ENVIRONMENTAL IMPACT ASSESSMENT

PROPOSED CONSTRUCTION AND IMPLEMENTATION OF AEP LEGOKO SOLAR PROJECT NEAR KATHU, NORTHERN CAPE

APPLICANT:
AEP LEGOKO SOLAR (PTY) LIMITED

REPORT:
AGRICULTURAL SCOPING REPORT
APRIL 2015

STUDY CONDUCTED AND
REPORT COMPILED BY: C R LUBBE
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1. **INTRODUCTION**

Cape Environmental Assessment Practitioners (Pty) Ltd is currently conducting an EIA for AEP Legoko Solar (Pty) Limited to construct a solar power plant. The development site is on Portion 2 of the farm 460 Legoko situated 5 km south of Kathu in the Northern Cape.

The EIA is conducted for environmental authorisation under the National Environmental Management Act (Act 107 of 1998), as amended. As part of this EIA, an agricultural potential study has been commissioned to scope possible impacts of the project on its immediate agricultural environment.

*This document* reports on a study that focuses specifically on the potential impacts of the project on agriculture. The study was undertaken by CR Lubbe during April 2015. The scope and purpose of the study are described in detail below.

2. **OBJECTIVES**

The objectives of this study were to consider the possibility of temporary and permanent impacts on agricultural production that may result from the construction and operation of the PV Power Plant.

3. **APPROACH AND METHODOLOGY**

3.1. **Desktop Study**

A desktop study was conducted to review existing data and literature sources. The desktop review provided a baseline agricultural and land use profile, focusing on the specific geographical area potentially impacted by the proposed project.

3.2. **Field Investigation**

The site was visited and assessed for land use and agricultural potential. An augering survey was carried out and plotted and soil groups were indicated in uniform polygons.

Potential impacts of the proposed project on agriculture were identified and considered, with particular attention to the following aspects:

- The possibility of permanent loss of high potential agricultural land;
- Impairment of land capability due to construction;
- Veld conditions for grazing;
- Analysis of erosion risk because of altered drainage patterns and poor rehabilitation in erosion-sensitive areas.

4. **ASSUMPTIONS AND UNCERTAINTIES**

A study of this nature will inherently contain various assumptions and limitations.

As far as *regional* information is concerned, this is primarily a desktop-based study. Climatic conditions, land uses, land type and terrain are readily available from literature, GIS information and satellite imagery.

Notwithstanding these limitations, the *site-specific* field studies confirmed most of the desktop findings and I am confident that the findings provide sufficient detail for the agricultural potential study reported in this document.
5. DESCRIPTION OF THE PROPOSED PROJECT

AEP Legoko Solar (Pty) Limited, a renewable energy developer, proposes to construct a Photovoltaic Facility on Portion 2 of the farm 460 Legoko with a 220ha footprint on a farm area of approximately 870 hectares.

The net generating capacity (AC) of the plant will be 75 MW. The project will connect into the national grid via the new Sekgame substation (to be situated approximately 1km south of Ferrum MTS).

6. THE POTENTIALLY AFFECTED ENVIRONMENT

This section provides a general description of the immediate environment potentially affected by the construction, operation and closure of the proposed PV power plant.

6.1. Locality

The development site is on Portion 2 of the farm 460 Legoko situated 5 km south of the town Kathu in the Northern Cape (see Figure 1).

![Figure 1: Location of the proposed Legoko PV Power Station](image)

6.2. Physical description of site

The site covers the Northern portion of the farm. The surrounding area has a rural, agricultural character and land is used for cattle farming. Open cast mining (Sishen Mine) takes place across the road west of the N14. Bestwood Agricultural Holdings border the northwestern corner.

The geology is that of the Transvaal sequence. Sedimentary and volcanic rocks of this sequence include dolomite, limestone and chert.

6.2.1. Climate

The region is classified as a semi arid zone. The following specific parameters are applicable:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual rainfall</td>
<td>201-400 mm</td>
</tr>
<tr>
<td>Mean maximum temperature</td>
<td>31 to 33°C</td>
</tr>
</tbody>
</table>
### Mean minimum temperature

<table>
<thead>
<tr>
<th></th>
<th>Minus 2°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>First frost expected</td>
<td>11 to 20 May</td>
</tr>
<tr>
<td>Last frost expected</td>
<td>01 to 10 September</td>
</tr>
<tr>
<td>Hours of sunshine</td>
<td>&gt;80%</td>
</tr>
<tr>
<td>Evaporation</td>
<td>2200 2400 mm</td>
</tr>
</tbody>
</table>

### 6.2.2. Soils

Soils in this region usually show the following characteristics:

- Soils have minimal development, are usually shallow, on hard or weathering rock, with or without intermittent diverse soils.
- Lime is generally present in part or most of the landscape.
- Red and yellow well-drained sandy soil with high base status may occur.
- Freely drained, structure less soils may occur.
- Soils may have favourable physical properties.
- Soils may also have restricted depth, excessive drainage, high erodibility and low natural fertility.

### 6.2.3. Vegetation

<table>
<thead>
<tr>
<th>Acoks veld type group</th>
<th>Tropical bush and savannah type (Bushveld)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetation Biome</td>
<td>SVk 12 Kathu Bushveld with a low to moderate</td>
</tr>
<tr>
<td>NDVI:</td>
<td>Low to moderate</td>
</tr>
<tr>
<td>Land capability</td>
<td>Non arable low potential grazing</td>
</tr>
<tr>
<td>Grazing capacity</td>
<td>18 – 21 ha/ LSU</td>
</tr>
<tr>
<td>Land use:</td>
<td>Cattle</td>
</tr>
<tr>
<td>Common Trees</td>
<td>Camel thorn acacia (Ae), Umbrella acacias (At), Camphor bush (Tc), Buffalo thorn (Zm) and Velvet raisin (Gf)</td>
</tr>
<tr>
<td>Indicator grasses with high grazing value</td>
<td>Silver Wool grass (Aa), Wool grass (Ap), Blue Buffalo (Cc), Gha grass (Cg), Stab grass (As), Feathered Chloris (Cv), Black footed Signal (Bn), Wether love grass (En), Tall Bushman (Sc), Small Bushman (So), Lehmans lovegrass (El)</td>
</tr>
</tbody>
</table>

### 6.2.4. Topography

The area is essentially sandy Bushveld with a flat to gently undulating topography. Level plains with some relief occur.

### 7. STUDY FINDINGS

The site was visited on 15 and 16 April 2015.

### 7.1. Structures on site

Structures on site consist only of handling facilities and internal fencing for cattle and a non-equipped borehole.
7.2. **Surrounding developments**

The site is isolated by cattle farms with an open cast mine west of the N14. Northwest is the town Kathu and Bestwood Agricultural Holdings.

7.3. **Past and Current Agricultural Activities on Site**

The site is utilised for extensive cattle farming. There is no evidence of past or current cultivation.

7.4. **Soil Classification**

An augering survey was carried out as indicated in Error! Reference source not found.2

![Figure 2: Augering points](image)

At each augering point, an observation record was completed. The soil observation records in Error! Reference source not found.1 are representative of the one soil form found on the site. The soil is further described below each observation record.

<table>
<thead>
<tr>
<th>Table 1: Soil Forms identified</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OBS</strong></td>
</tr>
<tr>
<td><strong>LAT</strong></td>
</tr>
<tr>
<td><strong>LONG</strong></td>
</tr>
<tr>
<td><strong>FORM</strong></td>
</tr>
<tr>
<td><strong>FAM</strong></td>
</tr>
<tr>
<td><strong>ROUGH</strong></td>
</tr>
<tr>
<td><strong>TERR_POS</strong></td>
</tr>
<tr>
<td><strong>CLAY</strong></td>
</tr>
<tr>
<td><strong>S-GR</strong></td>
</tr>
<tr>
<td><strong>CONS</strong></td>
</tr>
<tr>
<td><strong>STRUC</strong></td>
</tr>
<tr>
<td><strong>L.COVER/USE:</strong></td>
</tr>
<tr>
<td><strong>SLOPE SHAPE</strong></td>
</tr>
<tr>
<td><strong>EROSION</strong></td>
</tr>
<tr>
<td><strong>MOISTURE</strong></td>
</tr>
</tbody>
</table>

**Plooysburg 1000 (40-120 cm)**

About 40% consists of the Plooysburg form (FamilyBrakkies)

0-20 cm redish brown, sandy, (fine grade) with single grain structure top soil

20-60 cm yellowish red, sandy, (fine grade) structure less sub soil

Limited hardpan carbonate horizon
The soils were then grouped in uniform utilization polygons.

The criterion used to differentiate between utilization units, was the effective depth of the soil. The observation points with soils that had an effective depth less than 30cm, mostly without a sub soil or with carbonate outcrops. The deeper soils, ranging from 50cm to 120 cm, were grouped in one class. With the low rainfall and sandy structure, differentiation was not necessary in this class. The soils were homogeneous in all the other classification criteria.

The two utilization groups are illustrated in Figure 3

![Figure 3: Soil Groups](image)

7.5. **Veld Condition Assessment**

A veld condition assessment was done simultaneous with the soil survey, by visual acknowledgement.
Table 2: Veld Condition Assessment

<table>
<thead>
<tr>
<th>Shallow soil</th>
<th>Deep soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veld condition</td>
<td>Rating</td>
</tr>
<tr>
<td>Plant cover</td>
<td>Cover is sparse with some bare areas</td>
</tr>
<tr>
<td>Types of grasses most common</td>
<td>Moderate and poor grazing grasses</td>
</tr>
<tr>
<td>Soil surface condition</td>
<td>Moderate levels of topsoil loss</td>
</tr>
<tr>
<td>Bush encroachment level</td>
<td>Heavy to medium infestation</td>
</tr>
<tr>
<td>Soil type</td>
<td>Sandy soil</td>
</tr>
</tbody>
</table>

7.6. Assessment of Access roads and connecting line

7.6.1. Access road (A)

This is an existing road in daily use, with low agricultural potential soil (Py30cm). It follows an old road alignment, before the N14 was constructed. It will have no new impact on agricultural activities.

7.6.2. Connecting line (B)

This runs along and existing path. It consists of low potential agricultural soil, with outcrops of hard carbonate. It will have impact on agricultural activities.

7.6.3. Access road (C)

This runs over low potential agricultural soil with a high percentage of outcrops with minimum topsoil. It will have a low impact on land use.

7.6.4. Connecting line (D)

This runs along an existing path with low agricultural soil. It forms an economical extension for line B. The connecting line will have low impact on land use.
Figure 5: Alternative access roads and connecting line
7.7. **Land Capability and Suitability for agriculture**

The site is largely unsuitable for cultivation due to the following limiting factors:

- Low annual rainfall, high evaporation and extreme temperatures restrict dry land cultivation.
- The very shallow soil depth with its limited water holding capacity restricts root development.
- The very fine sand grade of top soil influences the stability and increases Erodability potential.
- Low clay percentage results in low water holding capacity and low nutrient availability, resulting in low soil fertility.

<table>
<thead>
<tr>
<th>Land capability class</th>
<th>Suitability Rating</th>
<th>Major Limitation to Crop Production</th>
<th>Area (ha)</th>
<th>% of Local Study Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class VI Py &lt;30cm</td>
<td>Very low</td>
<td>Low water holding capacity</td>
<td>200 ha</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shallow rooting zone</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Severe climate</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Severe erosion hazard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class IV Py &gt;40cm</td>
<td>Low</td>
<td>Low water holding capacity</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Severe climate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 4: Land Capability and Suitability Assessment for Grazing**

<table>
<thead>
<tr>
<th>Area Description</th>
<th>Suitability Rating</th>
<th>Major Limitation to Grazing</th>
<th>Area (ha)</th>
<th>% of Local Study Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>Low</td>
<td>Very shallow rooting depth</td>
<td>220</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>low clay content, low rainfall, with a carrying capacity of 16-25ha /LSU</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7.8. **Water Availability/Provision**

Water is provided to livestock from a borehole pumped in a reservoir and troughs.

7.9. **Erosion potential**

The erosion potential for this land is classified as low for water erosion. The predicted soil loss and sediment delivery is low; the reason is the low effect the rainfall has (erosivity class: 201–300mm) in combination with the level slope (0.5%).

The soil, however, has a high susceptibility for wind erosion due to the pure sand that is dominant to the area. Regeneration of the soil if badly eroded is very low due to the shallow topsoil on hard setting carbonate.
7.10. **Summary of findings**

More than 90% of the area has an effective depth of less than 30 cm and dominated by carbonate outcrops. Cultivation on this portion is prevented by the lack of soil. Soil characteristics on the remainder of the area include the following:

- Effective depth: 40cm to 120cm,
- Texture of the top and subsoil: sandy
- Sand grade: very fine
- Colour: red
- Water holding capacity: <20mm/m
- Carbon content: low
- Consistency: Loose to very loose

Climate of the area

- Semi arid
- Annual rain 201 to 400mm
- Evaporation 2200 to 2400mm

The climate and soil property combination makes the site largely unsuitable for cultivation. The area could be utilised as grazing, but the grazing potential is very low.

8. **POSSIBLE IMPACTS**

1. Loss of agricultural land due to direct occupation by solar panels and other infrastructure,
2. Alteration drainage due to construction of foundations and roads.
3. Placement of spoil material generated from construction related excavations.
4. Access roads dividing grazing camps in unusable sizes.

9. **CONCLUSION AND RECOMMENDATION**

The climate and soil property combination makes the site largely unsuitable for cultivation. The area could, and is indeed utilised as grazing.

It is not deemed necessary to conduct further investigation into possible impacts. However, the construction phase should take note of points 2 to 4 of paragraph 8 to prevent damage.

[Signature]

C R LUBBE

AGRICULTURAL SPECIALIST

28 April 2015
LIMITATIONS

This Document has been provided subject to the following limitations:

(i) This Document has been prepared for the particular purpose outlined in the proposal and no responsibility is accepted for the use of this Document in other contexts or for any other purpose.

(ii) CR Lubbe did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document.

(iii) Conditions may exist which were undetectable given the limited nature of the enquiry CR Lubbe was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.

(iv) It is recognised that the passage of time affects the information and assessment provided in this Document. CR Lubbe’s opinions are based upon information that existed at the time of the production of the Document. CR Lubbe’s opinion rests on the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes in the quality of the site.

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REFERENCES


Environmental Practitioner Curriculum Vitae

KEY QUALIFICATIONS:
National Higher Diploma in Agriculture (Irrigation), Technikon Pretoria, 1982
Certificate in Stereoscopic Interpretation, Geology and Resource Classification and Utilisation, Department of Agriculture, 1979
National Diploma in Agriculture, Technikon Pretoria, 1976

OTHER EDUCATION:
Certificate in Landscape Management, Technikon Pretoria, 1988
Cultivated pastures (Mod 320), University of Pretoria, 1995
FSC Auditors Course (Woodmark, UK), Sappi Ltd, 2003
NOSA Health and Safety Certificate, 1996
Certificate of Competence: Civil Designer - Design Centre and Survey and Design (Knowledge Base, August 2005)

EMPLOYMENT RECORD:
July 2006 to date CR LUBBE Self employed
Involved in various projects (see project related experience).

Acting Assistant Director: Resource Planning and Utilization

Jan 1997 – May 2004 CR LUBBE Pretoria, SA
Self employed
Involved in various projects (See Project related experience below)

1980 to 1996 Technikon Pretoria Pretoria, SA
Lecturer
Teaching Agricultural Engineering and Land Use Planning subjects. Teaching included practical courses, examination and moderation

1974 - 1979 Department of Agriculture (Transvaal Region) Carolina and Ermelo, SA
Senior Extension Technician
Farm Planning, Surveying, Design of soil conservation systems, Agricultural Extension.

SUMMARY OF EXPERIENCE
Has 42 years of experience in planning and managing natural resources to ensure optimal utilisation, without exploiting such resources to the detriment of future generations.

Fourteen years experience as a soil consultant, doing mainly soil surveys, terrain classification and agricultural potential studies. Reports include a variety of maps and GIS aspects thus play a large role in these surveys and studies.

Seventeen years of lecturing agricultural engineering subjects: Soil Conservation Techniques I, II and III, which dealt with the surveying, design and drawing of soil conservation structures; Farm Planning, which dealt with optimal resource utilization and Agricultural Mechanization, which dealt with the implements and machinery used to mechanize farming.

Ten years experience in the survey, design and supervising the construction of soil conservation structures in the agricultural field, mainly for farm planning.

PROJECT RELATED EXPERIENCE

PROJECTS UNDERTAKEN IN INDIVIDUAL CAPACITY

Cape EA Agricultural Impact Assessment : EIA for the Construction and Operation of two Photovoltaic Power Stations at Kathu in the Northern Cape. Apr 2015

Savannah Environmental Agricultural Impact Assessment : EIA for the Construction and Operation of a Wind Farm near Moorreesburg, Western Cape. Mar 2015

Department of Agriculture, Forestry and Fisheries Eastern Cape Land Capability Verification Survey Mar 2015

Department of Agriculture, Forestry and Fisheries Western Cape Land Capability Verification Survey Dec 2014
Cape EA | Aug 2014
--- | ---
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station at Upington (RE Cap 5) in the Northern Cape.

Cape EA | Aug 2014
--- | ---
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station at Postmasburg (RE Cap 5) in the Northern Cape.

Cape EA | Aug 2014
--- | ---
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station at Upington (Joram) in the Northern Cape.

Cape EA | Aug 2014
--- | ---
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station at Copperton (RE Cap 5) in the Northern Cape.

Cape EA | Aug 2014
--- | ---
Agricultural Impact Assessment : EIA for the Establishment of a Cemetery at Zoar, near Ladismith in the Western Cape.

Macroplan | Jun 2014
--- | ---
Agricultural Impact Assessment: Application for rezoning of Agricultural land at Upington (Sweet Sensation), Northern Cape.

Macroplan | Mar 2014
--- | ---
Agricultural Potential Study: Application for change of land use at Upington (McTaggarts), Northern Cape.

Agricultural Development Corporation | Jan to March 2014
--- | ---
Design of Feedlot infrastructure and stock watering systems for Kenana Sugar in Sudan.

Cape EA | Nov 2013
--- | ---
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station in the Richtersveld, Western Cape.

Cape EA | Jul 2013
--- | ---
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station at Upington in the Northern Cape.

Cape EA | Oct 2012
--- | ---
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station near Danielskui in the Northern Cape.

Senter360 | Oct 2012
--- | ---
Agricultural Potential Study for a Food Security Development Units in the Democratic Republic of the Congo.

Africa Livestock Project Development Consortium | Aug 2012
--- | ---
Agricultural Impact Assessment for the Construction and Operation of a Beef Cattle Handlings Facility for a Sugar Company in Northern Sudan.

Van Zyl Environmental Consultants | Mar 2012
--- | ---
Agricultural Impact Assessment : EIA for the Construction and Operation of a Photovoltaic Power Station in the Northern Cape.

Bushveld Eco Services | Nov 2011
--- | ---
Design and cost estimate of a stock watering system in the Lephalale district.

WSM Leshika | Sep 2011
--- | ---
Soil suitability survey for two new upcoming farmers at Vhuawela & Tshoga in the Limpopo Province.

National Department of Agriculture | Aug 2011
--- | ---
Soil survey investigating soil potential for change of land use at the Levendal Development in the Paarl district, Western Cape.

Van Zyl Environmental Consultants | Mar 2011
--- | ---
Agricultural Impact Assessment : EIA for the Construction and Operation of four Photovoltaic Power Stations in the Northern Cape.

WSM Leshika | Nov 2010
--- | ---
Potential assessments and land use plans for four new upcoming farmers in the Limpopo Province.

FP Botha | Apr 2010
--- | ---
Potential assessments and land use plans for various new Limpopo agricultural development hubs.
Golder Associates Africa (Pty) Ltd May 2009 – Apr 2010
Potential assessments and Landuse plans for the resettlement of land tenants at Mafube Coal Mine in the Belfast district of the Mpumalanga Province

Sappi Vryheid, RSA
 Undertook reconnaissance soil surveys on various plantations and farms in the Vryheid and Piet Retief districts to establish forestation potential and evaluation for species choice (covering a total area of 5173 ha).

Environmentek, CSIR Nelspruit, RSA
Undertook soil and terrain classification surveys on the Jessievale (8313 ha) and New Agatha (1 700 ha) plantations.

Safcol (Komatieland) Limpopo Province
Undertook environmental, soil and terrain classification surveys on the Thatevondo (4 500 ha), Mafela (920 ha) and Mmamatola (1 263 ha) plantations.

Measured Farming Gabon, Swaziland & RSA
Undertook soil and terrain classification surveys on Ranch Lope and Ranch Suba in Gabon, Kubuta Farm in Swaziland and on the farms Madikwe in the Limpopo Province and Stoffelsrus in the Free State, South Africa.

Loxton Venn and Associates Potgietersrus, RSA
Assess comparative soils and area for relocating Village Ga-Sekhaolelo on Overysel 815LR to Rooibokfontein 812LR and Village Ga-Puka on Swartfontein 818 LR to Armoed on Potgietersrus Platinum Mine.

Department of Water Affairs and Forestry Gauteng
GPS survey and alien identification for mapping of Jukseki and Swartspruit areas, as part of the Working for Water Program.

Sustainable Forestry Management Ltd Limpopo and Mpumalanga
Participated in a due diligence audit on various SAFCOL plantations in the Limpopo and Mpumalanga Provinces as part of the preparation of a British company’s tender to purchase these plantations.

Mustek Engineering Ghana
Survey to provide a detailed inventory of the forest resources in 17 specified Forest Reserves in Ghana to develop a practical and operationally sound methodology for monitoring the natural forest resources in Ghana, based on satellite imagery for the Ghana Forestry Commission.

Afrigis Environmental Solutions, Pretoria Various Soil Surveys and Landuse Plannings – Domestic and Neighbouring Countries

Rural Integrated Engineering, Pretoria Various Soil Surveys and Landuse Plannings

Africa Land-Use Training, Modimole
Lectures at Basic Farm Planning Course (Limpopo and Gauteng)
Declaration of Independence

CR Lubbe was appointed by AEP Legoko Solar (Pty) Limited via Cape Environmental Assessment Practitioners (Pty) Ltd, the EAP, to conduct an independent agricultural scoping study for the proposed PV Power Plant in the Northern Cape.

He is not a subsidiary or in any way affiliated to AEP Legoko Solar (Pty) Limited.

CR Lubbe also does not have any interest in secondary developments that may arise from the authorisation of the proposed project.

CR Lubbe

28 April 2015