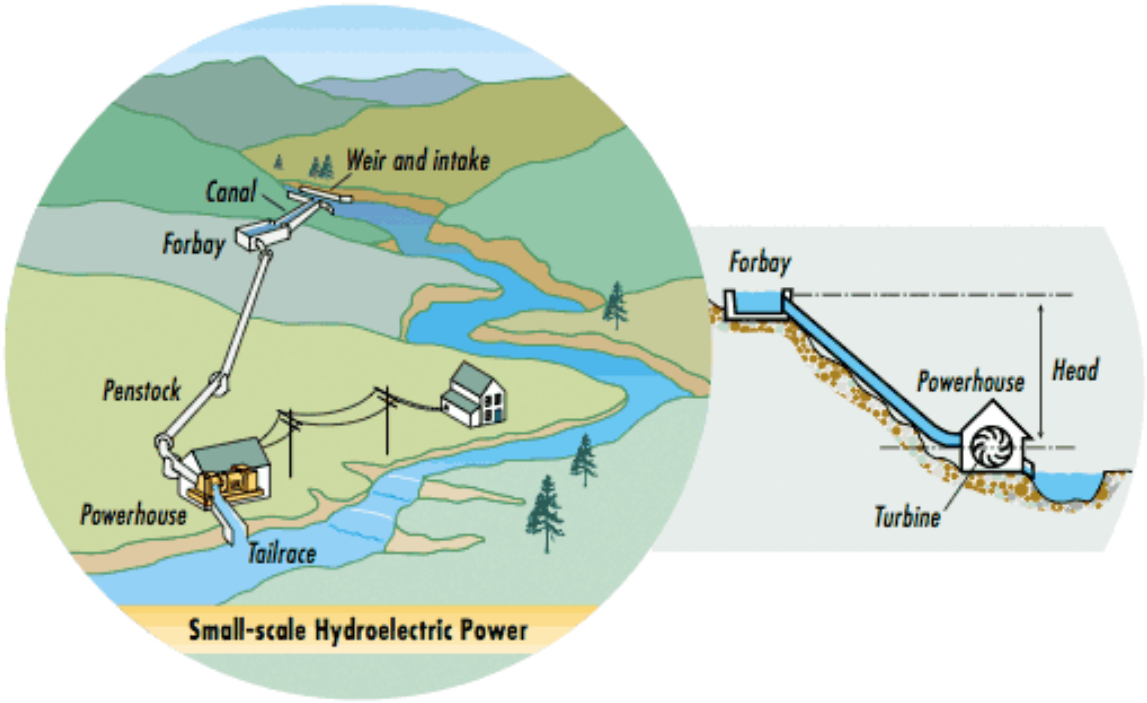


Figure 5 | Illustration of a run-of-river hydropower station [Source: http://enermed.cres.gr **(Accessed**: 28 June 2013)]

The location of the various components is indicated in **Figure 6**.

Weir and Off-take Structure

The weir (refer to **Figure 7)** diverts the required amount of water into the off-take structure. The weir would be designed and constructed to allow the permitted flow volumes to pass the weir and remain within the Orange River and only take water for power generation that is surplus to the environmental reserve flow requirement. The Boegoeberg weir is approximately 11m high (as measured from the river bed). However the Boegoeberg Dam created by the weir is currently heavily silted and the actual water height in the dam is estimated to be 6m (measured from the river bed). It is proposed that up to 120m^3 would be diverted from the river. This diverted flow would then pass through the hydropower plant infrastructure and be returned to the river some 400m downstream of the offtake weir. The following environmental and technical requirements will be considered as part of the flow diversion required for the hydropower plant:

- An uninterrupted flow equivalent to the demand of the local irrigation scheme, which would pass through the irrigation outlet on the left bank;
- An environmental release in a quantity to be agreed must pass over the weir structure and down the river at all times;
- The hydro scheme requires a flow of up to 120m^3/s when sufficient river flow is available after environmental releases;
- The project may include a system for flushing sediment that could build up in the water conveyance infrastructure upstream of the powerhouse.

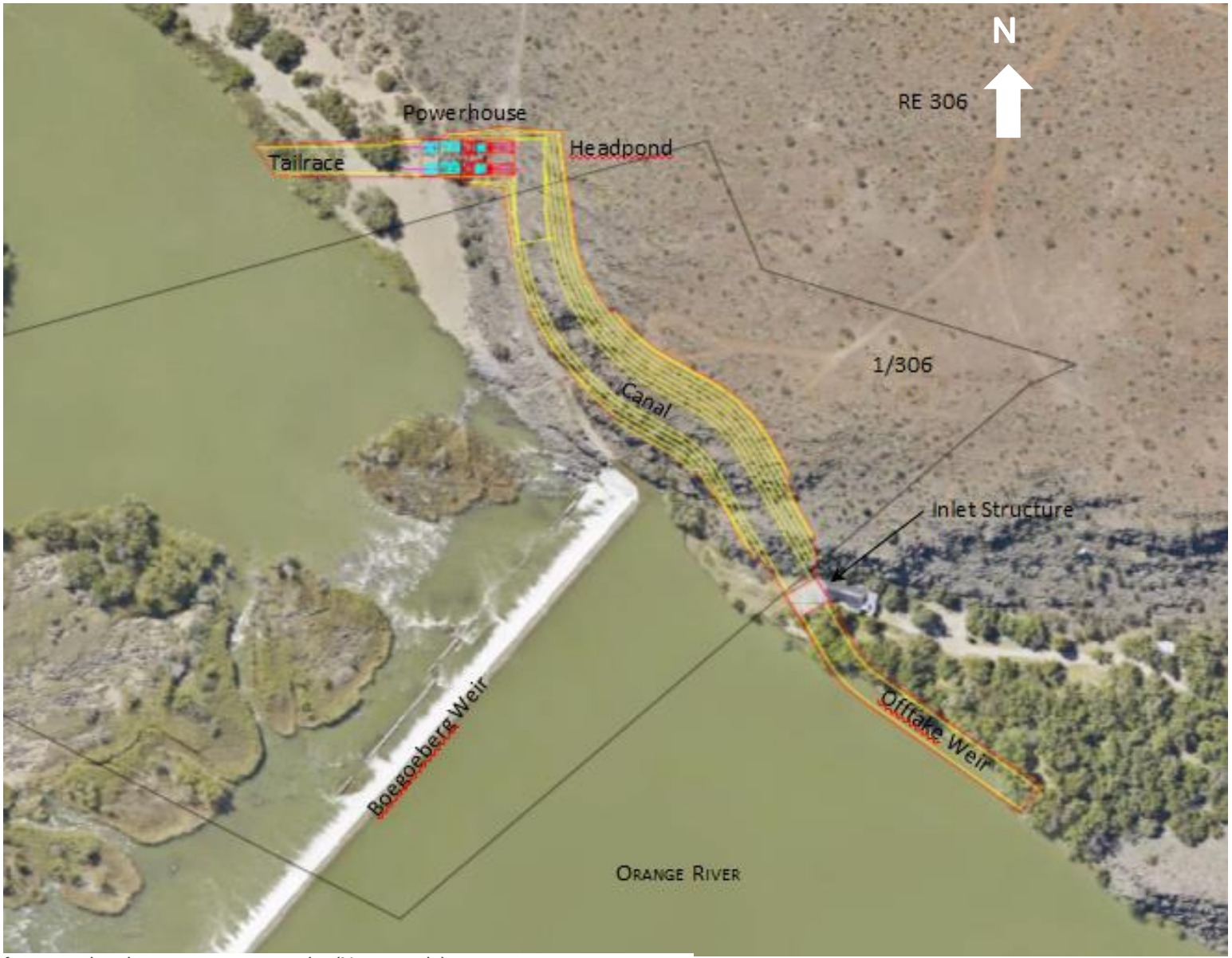


Figure 6. Layout of proposed project components on site (Not to scale)

Figure 7 | Boegoeberg weir, taken from the southern bank. The power station would be situated on the northern bank.

The main criterion for the selection of the proposed site was that there was sufficient elevation between the off-take and release points to allow transport of water to the power station to produce the maximum amount of power based on the physical properties of the site.

The off-take structure (refer to Figure 9) would consist of a predominantly concrete structure built into the riverbank 120m to 250m upstream of the existing weir wall. The off take structure would be engineered in consultation with the DWA and their requirements in order not to affect the existing weir's structural integrity. Downstream of the offtake weir an inlet structure would be built comprising a trash rack and an operable gate. The trash rack prevents the intake of debris such as branches or trees.

The operable gate regulates the volume of water which enters the canal or tunnel downstream. The regulation of the volume of water entering the off-take and inlet structure will be necessary, to amongst other things:

a. limit the flow of water to the power station during low flow periods to ensure the obligations to maintain the environmental reserve flow in the Orange River are met; and
b. ensure that only the volume of water required for electricity generation is transferred to the water conveyance infrastructure during peak flows in the Orange River.

Figure 8 | Example of a similar intake structure with trash racks and cleaner. The proposed intake would not have the gate shed.

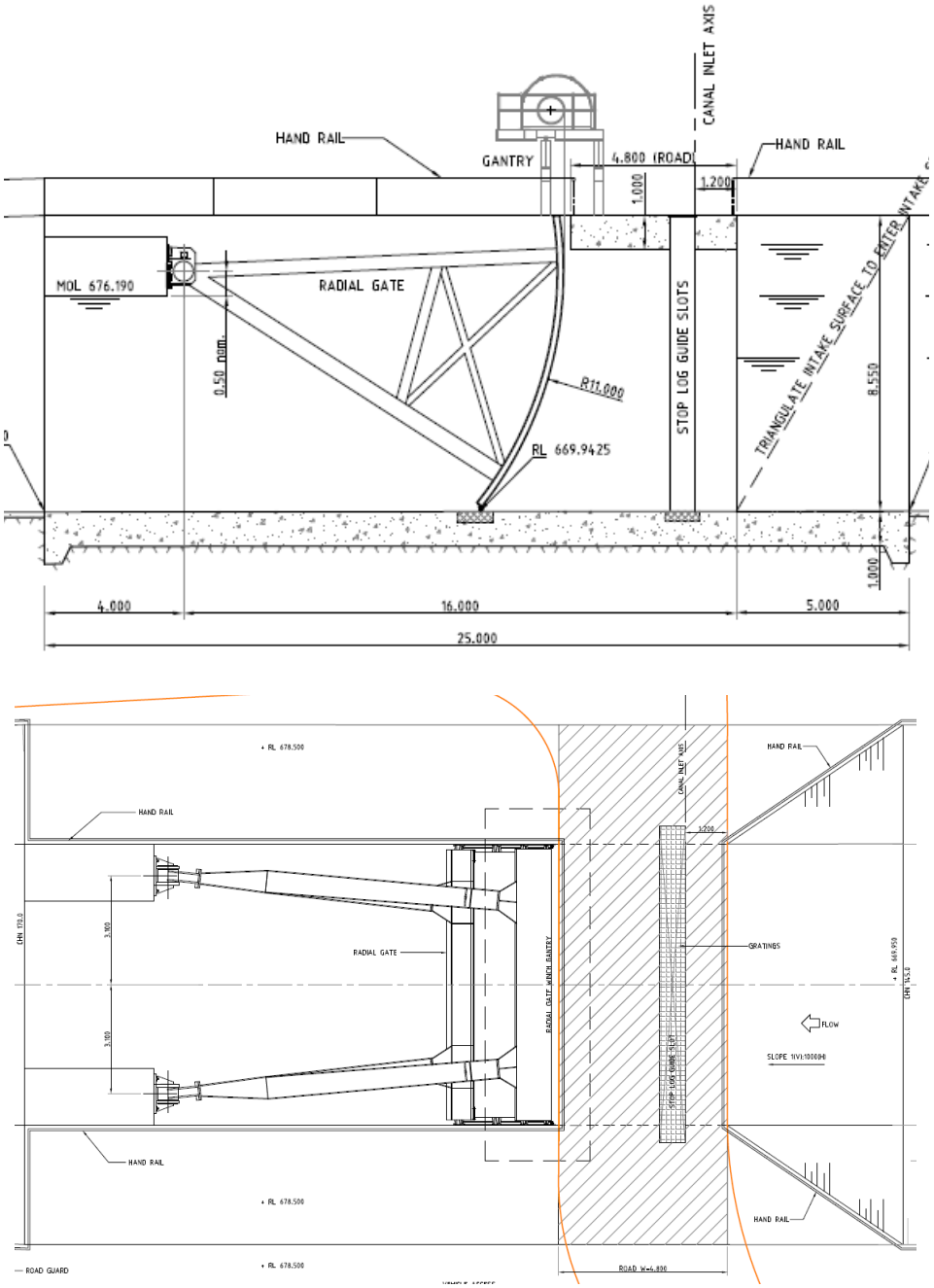


Figure 9 | Section and plan of a similar inlet structure

Water Conveyance Infrastructure

The water conveyance infrastructure transports the water from the river level in the off-take structure, located upstream from the weir, to the forebay located upstream of the powerhouse. It will comprise a combination of an open canal, a pipeline or tunnel to convey the water to the head pond.

Canal- The canal would follow contours as much as possible so as to maintain a constant gradient throughout its length, without losing too much head. The topography will determine the amount of material that needs to be removed for construction of the canal. If the amount of material is found to be too great a tunnel will be considered as an alternative to deliver water to the headpond.

In this case, it is envisaged that an open canal would be possible. The depth of the canal would vary depending upon, amongst other things, the topography of the terrain through which it is passing and the geological conditions of the ground in which it is constructed. Preliminary analysis has estimated that a typical cross-section for the conduit would be in the order of 10 deep and 15m wide at the floor of the canal.

The open canal would be fenced in to ensure animals and people cannot fall into the canal, with a bridge built over the canal to allow access to Boegoeberg Weir. A stormwater drain located up-slope of the canal would prevent storm water entering the canal. Stormwater would be diverted around the project infrastructure and returned to the river. The canal would be concrete lined (see **Figure 10**).

Figure 10 | Example of an open channel (Source: http://www.bptargetneutral.com (Accessed: 28 June 2013).

Tunnel- Preliminary analysis has estimated that the tunnel would be as follows:

a. Twin approximately 7.5m wide by 9.0m high concrete lined tunnels to convey the required volume of water; and
b. Approximately 300m in length.

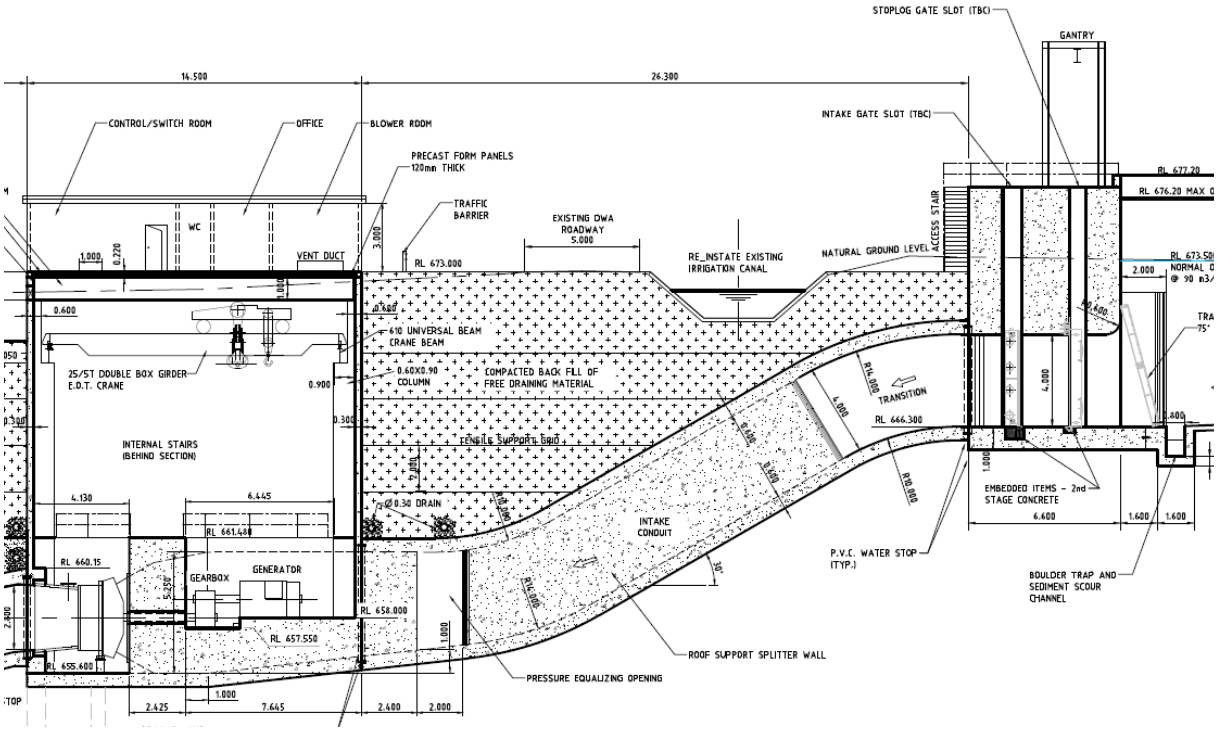
Head pond - The purpose of the head pond, also called the forebay, is to accumulate water temporarily and control the rate of the flow into the penstock (**Figure 11**). The head pond's secondary function is to allow for debris (i.e. silt, sediment, etc.) to settle so that it does not enter the facility and damage the turbines. The head pond would be located downstream of the water conveyance infrastructure and immediately upstream of the power station intake structure. The head pond will be a small concrete structure cut into the hillside with sluices to discharge built up sediment beck to the river. An overflow/ spillway from the head pond may be required in the event of machine shutdown or in the event that the flow of water in the water conveyance infrastructure is otherwise greater than that able to be utilised by the turbines.

Figure 11 | Example of a small head pond. (Source: energypedia.info (Accessed: 28 June 2013)].

This overflow/spillway would have low water velocities (compared to that of the turbine) and would provide a controlled release of water from the head pond into the river downstream. It also assists in the regulation of the volume of water in the head pond.

Power Station Intake Structure (Penstock)

A concrete intake structure comprising gates at the upstream end of the penstock will transfer water from the head pond to the penstock (**Figure 12** and **Figure 13)**. The penstock, an enclosed conduit of approximately 5.0m wide by 6.0m high will convey water to the power house. The gates would operate in an emergency to shut off flow into the penstock, or to allow maintenance of the penstock to occur.



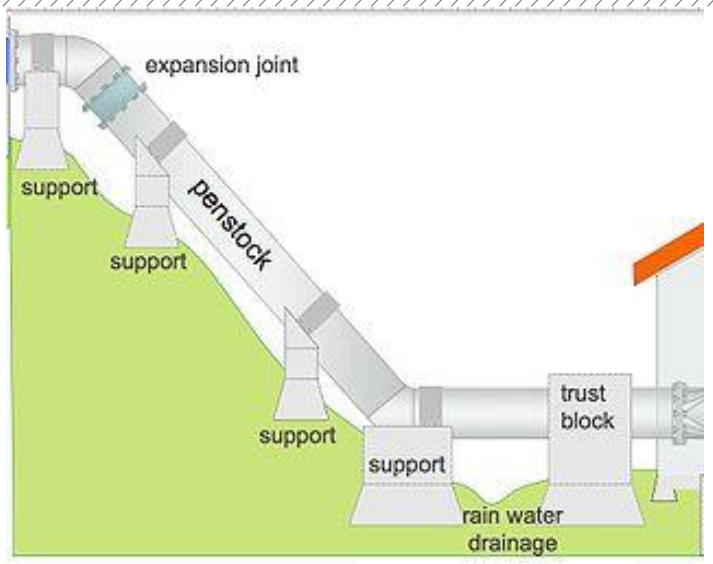


Figure 12 | Illustrated example of a penstock (Source: energypedia.info (Accessed: 28 June 2013)].

Figure 13 | Example of a penstock (source: energypedia.info (Accessed: 28 June 2013)].

Power chamber

The power chamber houses the turbines and generation units within a turbine hall (**Figure 14** and **Figure 15**). The power chamber would be located approximately almost immediately downstream of the intake structure. The power house dimensions would be approximately 30m x 15m x 15m (lxbxh). A crane would be positioned over the power house chamber for the installation and removal of the turbines and generators as well as for any maintenance required during operation.

Figure 14 | Example of a power house. (Source: http://www.lowimpacthydro.org/Accessed: 28 June 2013).

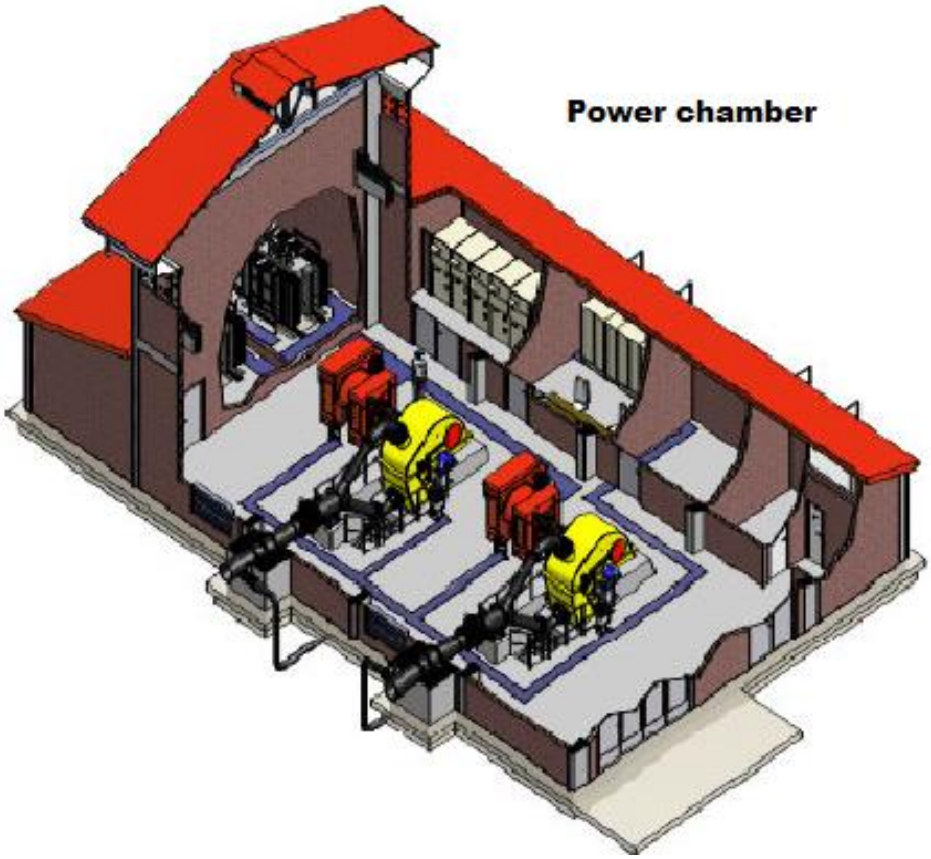


Figure 15 | Illustration of a power house chamber. (Source: http://www.lcclao.com (Accessed: 28 June 2013)].

Turbines and Generators

Typically, water flows from the elevated head pond down the penstock which maximises flow into the connected turbines. The flowing water applies pressure on the turbine blades causing the shaft to rotate which in turn is connected to an electrical generator which converts the motion of the shaft into electrical energy (**Figure 16**).The turbines to be used at the Boegoeberg Hydro Electric Project would be Kaplan type turbines based on the head an flow characteristics of the site.

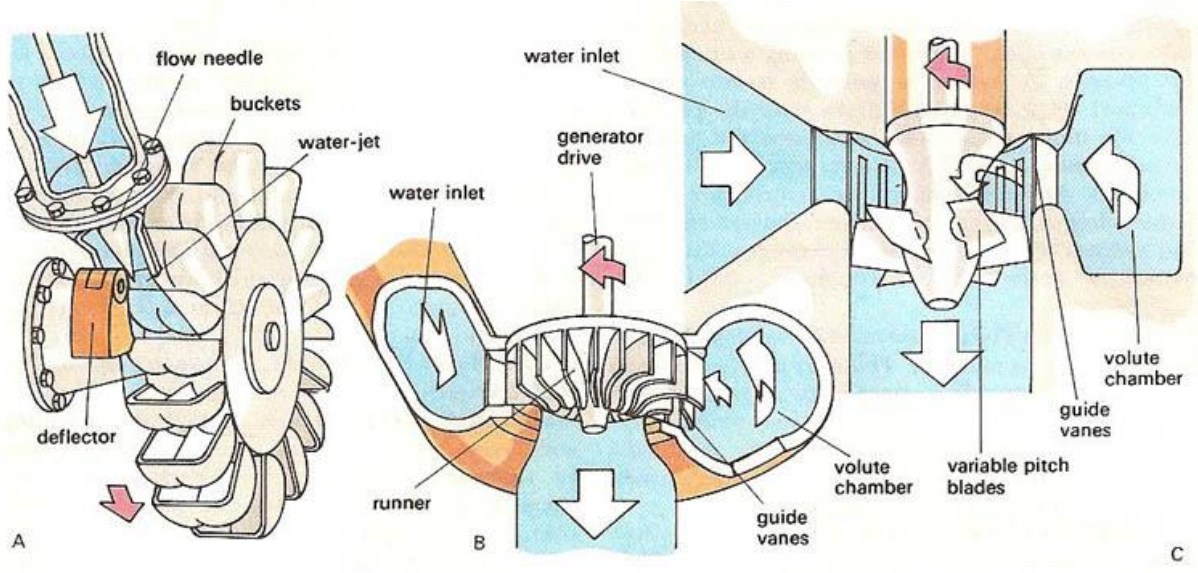


Figure 16 | Illustration of the three main types of water turbines: (A) Pelton wheel; (B) Francis turbine; (C) Kaplan turbine. (Source: The Encyclopaedia of Alternative Energy accessed 8 July 2013)

Outlet Works/ Tailrace

Water would be released from the power chamber, via a draft tube, into a tail race canal/ tunnel (**Figure 17**). This tail race canal/ tunnel terminates in the river where preliminary analysis suggests that the water would be released at a maximum velocity of approximately 2m/s, but this velocity would vary depending on the volume of water entering the relevant station at any given point in time. The tailrace canal would be approximately 100m long. The tailrace will have a width of about 20m and a depth of about 4.0m and may be concrete lined.

Switchroom

The switchyard would be a small platform approximately the size of a triple bay, garage. It would be located in the vicinity of the power chamber, outside the 1:100 year flood line, and its final location would be informed by the detailed design of the power chamber. An area of approximately 20m by 20m would be required for the structure. The switchroom may also be located within the power house.

Transformer yard

Transformers would be located immediately adjacent to the power chamber to transform the electricity produced by the turbines to the transmission line.

Figure 17: Example of a powerhouse and associated infrastructure. (source: http://www.photosensitive.com (Accessed: 28 June 2013)].

High Voltage (HV) Transmission Infrastructure

The HV transmission infrastructure (**Figure 18**) is to be located above ground and would connect into Eskom's 132kV transmission system via the Fibre Substation some 36km south of the plant (**Figure 1**).

Figure 18: Example of a 143kV transmission line (Source: http://www.commons.wikimedia.org (Accessed 9 July 2013))

3.1.2 Construction of the proposed hydropower station

The construction of the proposed hydropower station will take approximately 24 months. During the construction period several major tasks will need to be completed, as described below.

Hydropower plant and associated Infrastructure dimensions and construction footprint

The proposed hydropower plant and associated infrastructure dimensions of each facet of the proposed development have been detailed below, in **Table 4**.

Table 4: Dimensions of plant infrastructure and constructed footprint.

Component	Dimension (WXL)	Total constructed footprint (m^2)
Offtake infrastructure a)	20m x 150m	3,000m^2
Water conveyance infrastructure b) canal c) tunnel	 35m x 230m 15m x 300m	 8,000m^2 Nil (underground)
Head pond/ forebay	20m x 20m	400m^2
Power station intake structure/ penstock	15m x 10m	150m^2
Powerhouse (i.e. Turbines and generator)	15m x 30m	450m^2
Outlet works/ tailrace	30m x 100m	3,000m^2
Switchroom/ Transformer yard	20m x 20m	400m^2
High Voltage (HV) Transmission Infrastructure	30m x 36,000m	1,080,000m^2
Temporary site infrastructure a) Site office b) Construction yard c) Staff accommodation	50m x 75m	3750m^2
Spoil material		Total excavated volume approximately 170,000m^3.
Access roads a) Existing b) New		To be provided in the FSR
Borrowpits		To be provided in the FSR

Site Access

Access to the site during the construction period would be *via* roads of approximately 6m in width. The access road would be in part an expansion of the existing Zeekoebaart farm roads, and would be gravel. Where possible these construction access roads would be constructed to a standard suitable for permanent site access for the construction and operational phases of the project. As far as possible existing road alignments will be modified to be approximately 6m wide to accommodate construction vehicles during the construction period.

Water Conveyance Route

Construction of the water conveyance structures would involve the clearing of vegetation along the alignment as required. The alignment will be cleared for a width of 30m. A temporary construction corridor of 6m width would be required adjacent to the alignment in order for the construction machinery to manoeuvre. Once cleared, any soft or intermediate material will be excavated by

mechanical means (i.e. excavator). Hard rock will be loosened by means of controlled blasting before it will be excavated. Concrete lining of the canal or tunnel would cast in-situ.

Head pond

Similar to the water conveyance route, the head pond site would be cleared and excavated. An area of 400m² will be cleared. Depending on the geology of the site, controlled blasting might again be required to loosen up hard rock that cannot be excavated mechanically. Any required concrete lining of the head pond would be cast in-situ.

Penstock

The penstocks would be concrete and would be partially buried.

Powerhouse

Construction of the powerhouse would involve the clearing of vegetation of an area of approximately 450m^3. Once cleared, any soft or intermediate material will be excavated by mechanical means (i.e. digger loader). Hard rock will be loosened by means of controlled blasting before it will be excavated.

Tailrace

Construction of the tailrace would involve the clearing of vegetation of an area of approximately 3000m². Once cleared, any soft or intermediate material will be excavated by mechanical means (i.e. digger loader). Hard rock will be loosened by means of controlled blasting before it will be excavated.

Transmission Line

The overhead transmission line would follow existing access roads where possible. The transmission line would be constructed to Eskom standards appropriate to the rating of the line finally decided upon.

Site Infrastructure

A site office would be located near the site of the construction works. It would house the administrative personnel for the construction works and would have its own services and amenities. The peak construction workforce is estimated to be 150 to 200 people. Accommodation for the workforce would be in temporarily constructed at the farm, close to the site as indicated in Figure 5.

Spoil Material

An approximate total of 170,000m³ spoil material will be excavated from the weir, canal/tunnel, powerhouse, and tailrace. The largest amount of spoil would be generated by the construction of the canal/tunnel. Several options will be assessed for the removal and disposal and/or re-use of spoil material. Where possible backfilling of excavated material will be undertaken to reduce quantities.

Re-use options include:

- Construct and upgrade access roads;
- Construct revetments on the farm to protect agricultural fields from periodic flooding (as requested by the landowner) (initial estimates indicate approximately 20,000m^3 spoil material will be required).

Options for disposal off-site include identif spoil sites near to the site capable of taking up to 20,000m^3 if so required.

A combination of the above options may be required to ensure the proper management of spoil during the construction phase. These options will be assessed in more detail during the EIA phase.

Borrow pits

Material would be needed for upgrading and the re-gravelling the existing gravel roads to a maximum width of 6 metres. Suitable gravel is not always readily available and has to be specifically sourced. Two informal borrow pits on the farm have been identified as suitable sources of wearing course as required and are in close proximity to the roads that will require upgrade. Spoil from the construction site would also be used to fill and even out roads. This will be addressed further in the EIR.

3.1.3 Operation of the hydropower station

The operational lifespan of the hydropower plant is estimated to be approximately 60 to 80 years. The turbines are designed to operate continuously and with a minimal maintenance intervention throughout the operational lifespan of the facility.

During the operational phase of the project, staff would undertake routine maintenance and the operation of the facility would be done remotely, consequently there would be no need for ancillary buildings to accommodate permanent site personnel.

It is estimated that the operational phase will result in between four to six job opportunities. Vehicles would use the permanent access roads to travel to the powerhouse for work. On occasion, maintenance activities would be required on other areas of the project, which may require heavier construction equipment. This equipment would be restricted to the access roads and the work site to minimise its impact on the environment.

3.1.4 Decommissioning of the proposed hydropower station

As the proposed hydropower station is to be constructed in response to the Power Purchase Agreement issued by Eskom under the Renewable Energy Power Procurement Program the minimum operational period will be 20 years (which is the duration of the PPA. However, as the entire infrastructure, such as roads, transmission, and powerhouse, etc. would already be established, and the energy source (water) is a renewable one, the proposed project could potentially continue to be operated beyond this. As such the facility will most likely be upgraded with the latest applicable technology and/or existing infrastructure will be maintained for further use after the expiration of the initial PPA.

However, should the facility be decommissioned, which is unlikely, all components will have to be disassembled, removed and recycled as far as possible. Depending on the best available option at the time, any above ground structures must be demolished unless an alternative use is found for them. Decommissioning would have to be undertaken as per the environmental legislation relevant at that time.

The rehabilitation of the disturbed areas would form part of any decommissioning phase. The aim would be to restore the land to its original substratum characteristics (or as near as possible). The prescribed restoration activities will be described in the Environmental Management Plan (EMP) in the EIR.

3.2 Consideration of Alternatives

3.2.1 Introduction

The NEMA requires that alternatives are considered during the EIA process. An important function of the Scoping Phase is to screen alternatives to derive a list of feasible alternatives that need to be assessed in further detail in the EIA Phase. An alternative can be defined as a possible course of action, in place of another, that would meet the same purpose and need (DEAT, 2004).

“alternatives”, in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to—

a. the property on which or location where it is proposed to undertake the activity;
b. the type of activity to be undertaken;
c. the design or layout of the activity;
d. the technology to be used in the activity;
e. the operational aspects of the activity; and
f. the option of not implementing the activity.

In addition to the list above, the 2013 DEA&DP Guidelines on Alternatives also considers the following as alternatives:

a. **Demand alternative:** Arises when a demand for a certain product or service can be met by some alternative means (e.g. the demand for electricity could be met by supplying more energy or using energy more efficiently by managing demand).
b. **Input alternative:** Input alternatives are applicable to applications that may use different raw materials or energy sources in their process (e.g. Industry may consider using either high sulphur coal or natural gas as a fuel source).
c. **Routing alternative:** Consideration of alternative routes generally applies to linear developments such as power line servitudes, transportation and pipeline routes.
d. **Scheduling and timing alternative:** Where a number of measures might play a part in an overall programme, but the order in which they are scheduled will contribute to the overall effectiveness of the end result.
e. **Scale and Magnitude alternative:** Activities that can be broken down into smaller units and can be undertaken on different scales (e.g. for a housing development there could be the option 10, 15 or 20 housing units. Each of these alternatives may have different impacts).

The alternatives most pertinent to the proposed project include the following:

- Location alternatives identify alternative locations for the entire project proposal or for components of the project proposal.
- Activity (type) alternatives are also referred to as project alternatives. This requires a change in the nature of the proposed activity. This category of alternatives is most appropriate at a strategic decision-making level.
- Layout alternatives include site layout alternatives that consider different spatial configurations of an activity on a particular site.
- Technology alternatives consider different types of technology that can be used in the project.
- Routing alternative consider different routes for linear aspects of the project, such as access roads and transmission lines.

The above categories of alternatives are most pertinent to this EIA process and are explored in detail below. The purpose of this section of the report is to identify (scope) and describe all potential alternatives and determine which alternatives should be carried through to the EIA Phase of the project for further assessment.

3.2.2 Location Alternatives

South Africa is on the verge of increasing the percentage contribution made by renewable energy power generation to the existing energy mix. In response to this opportunity for large scale renewable energy production, Boegoeberg Hydro has identified potential sites across the country and is currently pursuing the best suited locations for hydropower production.

A number of options were considered for the location of the site. The applicant investigated some 12 sites along the Lower Orange River, from Onseepkans to Vioolsdrift. All of these opportunities would involve extensive tunnelling (approximately 8km to 10km at each site), with an 8m to 12m drop in elevation. For these projects to be feasible, a flow rate of some 100m^3/s would be required for 80% of the time (which is unlikely to occur on the Lower Orange River). Furthermore, they would all require

extensive infrastructure to be built and connections to the existing grid were generally 50km or more away. As such, most of these sites were not considered to be feasible. A few sites were however considered to be feasible. A site at the Neusberg weir near Kakamas has been approved for a proposed hydropower station with an installed capacity of 12MW. This proposed hydropower station at Neus was selected in the second bid round and is currently under construction. The applicant has also initiated an EIA for a new site at Riemvasmark near Augrabies for a 40MW hydropower plant (DEA Ref. No. 14/12/16/3/3/1/681).

Furthermore, the applicant also investigated five sites on the Thukela River. These sites would require tunnel lengths ranging from 1km to 2.5km, with elevation drops ranging from 13m to 32m. Two of these sites with tunnel lengths of 1km to 1.3km have received favourable EA's but have received favourable EA's but are currently not feasible as the construction costs are too high. Of the three remaining sites, two are still being investigated for future development.

The Boegoeberg site was selected for the following reasons:

- The suitable hydrology allows for the project to be considered feasible. Most rivers in South Africa do not provide the hydrological condition required for the development of small hydro opportunities. In this regard only the Orange and Thukela rivers present themselves as viable options for smaller hydropower schemes;
- Good difference in elevation between abstraction and release points for water (also called head), which therefore requires only a small diversion of water to make the project feasible; and
- The potential for socio-economic development in the !Kheis Local Municipality from the project.

A number of location alternatives were considered in the vicinity of the Boegoeberg weir, at the initiation of the project, including options along the northern and southern banks of the river. Due to various reasons such as ownership of land, technical complexity and length of routes these options were discarded in favour of the currently proposed alternative. The proposed project balances the need for a significant difference in elevation in the river with the length of the proposed aqueduct and is considered most suitable from a technical perspective.

3.2.3 Activity Alternatives

There are numerous policies and legislation which govern the generation of energy in South Africa. The legal requirements are described in detail in **Annexure C**. The need for additional energy generation in South Africa is well documented, as summarised in **Annexure C** (Forward planning of Energy in South Africa) which covers the following policies and legislation:

- Policies regarding greenhouse gas and carbon emissions;
- White Paper on the Energy Policy of the Republic of South Africa (1998);
- White Paper on Renewable Energy (2003);
- National Energy Act (No. 34 of 2008) and Electricity Regulation Act (ERA) (No. 4 of 2006);
- Integrated Energy Plan for the Republic of South Africa (2003);
- Integrated Resource Plan (2010); and
- Regional Methodology for Wind Energy Site Selection (Department of Environmental Affairs and Development Planning (DEA&DP), 2006 Guideline document).

Furthermore, numerous policies and legislation have been promulgated indicating the mixture of renewable and non-renewable energy which South Africa wishes to pursue. These strategic documents provide the road map for the activity alternatives available to South Africa. Boegoeberg Hydro has identified a number of projects for hydropower generation across South Africa, aimed at meeting these stated goals, hydropower in particular.

The site, situated on the banks of the Orange River near Groblershoop, is suitable for a small hydro given the reasons provided in Section 3.2.2.

Boegoeberg Hydro is a company which specialises in hydropower generation. As such, only hydropower generation will be considered for the proposed Boegoeberg site by this company.

3.2.4 Site Layout Alternatives

One site layout has been compiled based on *inter alia* the following criteria:

- Technical constraints, namely:
  - Construction alongside the Boegoeberg weir;
  - Spatial orientation requirements of project components and associated infrastructure (e.g. roads); and
  - Layout relative to other existing infrastructure, such as power lines.
- Environmental constraints, namely:
  - Hydrology profile of the river;
  - Topographical constraints relative to construction requirements;
  - Botanical and faunal constraints (presence of sensitive or protected plant communities or fauna); and
  - Aesthetics.

It should be noted that due to specific hydrology profile and the constraints presented by the rugged terrain, there are limited and very specific locations for the proposed infrastructure that can be considered in order to utilise the energy potential of the hydropower resource effectively.

Where necessary, the site layouts will be amended during the EIA Phase in response to any particular environmental sensitivities or technical constraints identified which will be presented and assessed in the Draft EIAR.

3.2.5 Technology Alternatives

There are two main types of hydropower turbines, namely impulse and reaction turbines **(Figure 19)**. The impulse turbine generally uses the velocity of the water stream which hits each bucket on the runner. An impulse turbine is generally suitable for high head, low flow applications.

A reaction turbine develops power from the combined action of pressure and moving water which flows over the blades rather than striking each individually.

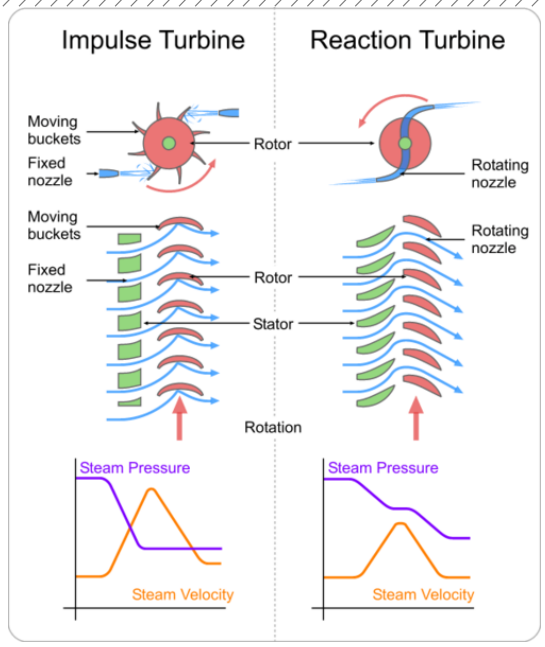


Figure 19 | Impulse and reaction turbines [Source: http://en.wikipedia.org, 5 July 2013)]

The type of hydropower turbine selected for a project is based on the following selection criteria:

- "Head" which is the differential in elevation between the water in the forebay and the turbines;
- “Flow”, or volume of water, at the particular site;
- Depth at which the turbine must be set (civil works);
- Turbine efficiency; and
- Turbine cost.

Reaction turbines are generally used for sites with lower head and higher flows than compared with the impulse turbines. The turbines selected based on the head and flow characteristics of the site, are only suitable for the Francis turbines (refer to **Figure 20**) as these are well adapted to these characteristics.

Figure 20 | Francis Turbine and generator. [source: [source: http://en.wikipedia.org, 5 July 2013)]

3.2.6 Routing Alternatives

Layout alternatives for the access roads are limited as it is proposed to use existing road alignments, as far as possible.

The layout for the transmission line will also follow the projects alignment as far as possible. Where the transmission line extends beyond the project's alignment it will follow the shortest available route towards the existing Eskom Fibre Substation to the south. This route may be adapted should specialist studies indicate that this is required to avoid any sensitive areas. Details will be provided in the EIR.

3.2.7 No-Go alternative

The assessment of alternatives must at all times include the "no-go" option. The "no-go" alternative will be the baseline against which all other alternatives are measured. The "no-go" alternative in this instance is defined as the status quo; i.e. no construction of any kind on the site, and no additional hydro power generation as would be achieved with this project.

3.2.8 Summary of Alternatives

To summarise, the feasible alternatives which will be assessed in the EIR include the following:

- Location alternatives - none
    - Only the current location of the proposed hydropower station will be considered.
- Activity alternatives
    - Energy generation by means of a hydropower station; and
    - "No-go" alternative to hydropower energy production.
- Site layout alternatives
    - Two powerhouse and tailrace layout alternatives;
    - Two water conveyance and head pond alternatives;
    - Transmission line and road access alternatives.
- Technology alternatives - none
    - Only one technology alternative will be considered.

4 NEED AND DESIRABILITY

The purpose of this Chapter is to describe the need and desirability of the proposed hydropower station as it relates to the local context. To provide a comprehensive analysis, the questions posed in the DEA&DPs Need and Desirability Guidelines (2011) have been addressed. The chapter also gives a brief description on the proposed assessment of sustainability which will form part of the EIA Report.

As noted previously the need for renewable energy is well documented. Hydropower generation is desirable as it:

- Creates a more sustainable economy by promoting South Africa's energy policy towards energy diversification.
- Provides baseload[3] power, which other renewable energy technologies typically do not, as they are dependent on the vagaries of wind and sunlight. As such hydropower can for instance replace coal-fired power stations as baseload stations, which other renewable technologies cannot do without storage capacity.
- Reduces the demand on scarce resources such as water, as well as non-renewable resources such as coal by promoting energy generating facilities which are less resource intensive[4].
- Assists in meeting nationally appropriate emission targets in line with global climate change commitments, by reducing reliance on coal as an energy source.
- Reduces and where possible eliminates pollution by using cleaner energy generating mechanisms and reducing the demand on carbon based fuels.
- Assists in alleviating energy poverty by providing energy in rural areas to stimulate the local economy.
- Promotes local economic development by creating jobs and promoting skills development.
- Enhances energy security by diversifying generation to reduce reliance on coal as a primary energy source and promoting renewable energy generation.

Furthermore, the IRP (see **Annexure C**) allows for an additional 20,409MW of renewable energy in the electricity blend in South Africa by 2030. Of the aforementioned, 75MW is reserved for small hydro. While there are a number of renewable energy options (including, *inter alia*, wind and solar) being pursued in South Africa, many more renewable energy projects are required to meet the targets set by the IRP. Consequently, based on this requirement for renewable energy, Boegoeberg Hydro is pursuing a number of hydropower projects of which this project is one.

[3] Baseload is the amount of power required to meet minimum demands based on reasonable expectations of customer requirements. Baseload power stations are devoted to the production of baseload supply and produce energy at a constant rate. Examples of baseload plants using non-renewable fuels include nuclear and coal-fired plants. Among the renewable energy sources, hydroelectric, geothermal, biogas, biomass, solar thermal with storage and ocean thermal energy conversion can provide baseload power (https://en.wikipedia.org/wiki/Base_load_power_plant, accessed 26/06/2013)

[4] A hydropower station only uses water for turning the turbines that generate electricity. Water is not consumed during energy production.

The questions posed in the DEA&DP's Need and Desirability Guidelines (2011) have been used as a framework to assess the needs and desirability of the proposed project, as required in terms of the NEMA (**Table 5**).

Table 5. Discussion related to specific questions in the Needs and Desirability Guideline (DEA&DP, 2011)

Need and Desirability	
Need (Timing)	
Question	Response
1. Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed to by the relevant environmental authority i.e. is the proposed development in line with the projects and programmes identified as priorities within the Integrated Development Plan (IDP)?	There is currently no SDF available for the area (p. 14 of the Siyanda District IDP). Although no SDF exists, the IDP (2012 – 2017) identifies two primary development objectives (p.26 of the Siyanda District IDP): • Promoting the growth, diversification and transformation of the provincial economy. • Poverty reduction through social development. The IDP (2012 – 2017) then lists the following macro-level condition for growth (p.26 of the Siyanda District IDP): • Enhancing infrastructure for economic growth and social development. To give effect to the above, one of the high-level development targets set in the Northern Cape is (p.26 of the Siyanda District IDP): • To provide adequate infrastructure for economic growth and development by 2014. The proposed project, which will generate sustainable electricity, will therefore help to promote development and economic growth.
2. Should development, or if applicable, expansion of the town/ area concerned in terms of this land use (associated with the activity being applied for) occur at this point in time?	Yes. As per the response to question 1 above, the proposed project would contribute to the provision of adequate infrastructure for economic growth and social development by 2014, as per the high-level targets set in the Siyanda District IDP (p.26 of the Siyanda District IDP). Furthermore, South Africa is actively pursuing renewable energy projects.
3. Does the community/ area need the activity and the associated land use concerned (is it a societal priority)?	Yes. The stated mission of !Kheis Municipality is as follows: • 'To promote economic development to the advantage of the communities within the boundaries of the !Kheis Municipality. This will be done by the establishment and maintenance of an effective administration and a safe environment in order to attract tourists and investors to the area' • To create an environment in which to empower the Community through capacity building and skills development, as well as for economic growth in order to reduce unemployment and poverty with at least 5%, by June 2014 (!Kheis Local Municipality IDP, 2012 - 2017).

Need and Desirability	
Need (Timing)	
Question	Response
	The proposed hydropower station would not only create job opportunities for the local community as the construction of the facilities require a wide range of skill levels which the District can, to a degree, supply, but will also be a source of income to the landowners. Secondary economic impacts may include an increase in service amenities through an increase in contractors and associated demand for accommodation.
4. Are there necessary services with appropriate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	Yes. The proposed project would feed into the national Eskom grid through at the Fibre Substation. The connection to the substation would be constructed as part of the proposed project.
5. Is this development provided for in the infrastructure planning of the municipality, and if not, what will the implication be on the infrastructure planning of the municipality (priority and placements of services)?	*No.* It should be noted that once the proposed project are operational, there would be a very limited requirement for municipal services.
6. Is this project part of a national programme to address an issue of national concern or importance?	*Yes.* The establishment of the proposed facilities would strengthen the existing electricity grid for the area. Moreover, the project would contribute towards meeting the national energy target as set by the DoE, of a 30% share of all new power generation being derived from IPPs. The Industrial Policy Action Plan (IPAP2, 2010) recommends a sector focussed approach identifying key sectors with potential to be developed. The sectors identified in the IPAP2 document renewable energies**.** The proposed hydropower project, although not specifically mentioned, will further facilitate the realisation of this development objective. The Integrated Resource Plan (IRP 2010) developed by the DoE for the 2010 to 2030 period aims to achieve a "*balance between an affordable electricity price to support a globally competitive economy, a more sustainable and efficient economy, the creation of local jobs, the demand on scarce resources such as water and the need to meet nationally appropriate emission targets in line with global commitments*". The final IRP provides for an additional 20,409MW of renewable energy in the electricity mix in South Africa by 2030.
Desirability (Placing)	
Question	Response
1. Is the development the best practicable environmental option (BPEO) for this land/ site?	*Yes.* !Kheis LM is a very arid region of the Northern Cape where agricultural potential is for irrigated agriculture. Irrigation activities are mainly situated along the Orange River and include crops such as lucerne, grapes and wheat, with subsidiary crops of vegetables, deciduous fruits and maize. The

Need and Desirability	
Need (Timing)	
Question	Response
	site for the facilities does not fall within a cultivated area and has a low agricultural potential. The hydropower plant small scale is very unlikely to have any effect on the status quo farming activities.
2. Would the approval of this application compromise the integrity of the existing approved Municipal IDP and SDF as agreed to by the relevant authorities?	*No.* The project is in line with the Siyanda DM IDP (2012-2017) which stated vision is to "enhance economic development for the benefit of the community of the Siyanda District area. We do this by creating and maintaining an effective administration and a safe environment to attract tourists and investors". The Siyanda District IDP is informed by a Regional Development Strategy that puts additional emphasis on specific aspects and strategic priority areas, notably that of infrastructure maintenance and economic development. There is currently no SDF available for the Siyanda DM or !Kheis LM.
3. Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in Environmental Management Frameworks (EMFs)), and if so, can it be justified from in terms of sustainability considerations?	*No.* The Siyanda DM EMF (2008) has prioritised the protection of Alluvial Thicket along the Orange River. However the Siyanda DM EMF (2008) also states that "By adopting a policy that only rocky outcrops within the river system should be considered for development provided that they can be reached without causing significant environmental impacts and that they are not sensitive in terms of their aesthetic value." Tithe proposed construction footprint is dominated by a rocky outcrop and would be in line with this recommendation. Furthermore, the EIA process would ensure that the proposed facilities would be environmentally sustainable. Although the site falls within a CBA the site layout will respond to this through the specialist recommendations. Comment will also be sought from the relevant authorities to ensure that the application does not comprise the Siyanda EMF.
4. Do location factors favour this land use (associated with the activity applied for) at this place?	*Yes.* The site were selected based on the following criteria: • The site has an existing weir. • Hydrologically suitable characteristics such as head (drop in elevation); • Existing database to inform engineering decisions - flow rate annual measurements collected for Boegoeberg and Neus DWA stations. • Suitable topography and accessibility for construction. • Favourable land ownership. • Feasibility of project design to accommodate environmental sensitivities and various financial and technical considerations. • Relatively easy grid connectivity and proximity to grid access via Fibre Substation.
5. How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/ natural environment)?	Potential impacts associated with the proposed upgrade will be assessed and discussed during the EIA Phase. Refer to the Plan of Study for EIA in Chapter 5.

Need and Desirability	
Need (Timing)	
Question	Response
6. How will the development impact on people's health and wellbeing (e.g. in terms of noise, odours, visual character and sense of place, etc.)?	Potential impacts associated with the proposed upgrade will be discussed and assessed during the EIA Phase. Refer to the Plan of Study for EIA in Chapter 5.
7. Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs?	The socio-economic impacts will be assessed and discussed in the EIA Phase. Refer to the Plan of Study for EIA in Chapter 5.
8. Will the proposed land use result in unacceptable cumulative impacts?	Potential cumulative impacts associated with the proposed upgrade will be discussed and assessed during the EIA Phase. Refer to the Plan of Study for EIA in Chapter 5.

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5 DESCRIPTION OF THE AFFECTED ENVIRONMENT AND POTENTIAL IMPACTS

The purpose of this Chapter is to provide a brief description of the affected environment and the potential impacts that could result from the proposed project. Potential impacts on the biophysical and the socio-economic environment during the construction, operation and decommissioning phases are discussed and take consideration of the previous specialist assessments that were undertaken as part of the similar processes in the area. Where additional information is required for detailed assessment in the EIR, recommendations are made as to appointing specialists.

5.1 Introduction

The description of the affected environment provided below draws on existing knowledge from published data, previous studies, site visits to the area and discussions with various role-players. The identification of potential impacts which may occur as a result of the proposed activities described in Chapter 3 of this report is broad, to cover the lifecycle of the proposed project. Impacts of lesser importance are also screened out in this Chapter, with reasons provided, to ensure that the EIR is focused on the potentially significant impacts.

5.2 Broad Description of the Affected Biophysical and Socio-Economic Environment

5.2.1 Description of the Site

The proposed site of the hydro power plant is situated in the Kheis Local Municipality. The transmission servitude will traverse the Siyathemba and Siyancuma Local Municipalities in the Northern Cape (**Figure 21**). The nearest town of Groblershoop is located approximately 26km north west of the proposed site.

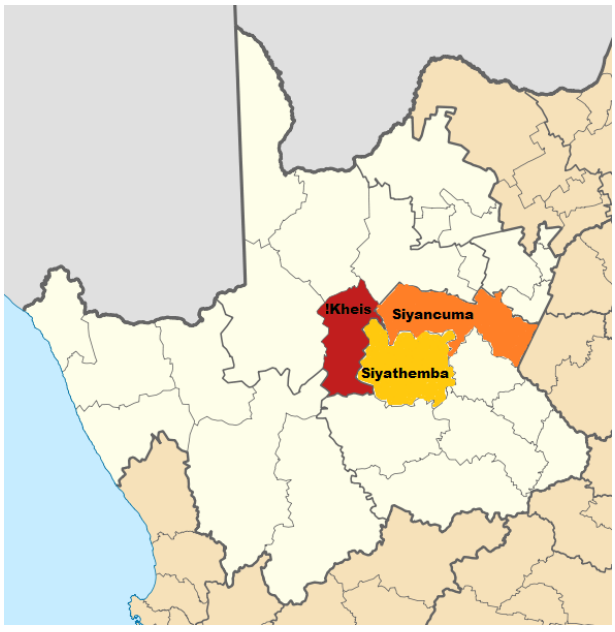

Figure 21 | Location of site within the !Kheis, Siyathemba, and Siyacuma Municipalities (Source: Wikipedia).

The site consists of the following farms (see

Figure 1 and **Table 6**)

Table 6: Farms comprising the plant site

Farms/ Erven comprising the plant infrastructure			
Farm name	**Farm/ Erven**	**Portion**	**Landowner**
Zeekoebaart	1		RSA
Zeekoebaart	306	2+3	Susara Marthina Geldenhuys
Farms/ Erven comprising the transmission line corridor/ servitude			
Farm name	**Farm/ Erven**	**Portion**	**Landowner**
Zeekoebaart	9	2+ 3	Hendrik Johannes Louis Hanekom
Zeekoebaart		0+ 5	Dirk Jacobus Francois Hanekom-Trustees
Zeekoebart		1	Dirk Jacobus Francois Greeff
Zeekoebart	10	0	Smit Jan Willem
Zeekoebart		1+12	Hendrik Johannes Louis Hanekom
Blinkfontein		19	Smit Jan Willem
Blinkfontein		16	Johnnie Smit Familie trust
Blinkfontein		4	Blaauwputs Trust
Rietfontein	11	2	Wilkot Boerdery Pty Ltd
Rietfontein		5	B J Groenewald Familietrust

The proposed off-take structure and hydro plant itself will be located on the remainder of farm 306, Zeekoebaart. The canal/pipeline would traverse farm 306/1 owned by DWA. The following photographs (**Figure 22** to **Figure 24**) are taken from Zeekoebaart and provide an overview of the proposed site and location of infrastructure.

Figure 22 | Photo from right bank of the Orange River at the Boegoeberg weir site.

Figure 23 | Photo of the proposed position of the powerhouse on the Orange River.

Figure 24 | Photo where the proposed channel/pipeline will be excavated from the rock face.

5.2.2 Climate

The Northern Cape experiences typical semi-desert and desert climatic conditions. The study area falls within the Nama Karoo Biome which is one of the most arid regions in South Africa. Groblershoop normally receives about 108mm of rain per year, with most rainfall occurring during autumn. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Groblershoop range from 19°C in June to 33°C in January (**Figure 25**). **Figure 26** shows the average rainfall values for Groblershoop per month which receives the lowest rainfall (0mm) in June and the highest (32mm) in March.

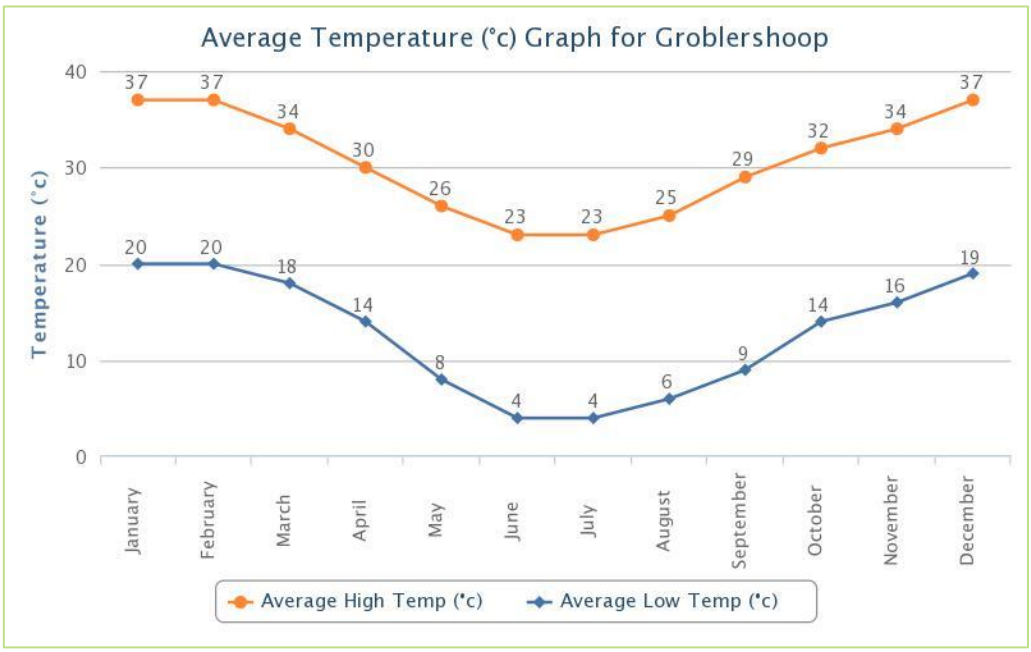

Figure 25 | Average temperatures for Groblershoop (Source: www.worldweatheronline.com).

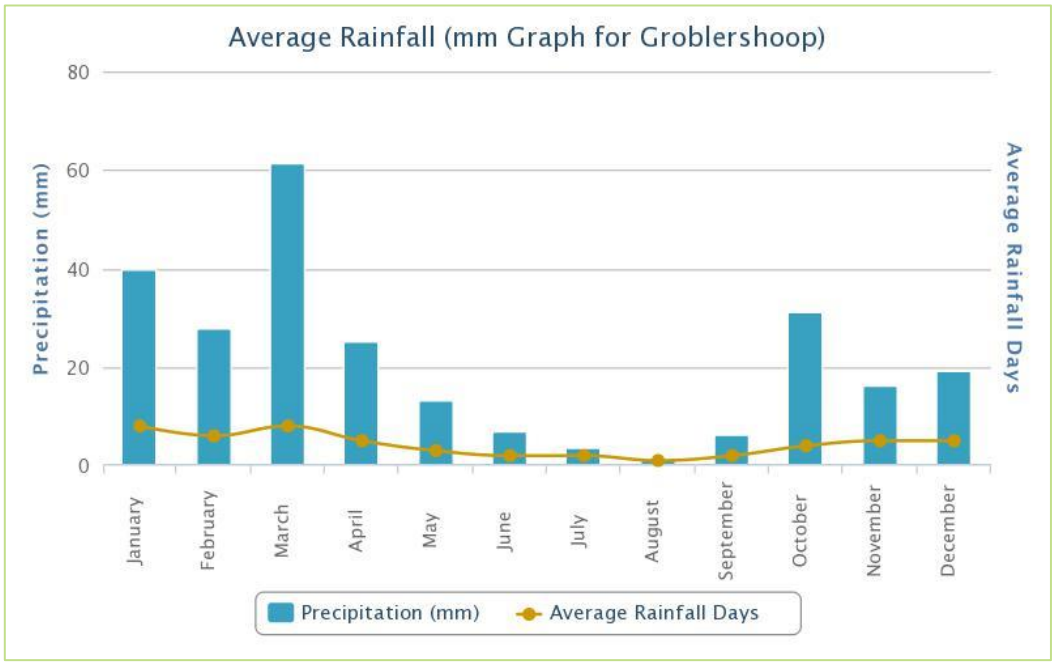

Figure 26 | Average rainfall for Groblershoop (Source www.worldweatheronline.com).

5.2.3 Topography, Geology and Soils

The Northern Cape landscape is characterised by vast arid plains with, sparse settlements and rugged terrain. The topography of the general area is relatively flat and interspersed with koppies which descend into to the Orange River basin.

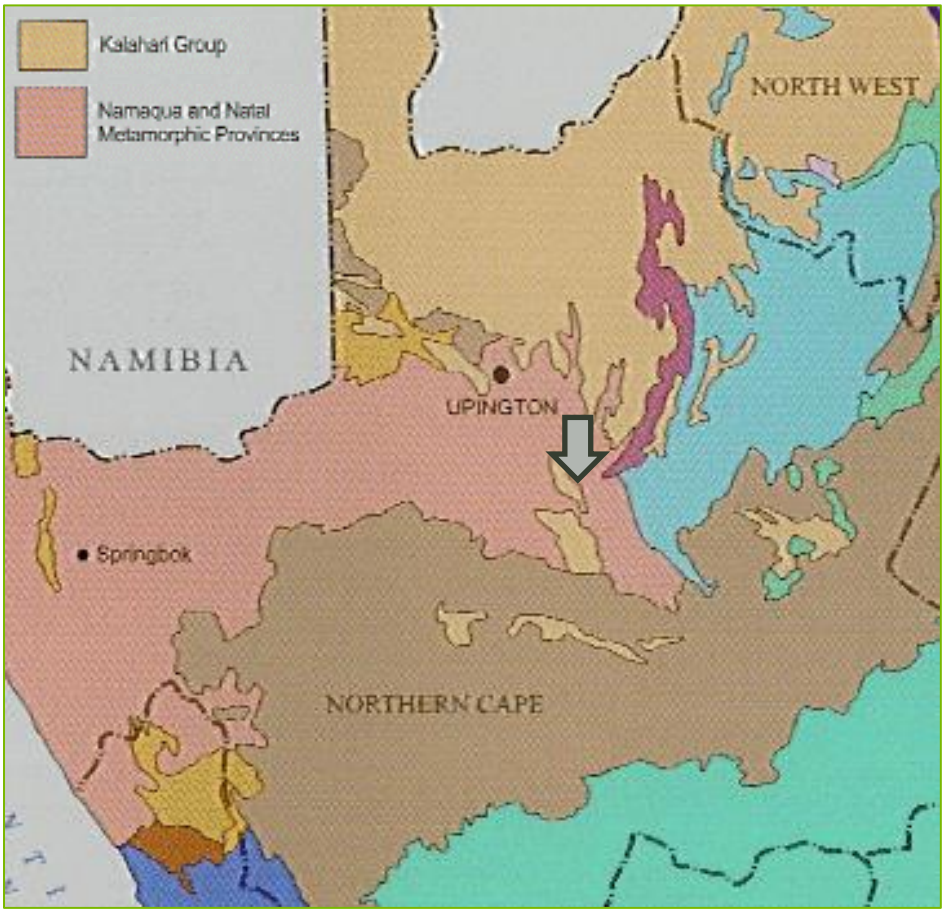

Figure 27 | Simplified Geology of the Northern Cape (source http://www.geoscience.org.za).

According to South African Geoscience Council (2013) the stratigraphic sequence represented in the Northern Cape Province incorporates the following major units:

- *The Namaqualand Metamorphic Province*[5]

  This province includes a group of schistose and gneissic metasedimentary, metavolcanic and intrusive rock types in an area along the Orange River from Prieska in the east, bordered by the Kaapvaal Craton, to the Atlantic coast in the west. To the north and to the south the province is overlain by younger sequences like the Nama Group and the Karoo Supergroup.

  Statutory mapping programmes in recent years have concentrated the attention of the Northern Cape Unit on the Namaqualand Metamorphic Complex. Due to the complex history of intense deformation and metamorphism, many aspects concerning the province are still controversial and revision of stratigraphic correlations and genetic models is an ongoing process.

[5] (Source: http://www.geoscience.org.za)

The province comprises supracrustal rocks that have been intensely deformed and metamorphosed, and a wide variety of intrusive rock types which are predominantly granitic. Metamorphism that has reached granulite facies, as well as deformation by folding and fluxion in a plastic state during metamorphism, characterise especially the western and central parts of this province.

Rocks of the Brulpan Group structurally overlie the Olifantshoek Supergroup. They comprise a succession of highly folded schists, with minor greenstone and quartzite. The western margin of the Kaapvaal Craton is marked by three volcano-sedimentary successions; the 1300 Ma old Wilgenhoutsdrif and Arachap Groups and the undeformed 1100 Ma old Koras Group.

The northern part of the eastern boundary zone is intensely deformed by east-directed folding and thrusting, and is metamorphosed to lower greenschist facies. The boundary between the Namaqualand Metamorphic Province and the Kaapvaal Craton is characterised by a number of normal, reverse and wrench faults as well as a sharp transition in the grade of metamorphism and the tectonic pattern.

- The floor to the Namaqualand Metamorphic Province has not been recognised (although some investigators in the past have claimed the recognition of such a floor). The volcanic Orange River Group in the Vioolsdrif area with its related intrusives of the Vioolsdrif batholith, are dated between 2 000 to 1 800 million years. Many rock types in the province are dated at around 1 200 million years, which most likely do not display their true age but rather the age of metamorphic resetting of the radiometric clock by extreme metamorphic conditions. The end of the Namaqua orogenesis is marked by intrusion of the mafic Koperberg Suite (1 100 Ma), as well as the formation of the pegmatite belt, which is dated at around 1 000 million years. *The Kalahari Group*[6]

The Kalahari basin is a flat, sand-covered, semi-desert region which contains some large pans north of Upington, dry river beds such as the Nossob and Molopo, and dunes striking in a north westerly direction. Outcrops are scarce in this sand-covered region.

The Kalahari Group is divided into four formations. At the base is a soft, clay gravel of fluvial origin (the Wessels Formation). Upon this follows calcareous claystone with interlayered gravel (the Budin Formation). This is in turn overlain by clay-containing, calcareous sandstone (the Eden Formation). Upon the Eden Formation follows the aeolian surface sand which is characteristic of the group (the Gordonia Formation).

5.2.4 Flora

The study area falls in the Nama Karoo Biome (**Figure 28**), Bushmanland and West Griqualand Bioregion (Rutherford & Westfall, 1994; Mucina *et al.*, 2006). These can be divided into three vegetation types **(Figure 29)**:

- Lower Gariep Alluvial Vegetation;
- Lower Gariep Broken Veld; and
- Bushmanland Arid Grasslands.

According to Mucina and Rutherford (2006), accessed through the SANBI BGIS website, neither the Lower Gariep Broken Veld nor the Bushmanland Arid Grasslands are listed in the National List of Threatened Ecosystems. However, the Lower Gariep Alluvial Vegetation is listed as **Endangered A1**[7].

[6] Source: http://www.geoscience.org.za

[7] The A1 criterion means there is irretrievable loss of natural habitat with the remaining natural habitat of this type less than its biodiversity target of greater than15%.

- ***Lower Gariep Alluvial Vegetation***

According to Mucina and Rutherford (2006) the Lower Gariep Alluvial Vegetation is found on the flat alluvial terraces and riverine islands supporting a complex of riparian thickets (dominated by *Ziziphus mucronata, Euclea pseudebenus* and *Tamarix usneoldes*), reed beds with *Phragmites australis* as well as flooded grasslands and herblands populating sand banks and terraces within and along the river.

Mucina and Rutherford (2006) also note this vegetation is considered endangered and only about 6% is statutorily conserved in the Richtersveld and Augrabies Falls National Parks. Some 50% has been transformed for agricultural purposes (vegetables and grapes) or alluvial diamond mining and a target of 31% has been set for conservation.

- ***Lower Gariep Broken Veld***

Mucina and Rutherford (2006) note that vegetation of the Lower Gariep Broken Veld is found on along the Orange River from Onseepkans in the west, including the canyon below the Augrabies Falls and parts of Riemvasmaak and adjacent areas to Keimoes resuming from the Boegoeberg to around Prieska in the east,

According to Mucina and Rutherford (2006), the landscape consists of hills and low mountains, slightly irregular plains with some rugged terrain with sparse vegetation which is dominated by shrubs and dwarf shrubs, with annuals conspicuous, especially in spring, and perennial grasses and herbs. Groups of widely scattered low trees such as *Aloe dichotomavar, dichotoma* and *Acacia mellifera* subsp. *detinens* occur on slopes of koppies and on sandy soils of foot slopes respectively. The conservation status is listed as least threatened as only a very small portion has been transformed.

- ***Bushmanland Arid Grassland***

According to Mucina and Rutherford (2006), Bushmanland Arid Grassland consists of irregular plains on a slightly sloping plateau sparsely vegetated by grass land dominated by white grasses (*Stipagrostis* species) giving this vegetation type the character of semi desert 'steppe'. In places low shrubs of *Salsola* change the vegetation structure. In years of abundant rainfall rich displays of annual herbs can be expected. The conservation status is listed as least threatened as only a very small portion has been transformed.

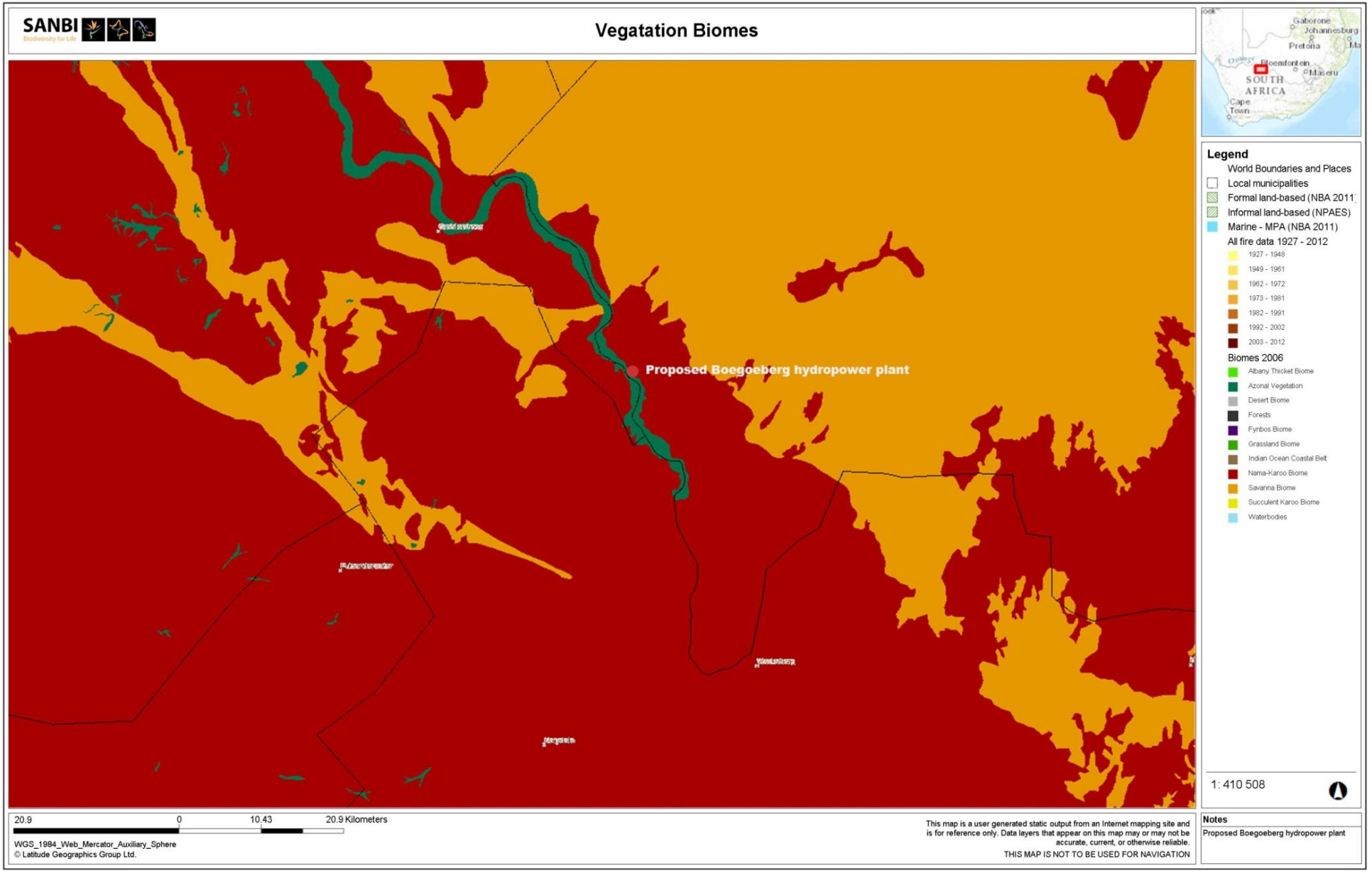

Figure 28 | Portion of the Vegetation Map of South Africa, Lesotho and Swaziland (Mucina et al., 2005); red – Nama-Karoo Biome; and Green – Azonal vegetation.

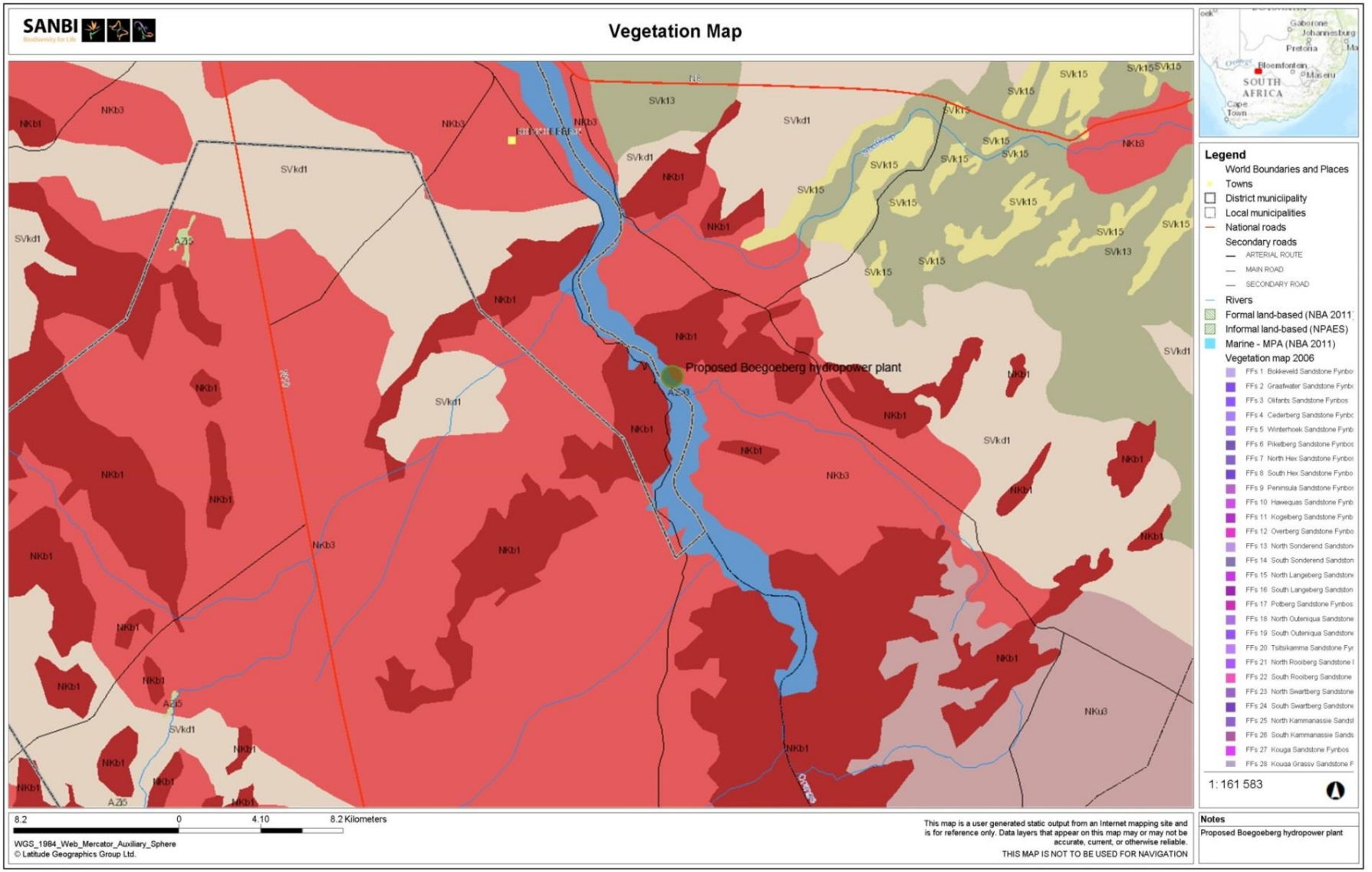

Figure 29 | Portion of the Vegetation Map of South Africa, Lesotho and Swaziland (Mucina et al., 2005); red – Lower Gariep Broken Veld. (Source: SANBI BGIS).

5.2.5 Fauna

There are likely a number of smaller mammals endemic to the Northern Cape in the study area, such as carnivores including bat-eared fox, Cape fox, slender mongoose, yellow mongoose, suricate, caracal, striped polecat and black-backed jackal and a number of smaller antelope species such as springbok, klipspringer and duiker.

5.2.6 Avifauna

The Northern Cape, especially the Kalahari, is a primary bird habitat. Raptors that occur include:

- Black Eagle (*Aquila verreauxii*),
- Tawny Eagle (*Aquila rapax*),
- Black-breasted Snake Eagle (Circaetus pectoralis),
- Jackal Buzzard (*Buteo rufofuscus*),
- Pale Chanting Goshawk (*Melierax canorus*),
- Rock Kestrel (*Falco tinnunculus*) and
- Pygmy Falcon (*Polihierax semitorquantus*), etc. (source: Northern Cape SDF)

5.2.7 Freshwater Ecology

According to the Lower Orange River Management Plan (LORMP, Draft October 2008) aquatic and riparian ecosystems of the Lower Orange River (LOR) have evolved in response to natural seasonal flow pattern, inclusive of the flood regime. The construction of large dams has however increasingly modified the regime. The LORMP (Draft October 2008) notes a number of aquatic microphytes and aquatic and semi-aquatic macrophytes in the LOR. The side streams are fairly abundant with *Filamentous Phycophyta,* a blue –green algae occurring in the lower stretches of the river. *Prosopis* (Mesquite) species have invaded large areas of the riparian forest. Reeds are the dominant semi-aquatic macrophyte (aquatic plant) along the entire river and can reach pest proportions downstream of irrigation areas. This is possibly due to increased disturbance and increased nutrients LORMP, Draft October 2008).

It is believed that invertebrate species are mostly homogenous through the entire length of the river. The river plays host to freshwater shrimp and freshwater mussels. 12 to 15 indigenous freshwater fish species are found downstream of Augrabies Falls (LORMP, Draft October 2008). These include one unique Red Data listed endemic and other unique and vulnerable indigenous species. The Orange River has a relative paucity of species diversity. A 2011 survey of 13,762 fish found only 16 species of fish present and include seven species are endemic to the Vaal-Orange River system:

- Rock-catfish (*Austroglanis sclateri*)
- Maloti minnow (*Pseudobarbus quathalambe*)
- Namaqua barb (*Barbus hospes*)
- River sardine (*Mesobola brevianalis*)
- Smallmouth yellowfish (*Labeobarbus aeneus*)
- Largemouth yellowfish (*Labeobarbus kimberlyensis*)
- Orange River Mudfish (*Labeo capensis*)

(Source: http://en.wikipedia.org/)

The present ecological state of the river is considered largely modified. This is due to upstream dams and large scale irrigation along the stretch of the river. Approximately 68.3% is transformed, 34.9% highly transformed, 19.1% moderately transformed and 9.8% totally transformed LORMP, Draft October 2008. Only 11.2% can be classified as pristine, but most of this is not formally protected and therefore under threat.

5.2.8 Heritage, Archaeology and Palaeontology

Groblershoop was founded in 1936 and named after a former Minister of Agriculture. It is considered the gateway to the Green Kalahari and is the farming and administrative centre of the Orange River Valley, east of Upington. The Groblershoop area is a major wine producing area with the Oranjerivier Wine Cellars located just outside of the town being the first on the Orange River Wine route. It is the largest co-operative cellar in Africa and the second largest in the world (source: http://www.northern-cape-info.co.za)

Situated 35km from Groblershoop on a gravel road, the Boegoeberg Dam was formed when an 11m high weir was constructed from 1926 -1933 as part of its drought alleviation scheme (**Figure 30**). The construction formed part of an extensive economic development plan to uplift the poor white Afrikaners at the time and is the third largest dam on the Orange River. The name of the dam derives from the Boegoe plant that grows wild in the surrounding hills which is widely used in traditional medicine. (http://www.greenkalahari.com).

Figure 30. Boegoeberg dam under construction (Source: http://www.boegoebergecoroute.co.za/)

In the Esel Mountains, about 30km south west of Groblershoop, mysterious footprint in the rock below the water hole is thought to be from some kind of primitive donkey which left its footprints in the mud (Figure). The mud then became fossilized which rendered the donkey's slippery path visible until today.

Figure 31. Mysterious footprint in Esel Mountains (Source: http://www.boegoebergecoroute.co.za/)

Other places of interest include the first water turbine on this section of the Orange River and the Commonwealth War Graves dating back to the Anglo Boer War as well as caves with San Paintings (source: http://www.boegoebergecoroute.co.za)

- **Stone Age**

South Africa has a long and complex Stone Age sequence of more than 2 million years and consists broadly of the Later Stone Age, the Middle Stone Age and the Earlier Stone Age. There is much regional variation regarding particular characteristics and time ranges.

Archaeological surveys have shown rocky outcrops and hills, drainage lines, riverbanks and confluences to be prime localities for archaeological finds and specifically Stone Age sites, as these areas where utilised for settlement of base camps close to water and hunting ranges (Lombard et al 2011). If any of these features occur in the study area Stone Age manifestations can be expected within the development area. This will be assessed further in the EIR phase.

- **Palaeontology**

Almond and Pether (2008) note the Namaqua-Natal Metamorphic rocks to have no paleontological significance, since no fossils have yet been recorded in them. However, it is possible that isolated fossils might be present trapped within the silt deposits on the Orange River floodplains. These would most likely comprise of tiny plant and animal remains.

5.2.9 Socio-Economic Aspects

A comparison is drawn between the general socio-economic aspects of the proposed area and the wider South African statistics (**Table 7**). The total population of the Northern Cape is estimated at approximately 1.1 million people with !Kheis Local Municipality having approximately 16 637 people with an average population growth rate of approximately 2.1%. Currently 26.07% of the population in !Kheis is unemployed.

Table 7. Population & Households

Population & Household Totals				
2011	**SA**	**NC**	**Siyanda DM**	**!Kheis LM**
Population Total	51,769,798	1,145,710	236,754	16,637
Average Population	1.4%	2.1%	2.1%	2.1%

Population & Household Totals				
2011	**SA**	**NC**	**Siyanda DM**	**!Kheis LM**
Growth Rate				
Household Total	14,449,831	301,367	61,086	4,146

(Source: **http://www.statssa.gov.za/** accessed July 2013)

More than 67% of the residents within the! Kheis Local Municipality are employed in the agricultural sector. This is due to the presence of the Orange River which provides a good source of water for irrigation purposes, as well as the climate which is favourable for the production of table grapes.

5.2.10 Surrounding Land Uses

As noted above, and according to the !Kheis IDP 2012-2017, the agricultural sector is the main economic sector. According to DWAF the Boegoberg Weir diverts water into an irrigation scheme for some approximately 7,500 ha of agricultural land.

The Orange River area delivers a major part of South Africa's table grape production. The Orange River Producers Alliance is a table grape industry that is renowned as a supplier of fresh table grapes to Europe, with an output of more than 20 million cartons. (OABS, 2012)

More than 90% of Africa's total dried vine fruit arm production is produced through 1250 sultana grape growers in the Northern Cape who produced more than 50,000 tons in 2010. The sultanas produced here comprise more than 80% of that which is exported primarily to Europe and other eastern countries. (OABS, 2012)

SAD Vine Fruit Pty (Ltd) is located in Upington and owns the largest dried vine fruit processing and packaging plant in South Africa, employing more than 350 persons. It has intakes at Groblershoop, Mylpaal, Louisvaleweg, Keimoes, Kakamas and Vredendal. (OABS, 2012)

The Orange River Wine Cellars Co-op, also based in Upington, is the second largest wine-making cooperative in the world and has wine cellars at Groblershoop, Grootdrink, Upington, Keimoes and Kakamas. This co-op has more than 740 members who produce wine grapes and 445 farmers who produce grape juice. (OABS, 2012)

In addition to cultivated crops, livestock from the area is marketed at Groblershoop, Upington, Johannesburg and Cape Town. There is an abattoir at Groblershoop, where all livestock from the area, as well as surrounding areas, are slaughtered. The abattoir provides approximately 180 permanent jobs. Cotton, corn, wheat, tomatoes, peanuts, musk melons and pumpkins are cultivated under irrigation from the Orange River (!Kheis IDP 2012-2017).

It is also noted that tourism is one of the most important economic sectors in the Northern Cape as well as within the !Kheis Local Municipality.

Boegoeberg Dam is an important tourism attraction and was managed by the Bo-Karoo District Council, but is now under the jurisdiction of !Kheis Municipality. The facility is especially popular for fishing, camping and water sport enthusiasts.

5.2.11 Visual Landscape

Boegoeberg Dam is a highly scenic area on the Orange River which is largely undisturbed visually. The predominant landuse in the area is agricultural and recreational, although the equipment associated with the dam wall provides some form of industrial type activity (cranes). A canal for irrigation water runs along the southern bank from the dam.

Figure 32. Boegoeberg Dam from the south bank

5.3 Construction Phase Impacts on the Biophysical and Socio-Economic Environment

The construction phase is likely to result in a number of potential impacts on the biophysical and the socio-economic environment. These could potentially include:

- Disturbance of flora and fauna (including avifauna);
- Impact on heritage resources;
- Sedimentation and erosion of water ways;
- Impact on local economy (employment) and social conditions;
- Visual impact;
- Traffic Impact ;
- Impact on agricultural land
- Impact of storage of hazardous substances on site;
- Noise impacts (including blasting);
- Impacts related to spoil; and
- Dust impact.

The significance of construction phase impacts is likely to be limited by its relatively short duration, since the construction phase for the proposed hydropower station .would last approximately 24

months. Many of the construction phase impacts could be mitigated through the implementation of an appropriate EMP. During the EIA Phase, the construction phase impacts on the biophysical and socio-economic environment will be assessed in terms of the methodology outlined in the Plan of Study for EIA (refer to Chapter 6). Furthermore, an EMP will be compiled as part of the EIA process and submitted as part of the EIR, to recommend measures to manage residual impacts and ascribe responsibilities for many of the construction phase impacts.

The potential construction phase impacts are described in more detail below.

5.3.1 Disturbance of Flora and Fauna

This considers impacts beyond just the permanent footprint impacts of the proposed hydropower station. Alien plant seeds could be introduced with construction material such as sand or other materials, with any disturbed areas being particularly vulnerable.

During the construction phase the vegetation within the footprint of the activity would be cleared. This might result in a loss of habitat and / or habitat fragmentation. Any affected fauna or avifauna would generally be mobile and would relocate during the construction phase but are likely to re-colonise the area, once the construction phase has been completed and the disturbed areas rehabilitated.

Vegetation clearance and topsoil preservation will be addressed in the EMP, in accordance with the specialist botanical recommendations (to be included in the EIA phase).

5.3.2 Impact on Heritage Resources

Heritage resources include archaeological material (e.g. rock paintings, stone tools), paleontological material (e.g. fossilised materials) and cultural heritage material (e.g. old graveyards, fences or ruins of buildings). Since some potential heritage material is buried, it is often only found during the construction phase of a project.

A large scale development such as the proposed project could have a negative impact on the archaeology, cultural heritage resources and paleontological resources (by damaging or destroying such material or by requiring the material to be removed and stored off-site. It is therefore necessary to assess the potential impacts of the proposed project at an early stage in order to best determine the course of action for the resources on site.

5.3.3 Sedimentation and Erosion

The proposed project will entail construction activities in and adjacent to the Orange River. This could therefore result in the increase of sediment loads in the Orange River. This would be exacerbated during the wet season and during any intense rainfall events. This will be addressed in the EMP and in the updated aquatic ecology study.

5.3.4 Impact on Local Economy (employment) and Social Conditions

The proposed project will create temporary jobs, mostly during the construction phase which will last approximately 24 months. If local suppliers will be used, a number of indirect jobs will also be created.
Visual Impact

The location of the proposed activity in on the banks of the Boegoeberg Dam, and the existing caravan park requires special attention in terms of visual impacts as it is a tourism destination. During the construction phase a number of construction vehicles would be required onsite. These include bakkies, excavators, trucks and other earth moving equipment. If not managed this could result in dust

impacts and an overall visual impact. The construction phase is however of limited extend (i.e. 24 months). The visual impact for the construction phase assessed further in the EIR.

5.3.5 Traffic Impact

A number of construction vehicles would be required on-site, including bakkies, excavators, trucks and other earth moving equipment. Construction vehicles are likely to make use of the existing roads, to transport equipment, people and material to and from the construction site. The necessary clearances from the respective Roads Authorities (specifically Department of Roads and Public Works, Northern Cape) would need to be in place if any "abnormal loads" are to be transported, prior to the transporting of these loads. The management of traffic would be achieved through the implementation of an EMP, which would specify measures to avoid accidents and hazards.

A further impact could be the possible impact of construction traffic on the collection and delivery of agricultural produce in the area. This will however only be for a short period of time and will be addressed by the EMP.

5.3.6 Storage of Hazardous Substances on Site

It is common practice at construction sites to use and temporarily store various hazardous substances on site. These substances may include, amongst other things, diesel, curing compounds, shutter oil and cement.

Use of hazardous substances at a construction site is controlled by various pieces of legislation. The management and protection of the environment would however be achieved through the implementation of an EMP, which would inter alia specify the storage details of hazardous compounds and the emergency procedures to follow in the event of a spillage.

5.3.7 Noise Pollution

An increase in noise pollution would be expected from the operation of heavy machinery during the construction period, as well as due to the increased traffic. There may also be blasting for limited periods during the construction of the canal. The proposed activity is however a good distance away from noise sensitive receptors. Noise impacts during the construction phase will be managed through the implementation of the EMP.

5.3.8 Generation of spoil

A large amount of spoil (approximately 170,000 m^3) would be excavated from the rocky outcrop and immediate surrounds for the conduit, powerhouse, and tailrace. The largest amount of spoil would be generated by the construction of the conduit/pipeline. However a number of options are available for the disposal of the spoil, such as use for upgrading access roads and farm revetments, which will be addressed in the EIR.

5.3.9 Dust Impacts

As mentioned earlier, construction vehicles will use existing access roads (i.e. dirt roads) to transport equipment and material to the construction site. Earthworks would also be undertaken. These activities would exacerbate dust, especially in the dry winter months. The dust impact would be managed through the EMP, which would include procedures for dealing with dust pollution events including watering of roads.

5.4 Operational Phase Impacts on the Biophysical and Socio-Economic Environment

This section of the report considers the operational phase impacts on the biophysical and socio-economic environment that may be associated with the proposed activities, including the following:

- Botanical impact;
- Impact on aquatic resources
- Visual impact;
- Impact of noise;
- Impact on local economy (employment), tourism and social aspects;
- Impact on agricultural land; and
- Impact on fauna (including avifauna).

5.4.1 Botanical Impact

As noted in Section 5.2.4 there are three main vegetation types applicable to the study area. One of these, the Lower Gariep Alluvial Vegetation is listed as **Endangered A1.** The vegetation is still of very good quality and mostly undisturbed.

The site is located within a CBA, an environmental support area/migration corridor; canyons and Lower Gariep Alluvial Vegetation.

Most of the impacts on botanical resources will occur during the construction phase of the proposed project when clearing of vegetation will occur. The operational phase will mostly relate to the rehabilitation of disturbed areas and management of these areas.

The Botanical Impact Assessment will be undertaken based on the project description, to determine the significance of impacts on botany during the operational and construction phase of the proposed project as well as to look at cumulative impacts and to propose mitigation measures that can be included in the EMP. The Terms of Reference (ToR) for this study are included in Table 13.

5.4.2 Impact on Aquatic Resources

The ecological importance and sensitivity of the site will be assessed during the aquatic study as part of the EIA process. The finding of the aquatic study will be used to provide impact and remediation on aquatic resources for the EIA phase. The ToR for this study are included in Table 13 .

5.4.3 Visual Impact

The location of the proposed project is at the site of the existing Boegoeberg weir of which already has quiet a formidable landscape context along with a number of other significant transformations and would not detract from the current view shed. This aspect will be discussed further in the EIR.

5.4.4 Impact of Noise on Sensitive Receptors

The turbines would generate machinery noise levels at approximately 95 decibels (dBA) at a distance of 3m from the turbine. The proposed hydropower station's machinery would be situated inside the power house and noise impacts are not predicted to be significant during the operational phase. Furthermore the potential for significance is further reduced during the operational phase due to the large distance between receptors and the project site. As such noise impacts will be managed through the EMP.

5.4.5 Impact on the Socio-Economic Environment

The Boegoeberg site falls within the Siyanda District Municipality. Limited job opportunities have resulted in a large portion of the young, economically active population immigrating to cities outside the Northern Cape and other centres of activity. The closing of mines in the municipality has also contributed to the high unemployment rate (Siyanda District Municipality IDP, 2012 - 2017). The proposed power station will not offer jobs during the operational phase.

There is a caravan site on the opposite banks of the river, but it is not anticipated that there will be any recreational and visual impacts related to the power station once it is constructed.

5.4.6 Impact on the Energy Production

The draft IRP was published on 8 October 2010 by the National Energy Regulator of South Africa, Department of Energy and the System Operator within Eskom. The IRP sets out a 20 Year Electricity Plan for South Africa and allows for an additional 123, 000MW of renewable energy in the electricity mix in South Africa by 2030. It also notes that there will be a shortfall of supply in the immediate future (2011 – 2017).

As discussed previously, there are a number of renewable energy options (including, inter alia, wind, solar and hydropower) which are being pursued in South Africa. However many more renewable energy projects are required to meet the targets set by the draft IRP. The benefits of renewable energy, such as is proposed, are the carbon savings of a decreased requirement for energy from non-renewable sources such as coal-fired power stations. Furthermore, the proposed project would contribute towards South Africa's energy requirements. The potential impact on energy production will be assessed in the EIR.

5.4.7 Impact on Agriculture

Though agriculture is the main economic contributor in the local area, no impact to the sector as a result of the proposed project is expected. This is because the site area proposed is not agriculturally productive and the small scale of the infrastructure would not impede or limit current or future agricultural production. Water will only be diverted and later released into the Orange River again. Therefore no water will be lost and it will not impact irrigation farmers downstream.

5.4.8 Impact on Fauna (including Avifauna)

There is not expected to be significant impact on fauna from the power station components after the construction phase. The transmission line may however impact on birds during the operational phase.

The impact on avifauna will be assessed in an Avifaunal Study during the EIA phase. The ToR for this study are included in Table 14.

5.5 Decommissioning Phase Impacts on the Biophysical and Socio-Economic Environments

This section of the report considers the decommissioning phase impacts on the biophysical and socio-economic environment that may be associated with the proposed activities, including the following:

- Sedimentation and erosion of water ways;
- Hazardous substances on site;
- Dust impact.
- Impact on flora;
- Impact on fauna;

- Impact on heritage resources;
- Impact on visual aesthetics;
- Impact on local economy (employment) and social conditions; and
- Impact of noise.

Depending on the economic feasibility Boegoeberg Hydropower plant may consider replacing only certain components of the project and extending the life of the facility. In order to assess the possible impacts of decommissioning the proposed hydropower station it is assumed that the facility will be completely decommissioned at the end of the official agreement, unless a new PPA (Power Purchaser's Agreement) is signed (expected lifespan 30 years from the date of commissioning). The decommissioning is expected to take between 12 to 18 months. Impacts associated with the decommissioning phase are expected to be in close correlation with impacts identified in for construction phase.

After disconnecting the hydropower station infrastructure from the electricity network, all above ground components will have to be disassembled, removed and recycled as far as possible.

Rehabilitation of the disturbed areas would form part of the decommissioning phase. The aim would be to restore the land to its original substratum characteristics (or as near as possible). A number of jobs during the decommissioning phase of the proposed project would be created. The necessary activities will be assessed by Aurecon in the EIR and measures to manage impacts included in the EMP.

6 PLAN OF STUDY FOR THE EIA

The purpose of this Chapter is to detail the Plan of Study for the EIA Phase to ensure that the impacts are adequately addressed in the EIA Phase. This section furthermore describes the assessment methodology that will be utilised in determining the significance of the impacts associated with the proposed project on the socio-economic and biophysical environment. Where additional information is required for detailed assessment in the EIR, the ToR for specialist studies are given.

6.1 Purpose of the Plan of Study for the EIA

The scoping process has been documented in this Scoping Report, which has identified various potential environmental impacts and project alternatives that require detailed investigation. This Plan of Study is the culmination of the Scoping Phase and its purpose is to ensure that the EIA Phase of this EIA process satisfies the requirements of the NEMA. Accordingly, this Plan of Study for EIA outlines the anticipated process and products for the EIA Phase.

This Plan of Study for EIA has been compiled in terms of GN No. R.33306 of 18 June 2010 of the NEMA and will be submitted to DEA for their consideration.

6.2 Description of tasks to be performed

6.2.1 Potential Environmental Impacts identified during Scoping

Chapter 5 has identified the range of potential environmental impacts associated with the proposed project. During this scoping exercise a shortlist of potentially significant environmental impacts was identified for further, more detailed investigation during the EIA Phase. Specifically the following potential environmental impacts have been identified:

- Construction phase impacts on the biophysical and socio-economic environments:
    - Disturbance of flora and fauna;
    - Impact on heritage resources
    - Sedimentation and erosion of water ways;
    - Impact on local economy (jobs) and social conditions;
    - Visual impact
    - Traffic impacts;
    - Impacts of storage of hazardous substances on site;
    - Impact on agricultural land;
    - Noise impacts (including blasting); and
    - Dust impacts.
- Operational phase impacts on the biophysical environment and socio-economic environments:
    - Impact on flora;
    - Impact on aquatic resources;
    - Visual impacts;
    - Impact on energy production;
    - Impact on local economy and social conditions; and
    - Impact on fauna (including Avifauna).
- Decommissioning phase impacts on the biophysical and socio-economic environments
    - Sedimentation and erosion of water ways;

- Impacts of storage of hazardous substances on site;
- Dust impacts;
- Impact on flora and fauna;
- Impact on heritage resources;
- Impact on visual aesthetics;
- Impact on local economy (employment) and social conditions; and
- Impact of noise.

6.2.2 Method of Assessing the Significance of Potential Environmental Impacts

This section outlines the proposed method for assessing the significance of the potential environmental impacts outlined above. As indicated, these include construction, operational and decommissioning phase impacts.

For each impact, the EXTENT (spatial scale), MAGNITUDE and DURATION (time scale) would be described. These criteria would be used to ascertain the SIGNIFICANCE of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The mitigation described in the EIR would represent the full range of plausible and pragmatic measures but does not necessarily imply that they would be implemented. A letter will be obtained from Boegoeberg Hydro indicating which measures will be implemented and this letter will be included in the Final EIR.

The tables (**Table 8** to **Table 12)** on the following pages show the scale used to assess these variables, and defines each of the rating categories.

Table 8. Assessment criteria for the evaluation of impacts.

Assessment criteria		
Criteria	**Category**	**Description**
Extent or spatial influence of impact	**Regional**	Beyond a 10 km radius of the candidate site.
	Local	Within a 10 km radius of the candidate site.
	Site specific	On site or within 100 m of the candidate site.
Magnitude of impact (at the indicated spatial scale)	**High**	Natural and/ or social functions and/ or processes are *severely* altered
	Medium	Natural and/ or social functions and/ or processes are *notably* altered
	Low	Natural and/ or social functions and/ or processes are *slightly* altered
	Very Low	Natural and/ or social functions and/ or processes are *negligibly* altered
	Zero	Natural and/ or social functions and/ or processes remain *unaltered*
Duration of impact	**Construction period**	Up to 2 years
	Short Term	Up to 5 years after construction
	Medium Term	5-15 years after construction
	Long Term	More than 15 years after construction

The SIGNIFICANCE of an impact is derived by taking into account the temporal and spatial scales and magnitude. The means of arriving at the different significance ratings is explained in **Table 9**.

Table 9. Definition of significance ratings.

Significance ratings	
Significance ratings	**Level of criteria required**
High	• High magnitude with a regional extent and long term duration • High magnitude with either a regional extent and medium term duration or a local extent and long term duration • Medium magnitude with a regional extent and long term duration
Medium	• High magnitude with a local extent and medium term duration • High magnitude with a regional extent and construction period or a site specific extent and long term duration • High magnitude with either a local extent and construction period duration or a site specific extent and medium term duration • Medium magnitude with any combination of extent and duration except site specific and construction period or regional and long term • Low magnitude with a regional extent and long term duration
Low	• High magnitude with a site specific extent and construction period duration • Medium magnitude with a site specific extent and construction period duration • Low magnitude with any combination of extent and duration except site specific and construction period or regional and long term • Very low magnitude with a regional extent and long term duration
Very low	• Low magnitude with a site specific extent and construction period duration • Very low magnitude with any combination of extent and duration except regional and long term
Neutral	• Zero magnitude with any combination of extent and duration

Once the significance of an impact has been determined, the PROBABILITY of this impact occurring as well as the CONFIDENCE in the assessment of the impact would be determined using the rating systems outlined in **Table 10** and **Table 11**. It is important to note that the significance of an impact should always be considered in concert with the probability of that impact occurring. Lastly, the REVERSIBILITY of the impact is estimated using the rating system outlined in **Table 10**.

Table 10. Definition of probability ratings.

Probability ratings	
Probability ratings	**Criteria**
Definite	Estimated greater than 95 % chance of the impact occurring.
Probable	Estimated 5 to 95 % chance of the impact occurring.
Unlikely	Estimated less than 5 % chance of the impact occurring.

Table 11. Definition of confidence ratings.

Confidence Ratings	
Confidence ratings	**Criteria**
Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.
Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact.

Table 12. Definition of reversibility ratings.

Reversibility Ratings	
Probability ratings	**Criteria**
Irreversible	The activity will lead to an impact that is in all practical terms permanent.
Reversible	The impact is reversible within 10 years after the cause or stress is removed.

6.3 Need for Additional Information: Specialist Studies

In reviewing the potential environmental impacts, a number of specialist studies were identified to provide input into the EIR so that the potential impacts can be adequately assessed. Accordingly, Aurecon propose to appoint appropriately qualified and experienced specialists to undertake the specialist studies listed in **Table 15,** in order to address a suite of potential environmental impacts.

The ToR for investigations as well as the identified specialists are outlined in **Table 13**. A short summary of the various specialist consultants is given (CVs are available upon request).

Table 13: ToR for specialist studies

Proposed Specialist Investigations			
Study	**Consultant**	**Specialist Summary**	**The proposed ToR for this specialist study are as follows**
Botanical Impact Assessment	**Dr Dave McDonald**	Dr Dave MacDonald of Bergwind Botanical Surveys' and Tours cc will undertake the requisite assessment. Dr MacDonald is a botanical ecologist with 20 years of experience in the field of vegetation science. Dr MacDonald is registered as a Professional Natural Scientist with the SACNASP.	• Provide a broad description of the botanical characteristics of the site and surrounds; • Identify and describe biodiversity patterns at community and ecosystem level (main vegetation type, plant communities in the vicinity and threatened/ vulnerable ecosystems species), at species level (Red Data Book species, presence of alien species) and in terms of significant landscape features; • Assess the potential direct and indirect and cumulative impacts resulting from the proposed development (including the canal / pipelines, power-house , transmission lines and associated infrastructure e.g. access roads), both on the footprint and the immediate surrounding area, during construction, operation and decommissioning; • Comment on whether or not biodiversity processes would be

			affected by the proposed project, and if so, how these would be affected; • Provide a detailed description of appropriate mitigation measures that can be adopted to reduce negative impacts and improve positive impacts for each phase of the project; • Include a detailed vegetation rehabilitation plan to show how impacts will be mitigated; • Consider any relevant guidelines and take cognisance of the Department of Environmental Affairs and Development Planning guideline: "Guideline for involving biodiversity specialists in EIA processes" (Brownlie, 2005) as well as the requirements of the Botanical Society of South Africa (BotSoc) and CapeNature in developing an approach to the botanical investigation; and • Assist in the assessment of the sustainability of the project, based on criteria contained in the DSR.
Aquatic Impact Assessment	**James MacKenzie**	Mr James MacKenzie from MacKenzie Ecological & Development Services CC will be undertaking the Aquatic Study for the proposed project. Mr MacKenzie has done work in the Orange River for other hydropower projects upstream of the proposed scheme.	• Undertake an initial desktop study of reputable sources to provide background information for the aquatic ecological assessment; • Collect primary data from the Orange River and side channels on site to provide information regarding riparian and in-stream sensitivity and importance; • Undertake the requisite field work and compile a report that considers the following aspects: o Broad description of the aquatic ecology of the candidate sites and surrounding wetlands/riparian zones and streams including aquatic assessment and habitat classification; o Delineation of riparian zones or wetlands; o Assessment of the consequences of the various release options on the ecological state of the river; o Assessment of the ecological state, importance and sensitivity of aquatic ecosystems on the site, together with an assessment of the ecological services provided by these ecosystems, using standard methods (such as the EcoClassification method); o General comment on whether ecosystem processes would be affected (including comment on how these would be affected); o Identification of potential impacts, including cumulative impacts, and recommendations to prevent or mitigate these; o Take cognisance of any guidelines which may be relevant including the Department of Environmental Affairs and Development Planning guideline: "Guideline for involving biodiversity specialists in EIA processes" (Brownlie, 2005). • Assist in the assessment of the sustainability of the project, based on criteria contained in the DSR.
Heritage Impact Assessment	**Dr Jayson Orton**	Dr Jayson Orton from ACO Associates has been appointed to undertake the requisite Heritage Impact Assessment for the proposed project. Dr Orton has extensive experience in conducting heritage assessments for various projects all over South Africa.	• Conduct a detailed desktop level investigation to identify known archaeological, cultural and historic sites in the proposed development area; • Undertake field work to verify the results of the desktop investigation; o Document (GPS coordinates and map) all sites, objects and structures identified; o Compile a report which would include: o Identify archaeological, cultural and historic sites within the proposed development area; o Assess the sensitivity and significance of all heritage remains on the site; o Evaluate the potential impacts, including cumulative impacts, of construction, operation and maintenance of the proposed

			development on heritage resources, in terms of the scale of impact (local, regional, national), magnitude of impact (low, medium or high) and the duration of the impact (construction, up to 10 years after construction (medium term), more than 10 years after construction (long term)); ○ Recommend mitigation measures to ameliorate any negative impacts on areas of heritage importance; ○ Consider any relevant guidelines and take cognisance must be taken of the Department of Environmental Affairs and Development Planning guideline: "Guideline for involving heritage specialists in EIA processes" (Winter & Baumann 2005). • Assist in the assessment of the sustainability of the project, based on criteria contained in the DSR.
Avifaunal Impact Assessment	**Andrew Jenkins**	Dr Andrew Jenkins has been involved in bird impact assessment work in South Africa and Lesotho since the early 1990s. After a brief sojourn as the research coordinator of the Wildlife and Energy Interaction Group of the Endangered Wildlife Trust in 2007-2009, he went solo and full-time as an ornithological consultant, and founded AVISENSE Consulting cc in mid-2009.	• Undertake a desktop review of relevant avifaunal literature and undertake a site visit. • Undertake the requisite field work to directly assess the habitats present within the inclusive impact zone, and to determine the in situ avifauna and identify any significant bird flight corridors present in the area • Compile a report including: ○ Integration of the route information with bird atlas (SABAP 1 & 2) and any other relevant bird data available for the general area to develop an inclusive, annotated list of the avifauna expected to occur along the routes; ○ Highlight Red Data species, endemic, restricted-range or other species of particular concern which may be present in the study area; ○ Identify, describe and assess potential direct and indirect and cumulative impacts resulting from the proposed development both on the footprint and the immediate surrounding area during construction and operation; and ○ Recommend mitigation measures to reduce or eliminate potential negative impacts on avifauna and improve positive impacts; and ○ Consider any relevant guidelines and take cognisance of the Department of Environmental Affairs and Development Planning guideline: "Guideline for involving biodiversity specialists in EIA processes" (Brownlie, 2005. • Assist in the assessment of the sustainability of the project, based on criteria contained in the DSR.

6.4 Reasonable Project Alternatives Identified during Scoping

Chapter 3 reviewed a range of project alternatives associated with the proposed activities. Pursuant to this Scoping exercise, a shortlist of reasonable project alternatives has been identified for further, more detail investigation during the EIA Phase, namely:

- Activity alternatives
  - Energy generation by means of a hydropower station.
- Site layout alternatives
  - Two powerhouse and tailrace layout alternatives;
  - Two conduit and head pond alternatives;
  - Transmission line and road access alternatives.
- .The "no-go" alternative

6.5 The Environmental Impact Assessment Report

The purpose of the EIR would be to undertake a comparative assessment of the relative significance of the potential environmental impacts for the proposed hydropower station and its alternatives. The EIR would thus include the following:

- A brief overview of the potential environmental impacts and reasonable alternatives identified during the Scoping investigation.
- A summary of the key findings of the various specialist studies as they pertain to the affected environment.
- An overview of the public participation process conducted during the compilation of the EIR.
- A detailed assessment of the significance of the potential environmental impacts for the various project alternatives. This assessment, which would use the methodology outlined in Section 6.2.2, would be informed by the findings of the specialist studies, and professional judgement.
- An overview of the full range of mitigation measures including an indication of how these would influence the significance of any potential environmental impacts, together with a lifecycle EMP. The mitigation measures would be informed by the specialist studies, professional experience and comment received from I&APs.
- A set of recommendations regarding the way forward would be provided, should any of the proposed alternatives be authorised in terms of NEMA.

6.6 Public Participation Process

The purpose of the public participation process would be to provide I&APs with adequate opportunity to have input into the environmental process. The public participation process would include the following:

6.6.1 Public Comment on the Draft EIR

Following the completion of the Draft EIR (refer to Section 6.5 above), it will be lodged at the Groblershoop Public Library, Khies Municipality offices in Groblershoop and on Aurecon's website (www.aurecongroup.com). I&APs will be notified of the lodging of the reports by means of letters, email or sms depending on what contact details are available.

The letters will include a non-technical Executive Summary, in English and / or Afrikaans. I&APs will be provided with 40 days in which to comment on the report. During the comment period a public meeting will be held with I&APs. Where the need arises, Focus Group meetings will be arranged with representatives from the relevant national and provincial departments and local authorities.

The public comments would be consolidated into CRR2, which would summarise the issues raised and provide the project team's responses thereto. The comments and CRR2 would form an annexure of the EIR. The draft report would also be revised in light of feedback from the public, where necessary.

6.6.2 Public Comment on the Final EIR

Once the EIR has been finalised and submitted to DEA for decision-making, it will be made available to the public for a 21 day comment period. The report will be made available in the same locations in which the Draft EIR was made available, and I&APs will be notified of the availability of the Final EIR in writing. Any comments received will not be included in a CRR but will instead be collated and forwarded directly to DEA.

6.6.3 Opportunity for Appeal

All registered I&APs would be notified in writing of the release of the Environmental Authorisation. They would be reminded of their right to appeal against DEA's decision to the Minister of Environmental Affairs in terms of the NEMA.

6.7 Proposed Programme

A summary of the proposed programme is given in **Table 14** below. The Project Schedule is included in **Annexure B4**.

Table 14. Proposed EIA Programme.

Proposed EIA Programme		
Task	**Date**	**Deliverable**
2nd round of public engagement:		
• Letter to I&APs • Lodge draft SR in public venues and with Authorities • Public comment period ends	July 2013 July 2013 July 2013	Informed I&APs DSR in libraries, websites etc. Updated CRR
Submit final SR (incl. Plan of Study for EIA) to environmental authority • Letter to I&APs • Lodge draft SR in public venues and with Authorities • Public comment period ends	 Aug 2013 Aug 2013 Aug 2013 Aug 2013	 Approved SR & Plan of Study EIA Informed I&APs DSR in libraries, websites etc. Updated CRR
Specialist studies	August – Sept 2013	Specialist reports
3rd round of public engagement:		
• Letter to I&APs • Lodge draft EIAR in public venues • Focus group meeting, if necessary • Public comment period ends	Sept 2013 Sept 2013 Oct 2013 Oct 2013	Informed I&APs Draft EIAR in libraries, website etc. Public engagement Updated CRR
Submit final EIAR to environmental authority	Nov 2013	Environmental Authorisation

6.8 Personnel

Aurecon have selected a team of highly experienced specialists and multi-disciplinary practitioners in order to execute this project as professionally as possible.

The Project Director, Mr Andries van der Merwe is a certified Environmental Engineer registered with the Engineering Council of South Africa (PrEng) and holds a B Eng (Civil) degree. Mr van der Merwe has over 13 years' experience in the field of impact assessment.

The Project Manager Ms Diane Erasmus is registered as a Certified EAP with the Environmental Assessment Practitioners of South Africa (EAPSA). She has an MSc in Nature Conservation and 18 years of experience in Environmental Management.

The Project Staff, Mr Simon Clark is an appropriately qualified member of the team with a BA in Environmental Management from the University of South Africa. He has experience compiling Basic Assessment Reports (BARs), Environmental Management Plans (EMPs), and Environmental Impact Assessments (EIAs) and has been exposed to a number of EIA projects that range from housing developments through to storm water upgrades. However the main focus has been renewable energy projects, specifically that of wind farms.

Aurecon works according to the codes of conduct for Natural Scientific Professions (SACNSP), as well as international best practice standards, as endorsed by the International Association of Impact Assessment, the World Bank and the IFC. The CV summaries of the key Aurecon staff are included in the Plan of Study for EIA contained in Chapter 5 with full CV's available on request.

Aurecon and the above environmental assessment practitioners (EAPs) are bound by the codes of conduct for EAPSA and SACNASP. The Curriculum Vitae's of the Aurecon staff are available upon request.

7 CONCLUSIONS AND WAY FORWARD

The purpose of this Chapter is to briefly summarise and conclude the Draft Scoping Report and describe the way forward.

7.1 Conclusions

As per the requirements of the NEMA, this Scoping investigation has reviewed a range of project alternatives and contemplated the array of potential environmental impacts associated with the following proposed activities on the Boegoeberg site.

The proposed hydropower station would consist of the following components:

- An off-take structure above the existing Boegoeberg weir to facilitate the abstraction of water;
- Existing Weir
- Off take structure, which is a low weir (constructed in the basin) inlet which controls inflows & protects against over abstraction, and in so doing protects the irrigation canal's supply
- Inlet structure, which is a further control after the off take structure (above) which contains a radial gate which is a further control against over abstraction but also a mechanism by which the headrace can be isolated for maintenance.
- Water conveyance infrastructure comprising a combination of either a canal (open or closed), a pipeline and/or tunnel and/or culverts to convey the water to;
- A head pond;
- Steel (or other suitable pipeline material) penstocks to transfer the water to the power chamber;
- The power chamber to house the turbines and generation equipment;
- Outlet works to release the abstracted water back into the riverine environment; downstream of the power chamber;
- A switchroom and transformer yard;
- A high voltage (HV) distribution lines to evacuate the power to a nearby Fibre substation; and
- Access roads;
- Stockpile areas
- Borrow pits

The following feasible alternatives have been identified for further consideration in the EIAR:

- Activity alternatives
  - Energy generation by means of a hydropower station; and
  - "No-go" alternative to hydropower energy production.
- Site layout alternatives
  - Two powerhouse and tailrace layout alternatives;
  - Two conduit and head pond alternatives;
  - Transmission line and road access alternatives.
- The no-go option

Specifically the following potential environmental impacts have been identified for further consideration in the EIR:

- Construction phase impacts on the biophysical and socio-economic environments:
    - Disturbance of flora and fauna;
    - Impact on heritage resources
    - Sedimentation and erosion of water ways;
    - Impact on local economy (jobs) and social conditions;
    - Visual impact
    - Traffic impacts;
    - Impacts of storage of hazardous substances on site;
    - Impact on agricultural land;
    - Noise impacts (including blasting); and
    - Dust impacts.
- Operational phase impacts on the biophysical environment and socio-economic environments:
    - Impact on flora;
    - Impact on aquatic resources;
    - Visual impacts;
    - Impact on energy production;
    - Impact on local economy and social conditions; and
    - Impact on fauna (including Avifauna).
- Decommissioning phase impacts on the biophysical and socio-economic environments
    - Sedimentation and erosion of water ways;
    - Impacts of storage of hazardous substances on site;
    - Dust impacts;
    - Impact on flora and fauna;
    - Impact on heritage resources;
    - Impact on visual aesthetics;
    - Impact on local economy (employment) and social conditions; and
    - Impact of noise.

The specialist studies and specialists, who will be commissioned to provide more detailed information on those environmental impacts which have been identified as potentially being of most concern, and/or where insufficient information is available, are listed in **Table 15**.

Table 15: Specialist investigations and recommended consultant

Specialist investigations and recommended consultant	
Study	**Consultant and Organisation**
Archaeological & Heritage Assessment	Mr Jayson Orton (ACO Associates)
Aquatic Ecology Assessment	Mr James MacKenzie (Mackenzie ecological and development services)
Avifauna Assessment	Dr Andrew Jenkins (Avisense)
Botanical Assessment	Dr Dave MacDonald (Bergwind Botanical Surveys)

The rationale for these specialist investigations and the ToR has been outlined under the relevant impacts in Chapter 5 of this report.

The approach to the EIA Phase should be conducted in terms of the guidelines outlined in the Plan of Study for EIA in Chapter 6.

7.3 The Way Forward

This DSR has been lodged on Aurecon's website (www.aurecongroup.com, change "Current Location" to "South Africa" and follow the "Public Participation" link), the Groblershoop Public Library and at the offices of the Khies Municipality in Groblershoop.

I&APs have 40 days, until 26 August, to submit their written comments on the DSR. Cognisance will be taken of all comments in compiling the final report and the comments, together with the project team and client responses thereto, will be included in the final report.

Comments should be directed to:

Aurecon

Diane Erasmus
P O Box 509, George, 6530
Tel: 044 805 5421
Fax: 044 805 5454
Email: diane.erasmus@aurecongroup.com

or

Simon Clark
PO Box 494, Cape Town, 8000
Tel: 021 526 6034
Fax: 021 526 9500
Email: simon.clark@aurecongroup.com

Once the FSR has been completed and all I&AP comments have been incorporated into the report, as necessary, it will be submitted to DEA and the Northern Cape DENC for their review and comment, respectively. DEA will either reject the application or instruct the client to proceed to the EIA Phase, either as proposed in the Plan of Study for EIR, or direct that amendments are made before continuing.

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The Integrated Resource Plan, 2010

The National Energy Act, Act No. 34 of 2008

The National Environmental Management: Waste Act, Act 59 of 2008

The Republic of South Africa Constitution Act (“the Constitution”), Act 108 of 1996

International Finance Corporation Performance Standards

Equator Principles

9 REPORT TRANSMITTAL NOTE

No of Hard-copies	No of E-copies	DISTRIBUTION RECORD (hard copy)			
		To (Name)	**Organisation**	**Rev**	**Date sent**
1	1	Mmatlala Rabothata	Department of Environmental Affairs	Draft	15 July 2013
0	1	Natalie Uys	Northern Cape Department of Environmental Affairs and Nature Conservation (DEANC)	Draft	15 July 2013
1	1	The Municipal Manager	!Kheis Local Municipality	Draft	15 July 2013
0	1	The Municipal Manager	Siyacuma Local Municipality	Draft	15 July 2013
0	1	The Municipal Manager	Siyathemba Local Municipality	Draft	15 July 2013
0	1	The Municipal Manager	Siyanda District Municipality	Draft	15 July 2013
1	0		Groblershoop Public library	Draft	15 July 2013
1	0	Kobus Streuders	Department of Water Affairs (DWA)	Draft	15 July 2013
0	1	Leon Terblanche	Department of Agriculture, Land Reform & Rural Development, Northern Cape	Draft	15 July 2013
0	1	Katie Smuts	South African Heritage Resources Agency (SAHRA)	Draft	15 July 2013
0	1	Timothy Ratha	Northern Cape Provincial Heritage: Boswa ya Kapa Bokone;	Draft	15 July 2013
0	1	SP Mokuele (Director)	Department of Energy (Northern Cape): Regional Energy Director	Draft	15 July 2013
0	1	John Geeringh	Eskom Holdings Limited	Draft	15 July 2013
0	1	Jacoline Mans	Northern Cape Department of Agriculture, Forestry and Fisheries (DAFF)	Draft	15 July 2013

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(Full name) (Signature)

Unit/Office : Cape Town Delivery Centre **Date :** 15 July 2013