

**APPENDIX C2 -  
VEGETATION IMPACT ASSESSMENT**



DRAFT

# VEGETATION IMPACT ASSESSMENT



OCES

ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES



**PROPOSED UPGRADE OF NATIONAL ROAD R52 SECTION 3 FROM  
KOSTER (KM 0.0) TO THE N4 TURNOFF NEAR RUSTENBURG (KM  
38.7), NORTH WEST PROVINCE**

**VEGETATION IMPACT ASSESSMENT REPORT**

**Prepared for:**



Under the direction of:

**The South African National Roads Agency SOC Ltd**

Regional Manager

Northern Region

38 Ida Street, Menlo Park

0081

**Prepared by:**



**CENTURION**

Route 21 Business Park

70 Regency Drive

Centurion, 0178

010 045 1372

*Also in Cape Town, East London, Grahamstown, Port Elizabeth,  
Maputo (Mozambique) and Romsey (UK)*


[www.cesnet.co.za](http://www.cesnet.co.za)

**OCTOBER 2020**



## REVISIONS TRACKING TABLE

### *CES Report Revision and Tracking Schedule*

|   |  |   |                              |
|---|--|---|------------------------------|
| <b>Document Title:</b>  | SANRAL Ilifa Koster R52 Upgrade Vegetation Impact Assessment   |   |                              |
| <b>Client Name &amp; Address:</b>   | Ilifa Africa Engineers (Pty) Ltd<br>35A Piet Retief Street, Harrismith, PO Box 802, Harrismith, 9880 |   |                              |
| <b>Status:</b>  | Draft  |   |                              |
| <b>Issue Date:</b>  | October 2020   |   |                              |
| <b>Lead Author:</b>   | Mr Aidan Gouws   |  |                              |
| <b>Reviewers:</b>   | Dr Alan Carter   |   |                              |
| <b>Study Leader/ Registered Environmental Assessment Practitioner – Approval:</b> |  |   |                              |
| <b>Report Distribution</b>  | <i>Circulated to</i>   | <i>No. of hard copies</i>   | <i>No. electronic copies</i> |
|   | Arno Poortman  |   | 1                            |
| <b>Report Version</b>   | <i>Date August 2020</i>  |   |                              |
|   | Draft  |   |                              |

This document has been prepared in accordance with the scope of CES's appointment and contains intellectual property and proprietary information that is protected by copyright in favour of CES. The document may therefore not be reproduced, used or distributed to any third party without the prior written consent of CES. This document is prepared exclusively for use by CES's client. CES accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared. No person other than the client may copy (in whole or in part), use or rely on the contents of this document, without the prior written permission of CES. The document is subject to all confidentiality, copyright, trade secrets rules and intellectual property law and practices of South Africa.



[Info@cesnet.co.za](mailto:Info@cesnet.co.za)  
[www.cesnet.co.za](http://www.cesnet.co.za)



## LIST OF ACRONYMS

|       |   |
|-------|---|
| AIS   | Alien Invasive Species                                  |
| CBA   | Critical Biodiversity Area                              |
| CITES | Convention on International Trade in Endangered Species |
| CES   | CES Environmental and Social Advisory Services          |
| ECO   | Environmental Control Officer                           |
| ESA   | Ecological Support Area                                 |
| GIS   | Geographical Information System                         |
| IUCN  | International Union for Conservation of Nature          |
| NEMBA | National Environmental Management Biodiversity Act      |
| NWBMA | North West Biodiversity Management Act                  |
| NWBSP | North West Biodiversity Sector Plan                     |
| QDS   | Quarter Degree Square                                   |
| SA    | South Africa  |
| SANBI | South African National Biodiversity Institute           |
| SCC   | Species of Conservation Concern                         |
| TOPS  | Threatened or Protected Species                         |

DRAFT



## SPECIALIST CHECKLIST

| SECTION | NEMA 2014 REGS - APPENDIX 6(1) REQUIREMENT   | POSITION IN REPORT               |
|---------|--|----------------------------------|
| 1       | A specialist report prepared in terms of these Regulations must contain—   |                                  |
| (a)     | details of-  |                                  |
|         | (i) the specialist who prepared the report; and  | Page 1                           |
|         | (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;   | Appendix C                       |
| (b)     | a declaration that the person is independent in a form as may be specified by the competent authority;   | Section 1.3                      |
| (c)     | an indication of the scope of, and the purpose for which, the report was prepared;   | Chapter 2                        |
| (d)     | the date and season of the site investigation and the relevance of the season to the outcome of the assessment;  | Section 1.3 and Section 5.2      |
| (e)     | a description of the methodology adopted in preparing the report or carrying out the specialised process;  | Chapter 4                        |
| (f)     | the specific identified sensitivities of the site related to the activity and its associated structures and infrastructure;  | Chapter 6                        |
| (g)     | an identification of any areas to be avoided, including buffers;   | Chapter 4 and Chapter 6          |
| (h)     | a map superimposing the activity including the associated structures and infrastructure on the environmental sensitive of the site including areas to be avoided, including buffers;   | Figure 6.1                       |
| (i)     | a description of any assumptions made and any uncertainties or gaps in knowledge;  | Section 2.6                      |
| (j)     | a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;  | Chapter 5 and Section 2.2        |
| (k)     | any mitigation measures for inclusion in the EMPr;   | Chapter 7 and Chapter 8          |
| (l)     | any conditions for inclusion in the environmental authorization;   | Chapter 8                        |
| (m)     | any monitoring requirements for inclusion in the EMPr or environmental authorisation;  | Chapter 7 and Chapter 8          |
| (n)     | a reasoned opinion-<br>(i) as to whether the proposed activity or portions thereof should be authorized and<br>(ii) if the opinion is that the proposed activity of portion thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan; | Chapter 8                        |
| (o)     | a description of any consultation process that was undertaken during the course of preparing the specialist report;  | Refer to Basic Assessment Report |
| (p)     | a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and  | Refer to Basic Assessment Report |
| (q)     | any other information requested by the competent authority.  | None for the Vegetation report   |



## TABLE OF CONTENTS

|          |  |           |
|----------|--|-----------|
| <b>1</b> | <b><u>PROJECT TEAM AND EXPERTISE.....</u></b>                  | <b>1</b>  |
| 1.1      | DETAILS OF SPECIALIST.....                                     | 1         |
| 1.2      | EXPERTISE.....   | 1         |
| 1.3      | DECLARATION.....   | 2         |
| <b>2</b> | <b><u>INTRODUCTION .....</u></b>                               | <b>3</b>  |
| 2.1      | PROJECT OVERVIEW AND LOCATION.....                             | 3         |
| 2.1.1    | General road works.....  | 4         |
| 2.1.2    | Drainage and culverts.....                                     | 4         |
| 2.2      | ALTERNATIVES .....   | 4         |
| 2.3      | PUBLIC PARTICIPATION.....                                      | 4         |
| 2.4      | OBJECTIVES AND TERMS OF REFERENCE (TOR).....                   | 4         |
| 2.5      | ASSUMPTIONS AND LIMITATION.....                                | 5         |
| <b>3</b> | <b><u>RELEVANT LEGISLATION .....</u></b>                       | <b>6</b>  |
| <b>4</b> | <b><u>ASSESSMENT METHODOLOGY.....</u></b>                      | <b>12</b> |
| 4.1      | THE ASSESSMENT APPROACH.....                                   | 12        |
| 4.2      | SPECIES OF CONSERVATION CONCERN.....                           | 12        |
| 4.3      | SAMPLING PROTOCOL.....   | 13        |
| 4.4      | VEGETATION MAPPING .....                                       | 13        |
| 4.5      | SENSITIVITY ASSESSMENT .....                                   | 13        |
| 4.5.1    | Biodiversity Legislation and Policy.....                       | 15        |
| 4.5.2    | Protected Areas.....   | 16        |
| 4.6      | IMPACT ASSESSMENT.....   | 17        |
| <b>5</b> | <b><u>DESCRIPTION OF THE BIOPHYSICAL ENVIRONMENT .....</u></b> | <b>20</b> |
| 5.1      | DESKTOP INVESTIGATION.....                                     | 20        |
| 5.1.1    | Climate .....  | 20        |
| 5.1.2    | Topography .....   | 20        |
| 5.1.3    | Geology and Soils.....   | 22        |
| 5.1.4    | Land Cover and Use.....  | 22        |
| 5.1.5    | Vegetation and Floristics.....                                 | 24        |
| 5.1.5.1  | National Vegetation Map.....                                   | 24        |
| 5.1.5.2  | Threatened Ecosystems .....                                    | 25        |
| 5.1.5.3  | North West Biodiversity Sector Plan (2015).....                | 26        |



|            |  |                  |
|------------|--|------------------|
| 5.1.5.4    | Protected areas .....  | 26               |
| 5.1.5.5    | Species of Conservation Concern.....                                 | 28               |
| 5.1.5.6    | Alien Invasive Species .....   | 29               |
| <b>5.2</b> | <b>SITE INVESTIGATION .....</b>                                      | <b>30</b>        |
| <b>6</b>   | <b><u>SITE SENSITIVITY .....</u></b>                                 | <b><u>44</u></b> |
| 6.1        | CONSERVATION AND SPATIAL PLANNING TOOLS.....                         | 44               |
| 6.2        | SENSITIVITY ALLOCATION.....  | 44               |
| <b>7</b>   | <b><u>VEGETATION IMPACT ASSESSMENT .....</u></b>                     | <b><u>49</u></b> |
| 7.1        | POTENTIAL ISSUES .....   | 49               |
| 7.2        | IMPACTS .....  | 51               |
| 7.3        | ASSESSMENT OF CUMULATIVE IMPACTS .....                               | 65               |
| <b>8</b>   | <b><u>IMPACT STATEMENT, CONCLUSION AND RECOMMENDATIONS .....</u></b> | <b><u>66</u></b> |
| 8.1        | CUMULATIVE IMPACTS .....   | 66               |
| 8.2        | NO GO AREAS .....  | 66               |
| 8.3        | ALTERNATIVES .....   | 66               |
| 8.4        | SUMMARY OF IMPACT SIGNIFICANCE.....                                  | 66               |
| 8.5        | RECOMMENDATIONS FOR THE PROPOSED ACTIVITY .....                      | 67               |
| 8.6        | MITIGATION MEASURES.....   | 67               |
| 8.7        | ECOLOGICAL STATEMENT AND OPINION OF THE SPECIALIST .....             | 70               |
| <b>9</b>   | <b><u>REFERENCES .....</u></b>                                       | <b><u>71</u></b> |
| <b>10</b>  | <b><u>APPENDIX A: LIST OF PLANT SPECIES .....</u></b>                | <b><u>73</u></b> |
| <b>11</b>  | <b><u>APPENDIX B: A3 PROJECT MAPS.....</u></b>                       | <b><u>80</u></b> |
| <b>12</b>  | <b><u>APPENDIX C: CURRICULUM VITAE .....</u></b>                     | <b><u>99</u></b> |





## LIST OF TABLES

|   |    |
|---|----|
| Table 1.1: Ecological assessment projects the specialist has completed include: .....                             | 1  |
| Table 3.1: Environmental legislation considered in the preparation of this report .....                           | 6  |
| Table 4.1 Criteria used for the analysis of the sensitivity of the site. ....                                     | 14 |
| Table 4.2 Categories in the NWBSP (2015). ....  | 15 |
| Table 4.3: Impact rating methodology. ....  | 17 |
| Table 5.1: Generalised soil patterns along the R52 project region.....  | 22 |
| Table 5.2: Mucina & Rutherford (2018) conservation classification for the project region<br>vegetation types..... | 26 |
| Table 5.3: Potential plant SCCs likely to occur within the study area.....  | 29 |
| Table 5.4: Potential plant AIS likely to occur within the study area. ....  | 29 |
| Table 5.5: Vegetation survey along the R52-03 project route.....  | 34 |
| Table 5.6: Plant species observed along the R52-03 project route.....   | 42 |
| Table 6-1: Sensitivity assessment along the R52-03 project route. ....  | 45 |
| Table 7.1: Technical scope of the impacts on the vegetation for all phases of the proposed<br>R52 upgrade. ....   | 50 |
| Table 7.2: Impacts and mitigation measures for the Planning and Design Phase.....                                 | 51 |
| Table 7.3: Impacts and mitigation measures for the Construction Phase. ....                                       | 55 |
| Table 7.4: Impacts and mitigation measures for the Operation Phase.....   | 61 |
| Table 7.5: Impacts and mitigation measures for the No-Go Alternative. ....  | 64 |
| Table 7.6: Cumulative impacts of the proposed road upgrade.....   | 65 |
| Table 8.1: Assessment of pre- and post-mitigation impact significance. ....                                       | 67 |
| Table 8.2: Mitigation measures for the Planning and Design phase. ....  | 67 |
| Table 8.3: Mitigation measures for the Construction phase.....  | 68 |
| Table 8.4: Mitigation measures for the Operation phase. ....  | 69 |
| Table 10.1 List of species that may occur within the proposed development area.....                               | 73 |



## LIST OF FIGURES

|  |    |
|--|----|
| Figure 2.1: Locality map of the proposed development. ....   | 3  |
| Figure 5.1: Climatic data for Koster (saexplorer, 2018). ....  | 20 |
| Figure 5.2: Topographic profile of the project region along the R52 road. ....                                 | 21 |
| Figure 5.3: Topographic map of the project region along the R52 road. ....                                     | 21 |
| Figure 5.4: Geology map of the project region along the R52 road (Source: AGIS, 2017)...                       | 22 |
| Figure 5.5: Generalised soil patterns map of the project region along the R52 road (Source: AGIS, 2017). ....  | 23 |
| Figure 5.6: Land use map of the project region along the R52 road. ....  | 23 |
| Figure 5.7: Mucina & Rutherford Vegetation Types for the project region.....                                   | 25 |
| Figure 5.8: Terrestrial CBAs and ESAs for the project area based on the NWBSP (2015). .                        | 27 |
| Figure 5.9: Aquatic CBAs and ESAs for the project area based on the NWBSP (2015) (CES, 2020). ....             | 27 |
| Figure 5.10: POSA search area highlighting botanical records (red). ....                                       | 28 |
| Figure 5.11: Map of the vegetation sample points along the R52-03. ....  | 31 |
| Figure 5.12: Vegetation and general land cover along the R52-03 route (Sample points 1-5). ....                | 31 |
| Figure 5.13: Vegetation and general land cover along the R52-03 route (Sample points 6-10). ....               | 32 |
| Figure 5.14: Vegetation and general land cover along the R52-03 route (Sample points 11-12). ....              | 32 |
| Figure 5.15: Vegetation and general land cover along the R52-03 route (Sample points 13-16). ....              | 33 |
| Figure 5.16: Vegetation and general land cover along the R52-03 route (Sample points 17-19). ....              | 33 |
| Figure 6.1 Sensitivity map of the entire R52 study area (KM 0.0 – KM 38.7).....                                | 47 |
| Figure 6.2 Sensitivity map of the R52 study area (KM 0.0 – KM 15.0).....                                       | 47 |
| Figure 6.3 Sensitivity map of the R52 study area (KM 15.5 – KM 28.5).....                                      | 48 |
| Figure 6.4 Sensitivity map of the R52 study area (KM 29.0 – KM 38.7).....                                      | 48 |
| Figure 11.1: Locality map of the proposed development. ....  | 80 |
| Figure 11.2: Topographic map of the project region along the R52 road. ....                                    | 81 |
| Figure 11.3: Geology map of the project region along the R52 road (Source: AGIS, 2017). 82                     |    |
| Figure 11.4: Generalised soil patterns map of the project region along the R52 road (Source: AGIS, 2017). .... | 83 |
| Figure 11.5: Land use map of the project region along the R52 road. ....                                       | 84 |
| Figure 11.6: Mucina & Rutherford Vegetation Types for the project region.....                                  | 85 |
| Figure 11.7: Terrestrial CBAs and ESAs for the project area based on the NWBSP (2015).87                       |    |
| Figure 11.8: Aquatic CBAs and ESAs for the project area based on the NWBSP (2015) (CES, 2020). ....            | 88 |
| Figure 11.9: Map of the vegetation sample points along the R52-03. ....  | 89 |
| Figure 11.10: Vegetation and general land cover along the R52-03 route (Sample points 1-5). ....               | 90 |
| Figure 11.11: Vegetation and general land cover along the R52-03 route (Sample points 6-10). ....              | 91 |
| Figure 11.12: Vegetation and general land cover along the R52-03 route (Sample points 11-12). ....             | 92 |
| Figure 11.13: Vegetation and general land cover along the R52-03 route (Sample points 13-16). ....             | 93 |



Figure 11.14: Vegetation and general land cover along the R52-03 route (Sample points 17-19). ..... 94

Figure 11.15 Sensitivity map of the entire R52 study area (KM 0.0 – KM 38.7)..... 95

Figure 11.16 Sensitivity map of the R52 study area (KM 0.0 – KM 15.0)..... 96

Figure 11.17 Sensitivity map of the R52 study area (KM 15.5 – KM 28.5)..... 97

Figure 11.18 Sensitivity map of the R52 study area (KM 29.0 – KM 38.7)..... 98

DRAFT



## 1 PROJECT TEAM AND EXPERTISE

In terms of Appendix 6 of the 2014 NEMA EIA Regulations (2014, as amended) a specialist report must contain-

(a) Details of-

(i) The specialist who prepared the report; and

(ii) The expertise of that specialist to compile a specialist report including a curriculum vitae;

(b) A declaration that the specialist is independent in a form as may be specified by the competent authority;

### 1.1 DETAILS OF SPECIALIST

#### Mr Aidan Gouws, Cand.Sci.Nat (Lead Report Writer)

Aidan obtained his MSc in Environmental Science (*Cum laude*) from Rhodes University, having conducted research on the spatio-temporal dynamics of *Acacia dealbata* invasions and broader land-use and cover changes in the northern Eastern Cape, funded through a study bursary awarded by the Agricultural Research Council (ARC). Aidan has two years of experience, working as an Environmental Consultant and Terrestrial Specialist for CES. He joined CES in 2018 and has been involved in several environmental projects, having conducted two specialist Ecological Impact Assessments for the Ramotshere Moiloa Local Municipality Residential Extension Projects in Zeerust, North West (2019), well as an Ecological Specialist opinion letter for the amendment of the SANSA Space Operations' environmental authorisation. Aidan is registered with the South African Council for Natural Scientific Professions (SACNASP) as a Candidate Natural Scientist (Cand.Sci.Nat. 121901) and with the International Association for Impact Assessments (IAIA).

#### Dr Alan Carter, Pr.Sci.Nat (Reviewer and Quality Control)

Alan is the executive of the CES East London Office. He holds a PhD in Marine Biology and is a Certified Public Accountant, with extensive training and experience in both financial accounting and environmental science disciplines with international accounting firms in South Africa and the USA. He has 25 years' experience in environmental management and has specialist skills in sanitation, coastal environments and industrial waste. Dr Carter is registered as a Professional Natural Scientist under the South African Council for Natural Scientific Professions (SACNASP). He is also registered as an EAP with the Environmental Assessment Practitioners Association of South Africa (EAPASA).

### 1.2 EXPERTISE

**Table 1.1: Ecological assessment projects the specialist has completed include:**

| NAME OF PROJECT  | DESCRIPTION OF RESPONSIBILITY | DATE COMPLETED |
|--|-------------------------------|----------------|
| Ecological Assessment for the Ramotshere Moiloa Local Municipality (RMLM) Berg and Drooge Street Residential Extension, Zeerust  | Ecologist                     | 2019           |
| Ecological Assessment for the RMLM Kort and Buiten Street Residential Extension, Zeerust   | Ecologist                     | 2019           |
| Ecological Assessment for the South African National Space Agency (SANSA) Proposed Development of Additional Satellite Antennae on Farm Hartebeeshoek 502 JQ, Gauteng. | Ecologist                     | 2020           |



### 1.3 DECLARATION

#### Mr Aidan Gouws

- I, Aidan Gouws, declare that, in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Amended Environmental Impact Assessment Regulations, 2017;
- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this report are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of specialist





## 2 INTRODUCTION

In terms of Appendix 6 of the 2014 NEMA EIA Regulations (2014, as amended) a specialist report must contain-

- (c) An indication of the scope of, and the purpose for which, the report was prepared;
- (cA) An indication of the quality and age of the base data used for the specialist report;
- (d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;
- (i) A description of any assumptions made and any uncertainties or gaps in knowledge;
- (o) A description of any consultation process that was undertaken during the course of preparing the specialist report;
- (p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto

### 2.1 PROJECT OVERVIEW AND LOCATION

The South African National Roads Agency SOC Ltd. (SANRAL) are proposing to upgrade National Route R52 Section 3 (R52-03), located between Koster (KM 0.0) and the N4 turnoff to Rustenburg (KM 38.7) in the North West Province (Figure 2.1). The carriageway is to be widened to accommodate passing lanes, where required, thus resulting in a carriageway of 15.4 m surfaced width, inclusive of 3.0 m surfaced shoulders. Included in the project are two river bridges, one road-over-rail Bridge and four major culverts that must be widened to accommodate the road cross section improvement.

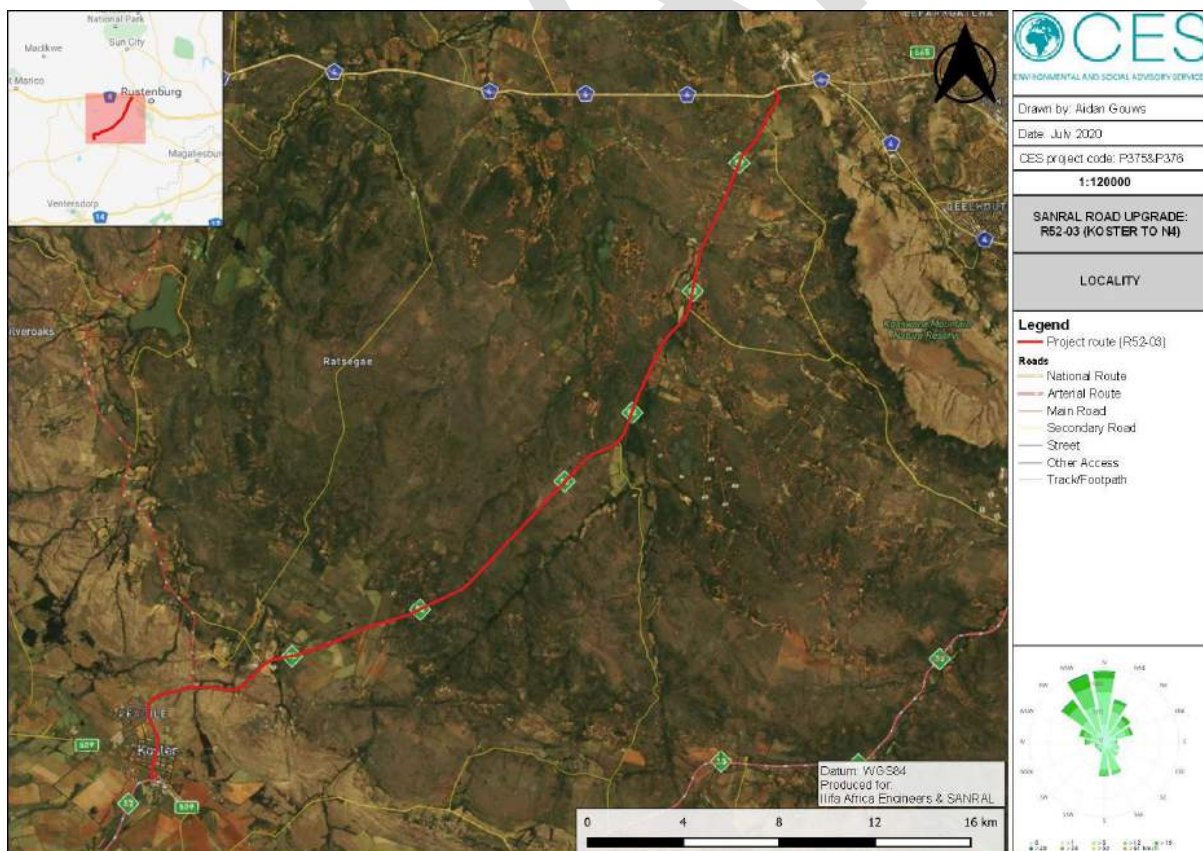


Figure 2.1: Locality map of the proposed development.



Major aspects of this project include the following:

#### 2.1.1 General road works

- Strengthening the existing pavement.
- General widening of the existing road cross section for climbing lanes and 3.0 m surfaced shoulders.
- Vertical and horizontal geometric improvements.
- Widening of existing river bridges and major and minor culverts.
- Possible horizontal re-alignment of the road between KM 0.00 to 0.500 and KM 38 to 38.70.
- Possible 6.5 m wide temporary deviation to accommodate two way traffic during construction.
- Possible opening of one hard-rock quarry and potential borrow pits.
- Stockpile areas and vegetation clearance inside or outside road reserve.

#### 2.1.2 Drainage and culverts

- Drainage forms an integral part of the rehabilitation and upgrade design.
- It is also assumed that the existing stormwater pipes and kerb inlets are not fully functional in the Koster Town and will thus require replacement.
- There are a number of pipe culverts present along the route which will have to be extended to ensure compliance with the widened cross section.

CES was appointed by Ilifa African Engineers (Pty) Ltd. on behalf of the South African National Roads Agency (SOC) Ltd. (SANRAL) to complete a Vegetation Impact Assessment that will provide input into the Basic Assessment (BA) Process.

## 2.2 ALTERNATIVES

There are no location or layout alternatives for the proposed road upgrade. The only alternative assessed for the proposed project is the status quo “No-go” alternative which has been assessed in this report.

## 2.3 PUBLIC PARTICIPATION

The Public Participation Process (PPP) followed to date has been described in detail in the Draft and Final BAR. The draft aquatic report (attached to the draft BAR) will undergo a formal 30-day public commenting and review period. All proof and correspondence to date is available in the draft and final BAR. No comments have been received to date that relates to the vegetation environment.

## 2.4 OBJECTIVES AND TERMS OF REFERENCE (TOR)

Taking into account the purpose of the specialist studies, the following activities are to be undertaken at a minimum:

- Undertake a desktop assessment of the biodiversity and conservation value of the study area in terms of the relevant conservation plans;
- Identify any significant landscape features of rare or important vegetation associations such as seasonal wetlands, seeps or rocky areas that might support rare or important species;



- Place the project area within the biodiversity context of the wider area (i.e. provide the “broad overview”);
- Describe the impacts of current land use, so that the potential impacts from the development on the natural environment can be understood in this context;
- Provide a detailed description of the vegetation within the area and immediately surrounding the footprint of the proposed road upgrade and consider terrestrial flora;
- Assess the extent of alien flora species over the site, and associated risks of alien invasion as a result of the project;
- Provide a sensitivity map of the concession area in order for the proponent to better place the layout of the project’s infrastructure;
- Review relevant legislation, policies, guidelines and standards;
- An assessment of the potential direct and indirect impacts resulting from the proposed road upgrade and associated infrastructure, both on the footprint and the immediate surrounding area during construction and operation;
- A detailed description of appropriate mitigation measures that can be adopted to reduce negative impacts for each phase of the project, where required;
- Address all ecological issues and concerns raised by I&APs during the Basic Assessment process;
- Checklists of floral groups identified in the region to date, highlighting sensitive species and their possible areas of distribution. This aspect of the report will specifically include the identification of:
  - Areas of high biodiversity;
  - The presence of species of conservation concern;
  - Habitat associations and conservation status of the identified flora;
  - The presence of areas sensitive to invasion by alien species; and
  - The presence of conservation areas and sensitive habitats where disturbance should be avoided or minimised.

## 2.5 ASSUMPTIONS AND LIMITATION

The following limitations and assumptions are implicit:

- The report is based on a project description provided by the client;
- Descriptions of the natural environments are based on limited fieldwork and available literature.
- Species of Conservation Concern (SCC) are difficult to find and difficult to identify, thus species described in this report do not comprise an exhaustive list. It is almost certain that additional SCCs will be found during construction and operation of the development.
- Sampling could only be carried out at one stage in the annual or seasonal cycle; and
- The site visit was initially scheduled for earlier in the year (late March to early April 2020). However, in response to the COVID-19 pandemic, the President of South Africa announced the implementation of a nationwide lockdown period during his national address on 23 March 2020. The lockdown imposed travel restrictions, which prevented the specialist from conducting the site visit prior to the easing of the restrictions. The site assessment was therefore conducted on 3 July 2020 during the dry (winter) season rather than during the wet season when many bushveld plants are flowering. Consequently, it is possible that some species have gone undetected.





### 3 RELEVANT LEGISLATION

Environmental legislation relevant to the proposed activity is summarised in Table 3.1 below.

**Table 3.1: Environmental legislation considered in the preparation of this report**

| LEGISLATION/POLICY   | DESCRIPTION   | RELEVANCE TO THE DEVELOPMENT  |
|--|---|---|
| <p><b>The Constitution</b></p>   | <p>The Constitution of the Republic of South Africa is the supreme law of the land. As a result, all laws, including those pertaining to this Management Plan, must conform to the Constitution. The Bill of Rights - Chapter 2 of the Constitution, includes an environmental right (Section 24) according to which, everyone has the right:</p> <p><i>a) To an environment that is not harmful to their health or well-being; and</i></p> <p><i>b) To have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that:</i></p> <p><i>i. Prevent pollution and ecological degradation;</i></p> <p><i>ii. Promote conservation; and</i></p> <p><i>iii. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.</i></p> | <ul style="list-style-type: none"> <li>- Obligation to ensure that the proposed activity will not result in pollution and ecological degradation; and</li> <li>- Obligation to ensure that the proposed development is ecologically sustainable, while demonstrating economic and social development.</li> </ul>  |
| <p><b>National Environmental Management Act (NEMA) (No. 108 of 1998), and its subsequent amendments.</b></p> | <p>The objective of NEMA is: <i>“To provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state; and to provide for matters connected therewith.”</i></p> <p>This report has been guided by the NEMA Principles detailed in Section 2 of the Act. NEMA introduces the “duty of care” concept, which is based on the policy of strict liability. This duty of care extends to the prevention, control and rehabilitation of significant pollution and environmental degradation. It also dictates a duty of care to address emergency incidents of pollution. A</p>   | <ul style="list-style-type: none"> <li>- The undertaking of a specialist study, in this case, the vegetation study, in order to identify potential impacts on the ecological environment and to recommend mitigation measures to minimise these impacts, complies with Section 28 of NEMA.</li> <li>- The developer must apply the NEMA principles, the fair decision-making and conflict management procedures that are provided for in NEMA.</li> </ul> |



| LEGISLATION/POLICY  | DESCRIPTION   | RELEVANCE TO THE DEVELOPMENT   |
|---|---|--|
|   | <p>failure to perform this duty of care may lead to criminal prosecution, and may lead to the prosecution of responsible persons, including companies, for the conduct of the legal persons.</p>  |  |
| <p><b>National Environmental Management Act (NEMA): Environmental Impact Assessment (EIA) Regulations (2014) and its subsequent amendments.</b></p> | <p>The NEMA EIA Regulations (2014, as amended) aim to avoid detrimental environmental impacts through the regulation of specific activities that cannot commence without prior environmental authorisation. Authorisation either requires a Basic Assessment or a Full Scoping and Environmental Impact Assessment, depending on the type of activity. These assessments specify mitigation and management guidelines to minimise negative environmental impacts and optimise positive impacts. Should any portion of an area be proposed for development (after proclamation) these Regulations should be consulted.</p>   | <ul style="list-style-type: none"> <li>- An application for Environmental Authorisation (as triggered by the EIA 2014 Regulations, as amended) is required to be submitted to the Competent Authority.</li> <li>- This report complies with Appendix 6 of the EIA 2014 Regulations, as amended (GNR. 326 of 2017) as regulated by NEMA (Act 107 of 1998, as amended), which cover the requirements of the content of a Specialist Report.</li> </ul> |
| <p><b>National Environmental Management: Protected Areas Act (No. 57 of 2003), and its subsequent amendments.</b></p>                               | <p>The National Environmental Management: Protected Areas Act (NEMPAA), No. 57 of 2003, aims to protect, conserve and manage ecologically viable areas that represent South Africa's biological diversity; this is achieved through a network of representative protected areas on state, private and communal land.</p>  | <ul style="list-style-type: none"> <li>- The proposed activity is not situated within any National, Provincial or Local Protected areas.</li> </ul>  |
| <p><b>National Environmental Management: Biodiversity Act (No. 10 of 2004), and its subsequent amendments.</b></p>                                  | <p>The National Environmental Management: Biodiversity Act (NEMBA), No. 10 of 2004, aims to assist with the management and conservation of South Africa's biological diversity through the use of legislated planning tools. These planning tools include the declaration of bioregions and the associated bioregional plans as well as other mechanisms for managing and conserving biodiversity. The objectives of the Act include inter alia:</p> <ul style="list-style-type: none"> <li>• The management and conservation of biological diversity within the Republic and of the components of such biological diversity;</li> <li>• The use of indigenous biological resources in a suitable manner;</li> <li>• The fair and equitable sharing of benefits arising from bio-prospecting of genetic material derived from indigenous biological resources; and</li> </ul> | <ul style="list-style-type: none"> <li>- Activities may not be carried out in threatened or protected ecosystems without first gaining authorisation for such activities.</li> <li>- Mthatha Moist Grassland (Gs 14), which is a listed threatened ecosystem, has a threat status of Vulnerable (VU).</li> <li>- No protected species may be removed or damaged without a permit.</li> </ul>   |



| LEGISLATION/POLICY   | DESCRIPTION   | RELEVANCE TO THE DEVELOPMENT |
|--|---|------------------------------|
|  | <ul style="list-style-type: none"> <li>• To give effect to ratified international agreements relating to biodiversity which are binding on the Republic.</li> <li>• To provide for co-operative governance in biodiversity management and conservation; and</li> <li>• To provide for a South African National Biodiversity Institute to assist in achieving the objectives of the Act.</li> </ul> <p>In addition to this, Sections 50-62 of the Act provide details relating to the protection of threatened or protected ecosystems and species, while Sections 63-77 of the Act provide details relating to alien and invasive species with the purpose of preventing their introduction and spread, managing, controlling and eradicating of alien and invasive species.</p>  |                              |
| <p><b>NEMBA National List of Threatened Ecosystems (GNR 1002 of 9 December 2011)</b></p> | <p>The National List of Ecosystems is in place for the ecosystems that are threatened and in need of protection. The NEMBA provides for listing of threatened or protected ecosystems in one of the following categories:</p> <ul style="list-style-type: none"> <li>• Critically endangered (CR) ecosystems, being ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation;</li> <li>• Endangered (EN) ecosystems, being ecosystems that have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems;</li> <li>• Vulnerable (VU) ecosystems, being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems;</li> <li>• Protected ecosystems, being ecosystems that are of high conservation value or of high national or provincial importance, although they are not listed as critically endangered, endangered or vulnerable.</li> </ul> |                              |



| LEGISLATION/POLICY  | DESCRIPTION  | RELEVANCE TO THE DEVELOPMENT  |
|---|--|---|
| <p><b>NEMBA: Alien Invasive Species Regulations (2014)</b></p>                    | <p>Invasive alien species are plants, animals and microbes that are introduced into countries, and then out-compete the indigenous species. Invasive alien species are cause billions of Rands of damage to South Africa’s economy on an annual basis and are a major threat to the country’s biological biodiversity.</p> <p>The Alien and Invasive Species Regulations (2014) categorises the different types of alien and invasive plant and animal species and how they should be managed:</p> <ul style="list-style-type: none"> <li>• Category 1a Listed Invasive Species – species which must be <u>combatted or eradicated</u>.</li> <li>• Category 1b Listed Invasive Species – species which must be <u>controlled</u>.</li> <li>• Category 2 Listed Invasive Species – species which <u>require a permit</u> and must not be allowed to spread outside of the designated area.</li> <li>• Category 3 Listed Invasive Species – species which are <u>subject to exemptions</u> in terms of section requiring a permit, but where such a species occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.</li> </ul> | <ul style="list-style-type: none"> <li>- An invasive species management, control and eradication plan for land/activities under their control should be developed, as part of their environmental plans in accordance with section 11 of NEMA.</li> </ul>   |
| <p><b>National Forest Act (Act 84 of 1998) and its subsequent amendments.</b></p> | <p>The NFA provides the legal framework for the protection and sustainable use of South Africa’s indigenous forests. Any area that has vegetation which is characterised by a closed and contiguous canopy and under storey plant establishment is defined as a ‘forest’ and as a result falls under the authority of the Department of Agriculture, Forestry and Fisheries (DAFF): Forestry sector. A clause in Chapter 3, Part 1 covers:</p> <p><u>Prohibition on destruction of trees in natural forests</u><br/>Section 7 (1) No person may cut, disturb, damage or destroy any indigenous living tree in, or remove or receive any such tree from, a natural forest except in terms of (a) a licence issued under subsection (4) or section 23.</p>   | <ul style="list-style-type: none"> <li>- No forest or trees that form part of a forest or forest association may be damaged or destroyed without a permit.</li> <li>- Development that comes within 50 metres of forest must be closely monitored during the construction phase.</li> <li>- No forest patches were identified within the construction footprint.</li> <li>- No protected tree species were identified on site.</li> </ul> |



| LEGISLATION/POLICY | DESCRIPTION   | RELEVANCE TO THE DEVELOPMENT |
|--------------------|---|------------------------------|
|                    | <p><u>Prohibition on destruction of protected trees</u><br/>           Section 15 (1) No person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate, or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated.</p> <p><u>Effect of setting aside protected areas</u><br/>           Section 10 (1) No person may cut, disturb, damage or destroy any forest produce in, or remove or receive any forest produce from, a protected area, except—</p> <ul style="list-style-type: none"> <li>(a) in terms of the rules made for the proper management of the area in terms of section 11(2)(b);</li> <li>(b) in the course of the management of the protected area by the responsible organ of State or person;</li> <li>(c) in terms of a right of servitude;</li> <li>(d) in terms of the authority of a licence granted under section 7(4) or 23;</li> <li>(e) in terms of an exemption under section 7(1)(b) or 24(6); or</li> </ul> <p>in the case of a protected area on land outside a State forest, with the consent of the registered owner or by reason of another right which allows the person concerned to do so, subject to the prohibition in section 7(1).</p> |                              |



| LEGISLATION/POLICY   | DESCRIPTION  | RELEVANCE TO THE DEVELOPMENT   |
|--|--|--|
| <b>Conservation of Agricultural Resources Act, (No. 43 of 1983).</b>                       | <p>The Conservation of Agricultural Resources Act, No. 43 of 1983 aims to control over-utilisation of the natural agricultural resources to promote the conservation of soil, water sources and vegetation through the combat of weeds and invader plants. Regulations 15 and 16 under this Act, which relate to problem plants, were amended in March 2001.</p> <p>This is achieved by:</p> <ul style="list-style-type: none"> <li>• Production potential of land is maintained,</li> <li>• Preventing and combating erosion,</li> <li>• Preventing and combating weakening or destruction of the water sources, and</li> <li>• Protecting vegetation and combating of weeds and invader plants.</li> </ul> | <p>- It should be noted that the CARA regulations for the legal obligations regarding alien invasive plants in South Africa have been superseded by the National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004) – Alien and Invasive Species (AIS) Regulations which was promulgated on 1 October 2014. However, CARA has not been repealed and is still included as a reference point to use in terms of the management of AIS where certain species may not be included in the NEM:BA AIS list.</p> |
| <b>National Veld and Forest Fire Act (No. 101 of 1998), and its subsequent amendments.</b> | <p>The National Veld and Forest Fire Act, No. 101 of 1998 (amended in 2001), aims to prevent and combat forest, veld and mountain fires throughout South Africa. This includes the regulation of the establishment, registration, functioning and duties of Fire Protection Associations (FPAs). FPAs manage all aspects of forest, veld and mountain fire prevention and firefighting.</p>  | <p>- The development should take note of the Act.</p>  |



## 4 ASSESSMENT METHODOLOGY

In terms of Appendix 6 of the 2014 NEMA EIA Regulations (2014, as amended) a specialist report must contain-

(e) A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;

### 4.1 THE ASSESSMENT APPROACH

The aim of this assessment is to evaluate the condition of the vegetation on site. The project site and surrounding areas were described using a two-phased approach. Firstly, a desktop assessment of the site was conducted in terms of current vegetation classifications and biodiversity programmes and plans. For the terrestrial flora, the consideration of the following has been included:

- The South African Vegetation Map (Mucina and Rutherford, 2018);
- The North West Biodiversity Sector Plan (NW BSP) (2015); and
- Council for Geoscience (2013) South African Geology;
- Soil and Terrain (SOTER) Database of South Africa (2008);
- Review of the SANBI Red Data List;
- Available literature on the regional vegetation.

Further to the above, a site visit was conducted in winter on 3 July 2020 to assess the site-specific ecological state, current land-use, identify potential sensitive ecosystems and identify plant species associated with the proposed project activities. The site visit also served to identify potential impacts of the proposed development and its impact on the surrounding ecological environment. Information on the general area and plant species was also generated using historical records for the area. This information has been used to supplement the findings of this report.

A Geographical Information System (GIS) map was then drawn up depicting the different zones of sensitivity using available aerial imagery and relating this to the information gathered from the field survey.

It is not the aim of this study to produce a complete list of all plant species occurring in the region, but rather to examine a representative sample. It is however, important to note that areas of high sensitivity as well as SCC have been identified as far as possible, either from records from the site or a review of their habitat requirements, and whether or not these habitats occur within the site.

### 4.2 SPECIES OF CONSERVATION CONCERN

Data on the known distribution and conservation status for each potential plant SCC needs to be obtained in order to develop a list of SCC. These plant species are those that are subject to significant impacts from the proposed activity. In general, these will be species that are already known to be threatened or at risk. Efforts to provide the conservation status (SA 'red list' status) of individual species may provide additional valuable information on SCC (see <http://redlist.sanbi.org>). SCC have been identified by means of a combination of applicable legislation, guidelines and conservation status lists. The following lists were utilised to cross reference conservation and protection statuses of various species:

- National Environmental Management: Biodiversity Act (No. 10 of 2004) - Chapter 4, Part 2;
- North West Biodiversity Management Act (NWBMA, No 4. of 2016) Schedule 2 – List of Specially Protected Species;





- 1976 List of Protected Trees (Government Gazette No. 9542 Schedule A) in the 1998 National Forest Act (NFA) as amended in November 2014; and
- SA Red Data List.

The South African Red Data List of plants use the internationally recognised IUCN Red List Categories and Criteria to measure a species risk of extinction. Since the Red List of South African plants are used widely for conservation practices throughout South Africa, this list has been modified to identify species that are at low risk of extinction but of high conservation importance.

Species that are afforded special protection, which are protected by the Threatened or Protected Species (TOPS) list and by Schedule of the NWBMA (No 4. of 2016) are also regarded as SCC.

#### 4.3 SAMPLING PROTOCOL

A drive through along the length of the road was conducted. The aim of this visit was to characterise and describe vegetation communities within the study area as well as identifying areas of high sensitivity and species of conservation concern. Visible species within the study area were identified using plant field guides and published literature .

Vegetation types within the study area were assessed and surveyed and vegetation communities were then described according to the dominant species recorded from each type. These were mapped and assigned a sensitivity score.

#### 4.4 VEGETATION MAPPING

The SANBI National Vegetation Map (2018) was used to describe the vegetation types found within the proposed development area. This is the third and latest update to the original 2006 Vegetation Map of South Africa, Lesotho and Swaziland. Changes made in the 2009 and 2012 versions were retained and additional portions of the 2006 map have been mapped at a finer scale, with 47 new vegetation types mapped since 2012 (SANBI, 2018). The map and accompanying book describes each vegetation type in detail, along with the most important species including endemic species and those that are biogeographically important. This is the most comprehensive data for vegetation types in South Africa.

The vegetation map was then compared to actual conditions of vegetation observed onsite during the site assessment through mapping from aerial photographs, satellite images, literature descriptions (e.g. SANBI and NWBSP) and related data gathered on the ground.

#### 4.5 SENSITIVITY ASSESSMENT

The sensitivity assessment approach entails identifying zones of high, moderate and low sensitivity according to a system developed by CES and used in numerous ecological studies. It must be noted that the sensitivity zonings in this study are based solely on ecological characteristics and social and economic factors have not been taken into consideration. The sensitivity analysis described here is based on 11 criteria which are considered to be of importance in determining ecosystem and landscape sensitivity. The method predominantly involves identifying sensitive vegetation or habitat types, topography and land transformation, biodiversity patterns (hotspots) and biodiversity process areas (ecological infrastructure and corridors) (Table 4.1).

Although very simple, this method of analysis provides a good, yet conservative and precautionary assessment of the ecological sensitivity.





Table 4.1 Criteria used for the analysis of the sensitivity of the site.

| CRITERIA |   | LOW SENSITIVITY   | MODERATE SENSITIVITY   | HIGH SENSITIVITY   |
|----------|---|---|--|--|
| 1        | <b>Topography</b>   | Level or even   | Undulating; fairly steep slopes  | Complex and uneven with steep slopes   |
| 2        | <b>Vegetation</b> - Extent or habitat type in the region                                | Extensive   | Restricted to a particular region / zone   | Restricted to a specific locality / site   |
| 3        | <b>Conservation status</b> of fauna / flora or habitats                                 | Well conserved independent of conservation value  | Not well conserved, moderate conservation value  | Not conserved - has a high conservation value  |
| 4        | <b>Species of special concern</b> - Presence and number                                 | None, although occasional regional endemics   | No endangered or vulnerable species, some indeterminate or rare endemics                           | One or more endangered and vulnerable species, or more than 2 endemics or rare species                   |
| 5        | <b>Habitat fragmentation</b> leading to loss of viable populations                      | Extensive areas of preferred habitat present elsewhere in region not susceptible to fragmentation | Reasonably extensive areas of preferred habitat elsewhere and habitat susceptible to fragmentation | Limited areas of this habitat, susceptible to fragmentation  |
| 6        | <b>Biodiversity contribution</b>  | Low diversity or species richness   | Moderate diversity, and moderately high species richness   | High species diversity, complex plant and animal communities   |
| 7        | <b>Erosion potential</b> or instability of the region                                   | Very stable and an area not subjected to erosion  | Some possibility of erosion or change due to episodic events                                       | Large possibility of erosion to the site or destruction due to climatic or other factors                 |
| 8        | <b>Rehabilitation potential</b> of the area or region                                   | Site is easily rehabilitated  | There is some degree of difficulty in rehabilitation of the site                                   | Site is difficult to rehabilitate due to the terrain, type of habitat or species required to reintroduce |
| 9        | <b>Disturbance</b> due to human habitation or other influences (alien invasive species) | Site is very disturbed or degraded  | There is some degree of disturbance of the site  | The site is hardly or very slightly impacted upon by human disturbance                                   |
| 10       | <b>Ecological function</b> in the landscape (corridor, niche habitats)                  | Low ecological function. No corridors or niche habitats   | N/A (There are NO moderate ecological functions. It is considered either high or low)              | High ecological function. Portions of entire sections of the site contains corridors or niche habitats   |
| 11       | <b>Ecological services</b> (food, water filter, grazing, etc.)                          | Low to no ecological services on site   | Some sections of the site contain ecological services  | Most of the site contains ecological services  |

A sensitivity map was developed with the aid of a satellite image so that the sensitive regions and vegetation types could be plotted (see Chapter 6). The following was also taken into account:



#### 4.5.1 Biodiversity Legislation and Policy

Relevant legislation and policy also inform the level of sensitivity of the receiving environment. Specific publications are mentioned below, while a full legislative review is provided in Section 3 of this report.

##### **Relevant National legislation:**

The National Environmental Management: Biodiversity Act, (Act No. 10 OF 2004) (NEM:BA) provides a National List of Ecosystems that are threatened and in need of protection – GN 1002 of 2011. These areas are included in the sensitivity map.

##### **Provincial Policy – The North West Biodiversity Sector Plan (NW BSP)**

The NW BSP (2015) is a biodiversity and spatial planning tool, which outlines areas containing important biodiversity needed to meet national and provincial biodiversity targets. This is achieved by identifying a network of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the province based on a systematic biodiversity plan. In general, CBAs are described as natural or near-natural areas that are important for preserving both biodiversity pattern and ecological process, whereas ESAs are semi-natural or transformed areas that at least retain some ecological function (Table 4.2). More than half of the province is covered by CBAs (29.1%) and ESAs (27.6%) collectively, with the remainder covered by Other Natural Areas (18%), areas with no natural habitat remaining (23%) and a small portion covered by Protected Areas (2.3%).

**Table 4.2 Categories in the NW BSP (2015).**

| CATEGORY        | MANAGEMENT OBJECTIVES  |
|-----------------|--|
| Protected areas | As per protected areas management plan   |
| CBA1            | <p><b>Maintain in a natural or near-natural state that maximises the retention of biodiversity pattern and ecological process:</b></p> <ul style="list-style-type: none"> <li>Ecosystems and species fully or largely intact and undisturbed.</li> <li>These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets. If the biodiversity features targeted in these areas are lost then targets will not be met.</li> <li>These are biodiversity features that are at, or beyond, their limits of acceptable change.</li> </ul>  |
| CBA2            | <p><b>Maintain in a natural or near-natural state that maximises the retention of biodiversity pattern and ecological process:</b></p> <ul style="list-style-type: none"> <li>Ecosystems and species fully or largely intact and undisturbed.</li> <li>Areas with intermediate irreplaceability or some flexibility in terms of meeting biodiversity targets. There are options for loss of some components of biodiversity in these landscapes without compromising the ability to achieve biodiversity targets, although loss of these sites would require alternative sites to be added to the portfolio of CBAs.</li> <li>These are biodiversity features that are approaching but have not passed their limits of acceptable change.</li> </ul> |
| ESA1            | <p><b>Maintain in at least a semi-natural state as ecologically functional landscapes that retain basic natural attributes:</b></p>  |



| CATEGORY   | MANAGEMENT OBJECTIVES  |
|--|--|
|  | <ul style="list-style-type: none"> <li>• Ecosystem still in a natural, near-natural state or semi-natural state, and has not been previously developed.</li> <li>• Ecosystems moderately to significantly disturbed but still able to maintain basic functionality.</li> <li>• Individual species or other biodiversity indicators may be severely disturbed or reduced.</li> <li>• These are areas with low irreplaceability with respect to biodiversity pattern targets only.</li> </ul>  |
| ESA2   | <p><b>Maintain as much ecological functionality as possible (generally these areas have been substantially modified):</b></p> <ul style="list-style-type: none"> <li>• Maintain current land use or restore area to a natural state.</li> <li>• Ecosystem NOT in a natural or near-natural state</li> <li>• Ecosystem significantly disturbed but still able to maintain some ecological functionality.</li> <li>• Individual species or other biodiversity indicators are severely disturbed or reduced and these are areas that have low irreplaceability with respect to biodiversity pattern targets only;</li> <li>• These are areas with low irreplaceability with respect to biodiversity pattern targets only. These areas are required to maintain ecological processes especially landscape connectivity.</li> </ul> |
| Other Natural Areas and No Natural Habitat Remaining | <p><b>Production landscapes</b></p> <ul style="list-style-type: none"> <li>• Manage land to optimise sustainability utilisation of natural areas</li> </ul>  |

4.5.2 Protected Areas

The National Environmental Management Protected Areas Act (Act No 57 of 2003; NEMPAA) was developed to provide for the protection and conservation of ecologically viable areas representative of South Africa’s biological diversity and its natural landscapes and seascapes. All protected areas within 15km of the study site were listed. Impacts were identified and mitigations proposed.

The goal of the National Protected Areas Expansion Strategy (NPAES) is to achieve cost-effective protected area expansion for ecological sustainability and increased resilience to climate change. It sets targets for protected area expansion, provides maps of the most important areas for protected area expansion, and makes recommendations on mechanisms for protected area expansion. The NPAES has classified protected areas into three categories: formally protected areas, informally protected areas and focus areas. Focus areas are large, intact and unfragmented areas suitable for the creation or expansion of large protected areas.



## 4.6 IMPACT ASSESSMENT

CES has developed the following impact rating methodology which has been developed in line with Appendix 6 and the impact ratings required in Appendix 1 and 3 of the EIA Regulations (2014, as amended). This scale takes into consideration the following variables:

**Nature:** negative or positive impact on the environment.

**Type:** direct, indirect and/or cumulative effect of impact on the environment.

**Significance:** The criteria in Table 4.3 are used to determine the overall significance of an activity. The impact effect (which includes duration; extent; consequence and probability) and the reversibility/mitigation of the impact are then read off the significance matrix in order to determine the overall significance of the issue. The overall significance is either negative or positive and will be classified as low, moderate or high (Table 4.3).

**Consequence:** the consequence scale is used in order to objectively evaluate how severe a number of negative impacts might be on the issue under consideration, or how beneficial a number of positive impacts might be on the issue under consideration.

**Extent:** the spatial scale defines the physical extent of the impact.

**Duration:** the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.

**Probability:** the likelihood of impacts taking place as a result of project actions arising from the various alternatives. There is no doubt that some impacts would occur (e.g. loss of vegetation), but other impacts are not as likely to occur (e.g. vehicle accident), and may or may not result from the proposed development and alternatives. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

**Reversibility:** The degree to which an environment can be returned to its original/partially original state.

**Irreplaceable loss:** The degree of irreplaceable loss which an impact may cause, e.g. loss of non-regenerative vegetation or removal of rocky habitat or destruction of wetland.

**Mitigation potential:** The degree of difficulty of reversing and/or mitigating the various impacts ranges from very difficult to easily achievable. The four categories used are listed and explained in Table 4.3 below. Both the practical feasibility of the measure, the potential cost and the potential effectiveness is taken into consideration when determining the appropriate degree of difficulty.

**Table 4.3: Impact rating methodology.**

| CRITERIA       | CATEGORIES | DESCRIPTION  |
|----------------|------------|--|
| Overall nature | Negative   | Beneficial/positive impact.  |
|                | Positive   | Detrimental/negative impact.   |
| Type           | Direct     | Direct interaction of an activity with the environment.  |
|                | Indirect   | Impacts on the environment that are not a direct result of the project or activity.                  |
|                | Cumulative | Impacts which may result from a combination of impacts of this project and similar related projects. |



| CRITERIA           | CATEGORIES                  | DESCRIPTION  |
|--------------------|-----------------------------|--|
| Duration           | Short term                  | Less than 5 years.   |
|                    | Medium term                 | Between 5-20 years.  |
|                    | Long term                   | More than 20 years.  |
|                    | Permanent                   | Over 40 years or resulting in a permanent and lasting change that will always be there.                            |
| Extent             | Localised                   | Impacts affect a small area of a few hectares in extent. Often only a portion of the project area.                 |
|                    | Study area                  | The proposed site and its immediate environments.  |
|                    | Municipal                   | Impacts affect the municipality, or any towns within the municipality.   |
|                    | Regional                    | Impacts affect the wider district municipality or the North West Province as a whole.                              |
|                    | National                    | Impacts affect the entire country.   |
| Consequence        | Slight                      | Slight impacts or benefits on the affected system(s) or party(ies).  |
|                    | Moderate                    | Moderate impacts or benefits on the affected system(s) or party(ies).  |
|                    | Severe/Beneficial           | Severe impacts or benefits on the affected system(s) or party(ies).  |
| Probability        | Definite                    | More than 90% sure of a particular fact. Should have substantial supportive data.                                  |
|                    | Probable                    | Over 70% sure of a particular fact, or of the likelihood of that impact occurring.                                 |
|                    | Possible                    | Only over 40% sure of a particular fact, or of the likelihood of an impact occurring.                              |
|                    | Unsure                      | Less than 40% sure of a particular fact, or of the likelihood of an impact occurring.                              |
| Reversibility      | Reversible                  | The activity will lead to an impact that can be reversed provided appropriate mitigation measures are implemented. |
|                    | Irreversible                | The activity will lead to an impact that is permanent regardless of the implementation of mitigation measures.     |
| Irreplaceable Loss | Resource will not be lost   | The resource will not be lost/destroyed provided mitigation measures are implemented.                              |
|                    | Resource may be partly lost | The resource will be partially destroyed even though mitigation measures are implemented.                          |



| CRITERIA                    | CATEGORIES                   |                          | DESCRIPTION  |
|-----------------------------|------------------------------|--------------------------|--|
|                             | <b>Resource will be lost</b> |                          | The resource will be lost despite the implementation of mitigation measures.   |
| <b>Mitigation Potential</b> | <b>Easily achievable</b>     |                          | The impact can be easily, effectively and cost effectively mitigated/reversed.   |
|                             | <b>Achievable</b>            |                          | The impact can be effectively mitigated/reversed without much difficulty or cost.  |
|                             | <b>Difficult</b>             |                          | The impact could be mitigated/reversed but there will be some difficulty in ensuring effectiveness and/or implementation, and significant costs.         |
|                             | <b>Very Difficult</b>        |                          | The impact could be mitigated/reversed but it would be very difficult to ensure effectiveness, technically very challenging and financially very costly. |
| <b>Impact Significance</b>  | <b>Low negative</b>          | <b>Low positive</b>      | Largely of HIGH mitigation potential, after considering the other criteria.  |
|                             | <b>Moderate negative</b>     | <b>Moderate positive</b> | Largely of MODERATE or partial mitigation potential after considering the other criteria.  |
|                             | <b>High negative</b>         | <b>High positive</b>     | Largely of LOW mitigation potential after considering the other criteria.  |





## 5 DESCRIPTION OF THE BIOPHYSICAL ENVIRONMENT

In terms of Appendix 6 of the 2014 NEMA EIA Regulations (2014, as amended) a specialist report must contain-

- (f) Details of an assessment of a specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying alternatives;
- (g) An identification of any areas to be avoided, including buffers;
- (h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers.

### 5.1 DESKTOP INVESTIGATION

#### 5.1.1 Climate

The R52 road section is situated in the Greater Rustenburg region of the North West Province, characterised by a warm and temperate climate, with cool dry winters and warm wet summers (Figure 5.1). Koster primarily receives summer rainfall, approximately 512 mm annually, with the minimum rainfall recorded in June (0 mm) and the maximum rainfall recorded in January (101 mm). Mean annual temperatures for the project region ranges from 17.4 °C in June to 28.5 °C in July, with the coldest temperatures averaging 0 °C during the night in July (SA Explorer, 2018).

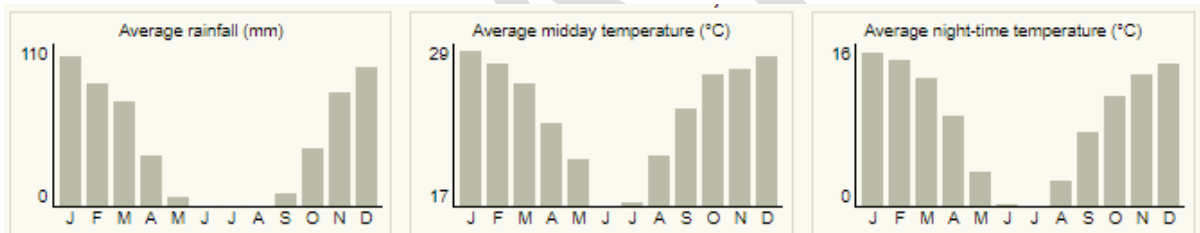


Figure 5.1: Climatic data for Koster (saexplorer, 2018).

#### 5.1.2 Topography

The topography of the region is characterised by plains, undulating slopes and rocky ridges (Mucina & Rutherford, 2018). The elevation along the R52 increases from approximately 1590 m in Koster to 1632 m then decreases gradually, with several fluctuations, to 1164 m towards KM 35, then increases to approximately 1200 m at the N4 intersection at KM 38 (Figure 5.2 and Figure 5.3).



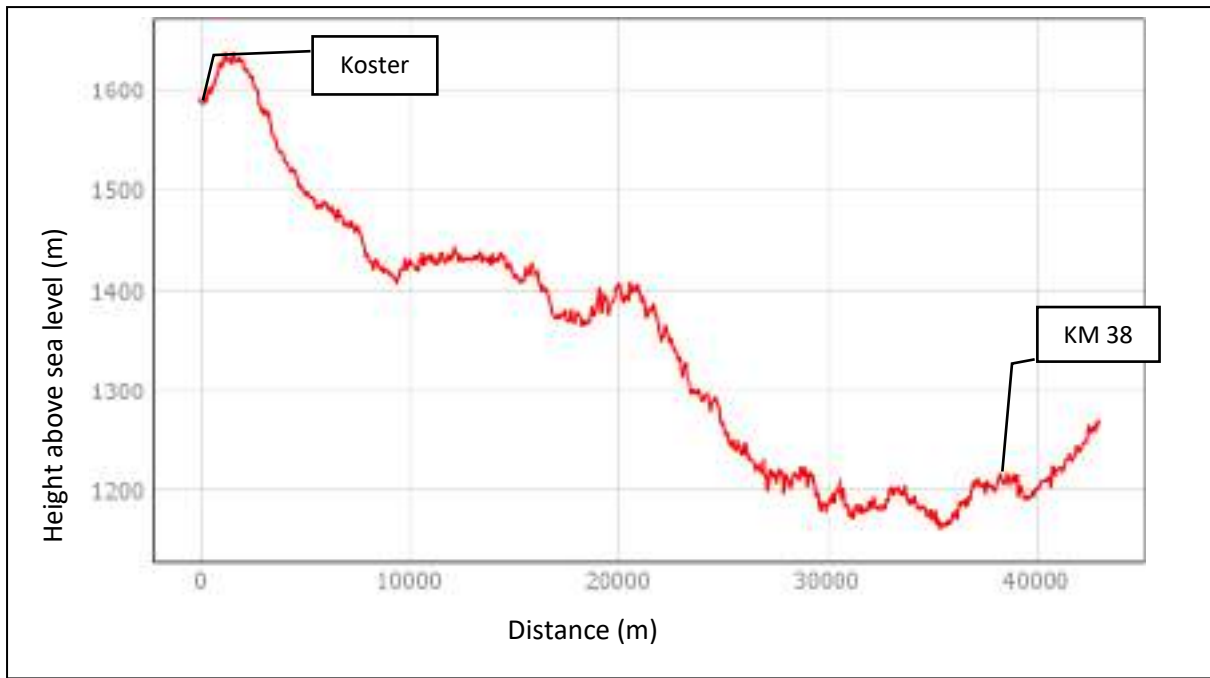


Figure 5.2: Topographic profile of the project region along the R52 road.

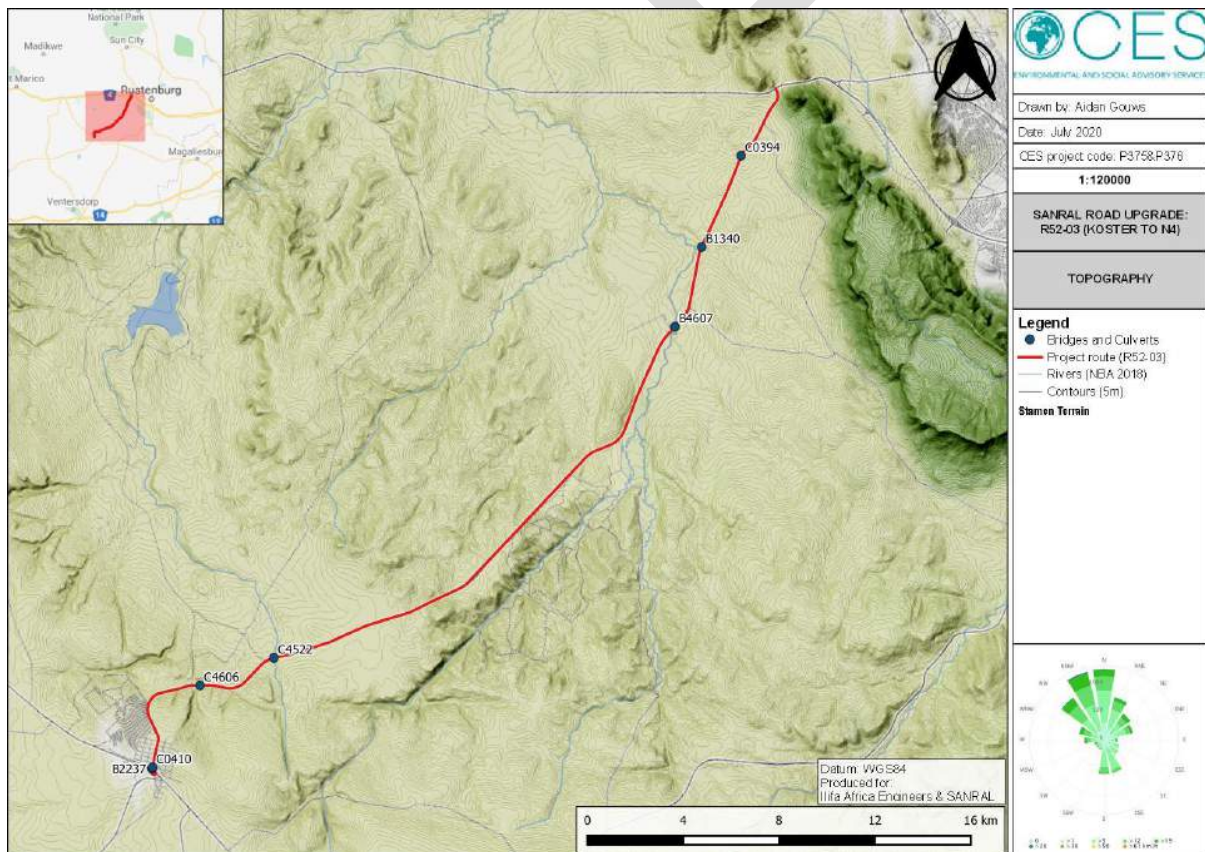


Figure 5.3: Topographic map of the project region along the R52 road.





### 5.1.3 Geology and Soils

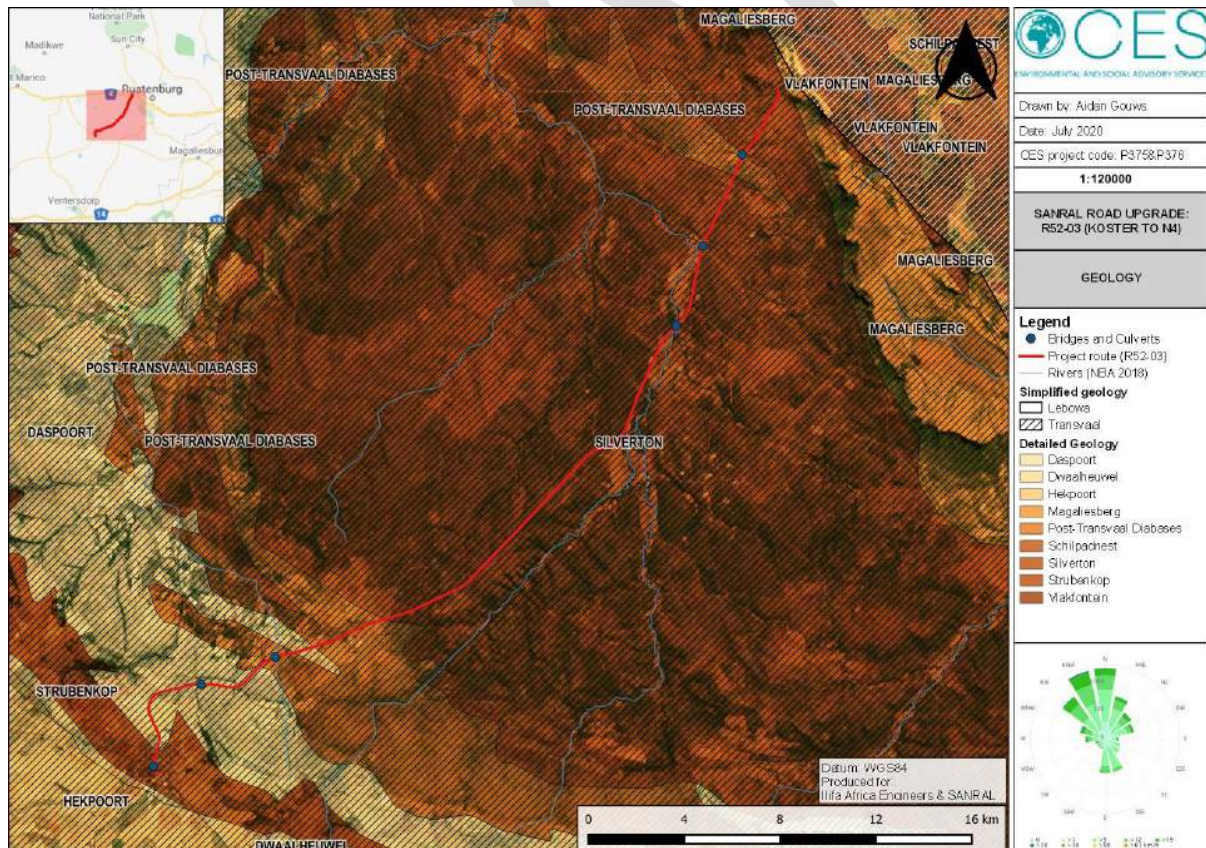
The geology of the study area consists entirely of igneous, sedimentary and metamorphic rocks from the Transvaal Supergroup. A detailed geological overview of the area further shows that the R52 study area crosses a range of geological subgroups, primarily the Silverton Shale Formation (Figure 5.4). The soil map indicates that the project area occurs mainly on minimally developed, shallow soils (LP2 - Leptosols) and well-drained, reddish soils (NT - Nitisols), with a small portion occurring on reddish, yellow soils with a low–medium base status (PT1 - Plinthosols) in Koster (Table 5.1 and Figure 5.5).

**Table 5.1: Generalised soil patterns along the R52 project region.**

| TYPE | DESCRIPTION  |
|------|--|
| PT1  | Red, yellow and/or greyish soils with low to medium base status.   |
| LP2  | Soils with minimal development, usually shallow, on hard or weathering rock, with or without intermittent diverse soils. Lime generally present in part or most of landscape.                          |
| NT   | Well drained, dark reddish soils having a pronounced shiny, strong blocky structure (nutty), usually fine (red structured soils). In addition, one or more of vertic and melanic soils may be present. |

### 5.1.4 Land Cover and Use

The primary land cover and use within the area is mixture of mainly grasslands and cultivated land in the northern areas towards the N4 turnoff, dense and open bush in the central areas, and various cultivated and urban land uses in the southern areas towards Koster town (Figure 5.6).



**Figure 5.4: Geology map of the project region along the R52 road (Source: AGIS, 2017).**



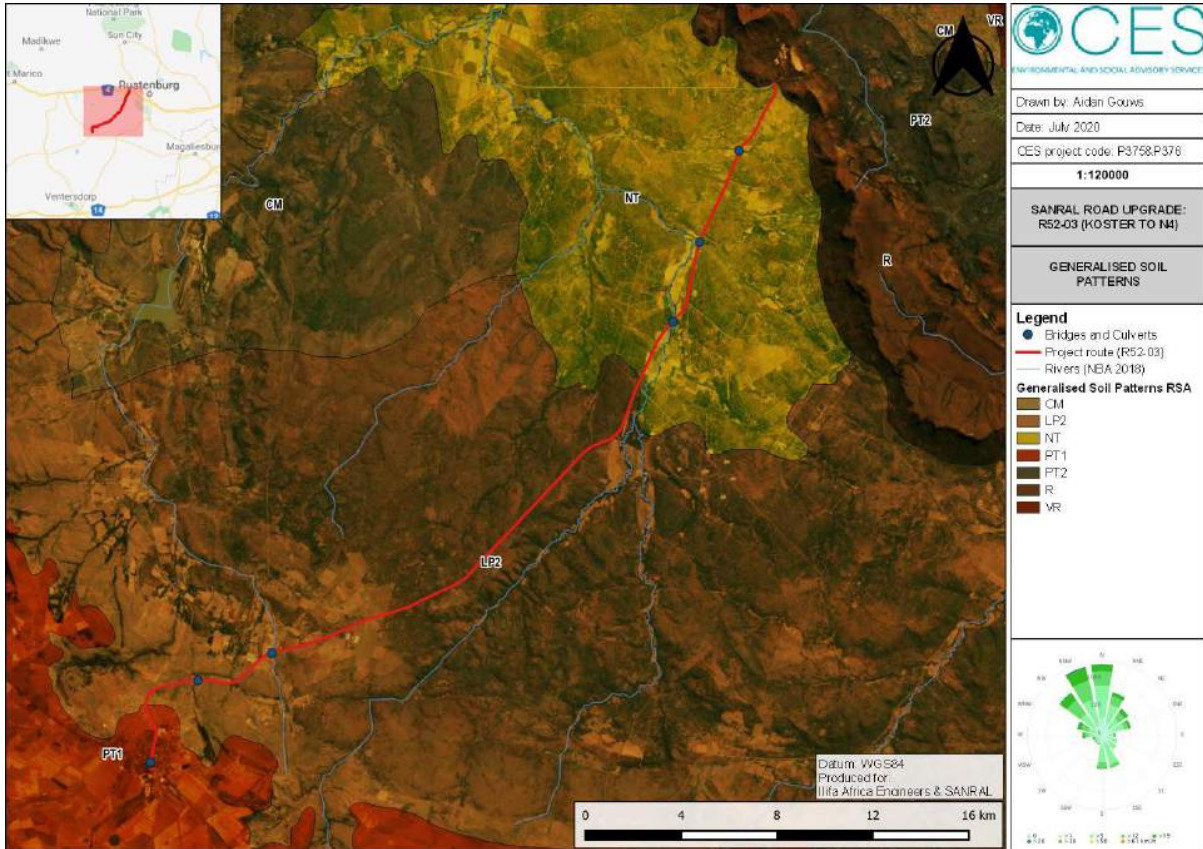


Figure 5.5: Generalised soil patterns map of the project region along the R52 road (Source: AGIS, 2017).

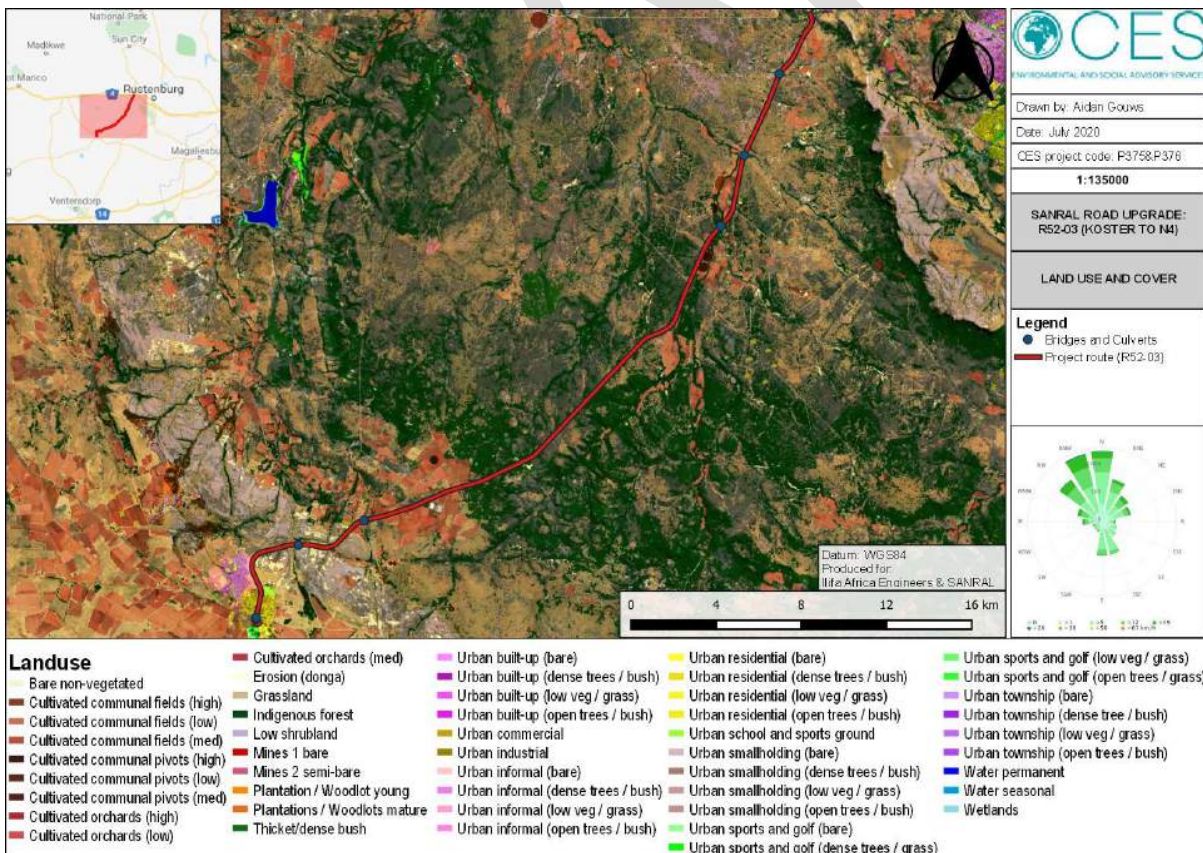


Figure 5.6: Land use map of the project region along the R52 road.



### 5.1.5 Vegetation and Floristics

#### 5.1.5.1 National Vegetation Map

The vegetation types found in the area include the Rand Highveld Grassland, Gold Reef Mountain Bushveld, Moot Plains Bushveld and Zeerust Thornveld in the Grasslands and Savanna biomes (Mucina & Rutherford, 2018; SANBI, 2018) (Figure 5.7). The different vegetation types are summarised below:

#### **Rand Highveld Grassland**

Rand Highveld Grasslands are found along rocky ridges eastward from Pretoria (Gauteng) to Witbank, Stoffberg and Roosenekal (Mpumalanga) and westward from Krugersdorp (Gauteng) towards Derby and Potchefstroom in the North West Province (Mucina & Rutherford, 2018). The undulating plains and ridged landscape are populated by species-rich vegetation of alternating sour grasslands (e.g. *Themeda* spp., *Eragrostis* spp. and *Heteropogon* spp.) and sour shrublands (e.g. *Rhus* spp.), respectively. Woodland species can also be found on rocky hills (e.g. *Protea caffra*, *Protea welwitschii* and *Senegalia caffra* and Asterid herbaceous species are particularly diverse in the area (Mucina & Rutherford, 2018). The rocky ridges are comprised of quartzite from the Witwatersrand and Transvaal Supergroups, with shallow Glenrosa and Mispah soil, generally of the Ba, Bc, Bb and Ib type (Mucina & Rutherford, 2018). This vegetation type is considered as **endangered**, characterised by historical mismanagement and incorrect land cover classification, with more than half of the areal extent transformed for agriculture and forestry, seven percent moderately to highly eroded, seven percent invaded by *Acacia mearnsii* and only one percent conserved (Mucina & Rutherford, 2018).

#### **Gold Reef Mountain Bushveld**

The Gold Reef Mountain Bushveld is distributed along the Magaliesberg and other parallel ridges running from North West Province (particularly around Boshhoek and Koster), through Gauteng and Free State, to Mpumalanga (Mucina & Rutherford, 2018). The south-facing slopes of the west-east running ridges are characterised by dense woody vegetation (e.g. *Senegalia caffra*, *Combretum molle* and *Dombeya rotundifolia*), while woody cover, although generally continuous, is more variable in other areas of the region. Graminoids such as *Loudetia simplex* and *Panicum natalense* dominate the herbaceous cover. Shallow, gravel lithosols of the Glenrosa and Mispah forms cover the quartzite conglomerates of the Magaliesberg, Daspoort and Silverton Formations, typically of the Ib and Fb land types (Mucina & Rutherford, 2018). It is one of the **least threatened** vegetation types in South Africa, with 22% of the targeted 24% already conserved in the Magaliesberg Nature Area, Wonderboom and Suitkerbosrand Nature Reserves, and an additional one percent conserved in other reserves. Agriculture and urban development are the main threat to this vegetation, transforming 15% of the vegetation type (Mucina & Rutherford, 2018).

#### **Moot Plains Bushveld**

The distribution of this vegetation type is predominantly the North West and Gauteng Provinces, with the belt south of the Magaliesberg running from the Selons River Valley to Pretoria along the Magalies River and the belt north of the Magaliesberg running from Rustenburg towards the Crocodile River (Mucina & Rutherford, 2018). The Moot Plains Bushveld is characterised by low, thorny *Vachellia* savannah (e.g. *V. nilotica* and *V. tortilis* subsp. *heteracantha*) along the plains, low-slope woodlands and a graminoid-dominated herbaceous layer (Mucina & Rutherford, 2018). The geology is dominated by the Transvaal Supergroup, consisting of the Pretoria Group's clastic sediments, carbonates and





volcanics, with Malmani dolomites and mafic Bushveld intrusives. The stony soil is characterised by colluvial clay-loam, often comprised of well-drained red-yellow plinthic, vertic and melanic clays. The land types include Ae, Ba, Ea, Bc and Ac (Mucina & Rutherford, 2018). This vegetation types is considered **vulnerable**, with 13% statutorily conserved in the Magaliesberg Nature area and a conservation target of 19% in 2006. A further 28% has been transformed by primarily agriculture and urban development (Mucina & Rutherford, 2018).

**Zeerust Thornveld**

The Zeerust Thornveld is primarily found in North West Province, running from the Lobatsi River plains through Zeerust to the Pilansberg flats (Mucina & Rutherford, 2012). The vegetation is characterised by deciduous, thorny woodlands (e.g. *Senegalia burkei* and *Vachellia erioloba*), with a graminoid-dominated herbaceous layer on deep, basic, clay soils between ridges (Mucina & Rutherford, 2012). This vegetation grows in deep, well-drained, red-yellow soils with some vertic and melanic clays, covering the Pretoria Group shale sediments of the Silverton and Rayton Formations. The land types include Ae and Ea (Mucina & Rutherford, 2012). This vegetation type is considered **least threatened**, with less than 4% of the targeted 19% area statutorily conserved and a further 16% transformed by agriculture and urban development (Mucina & Rutherford, 2012).

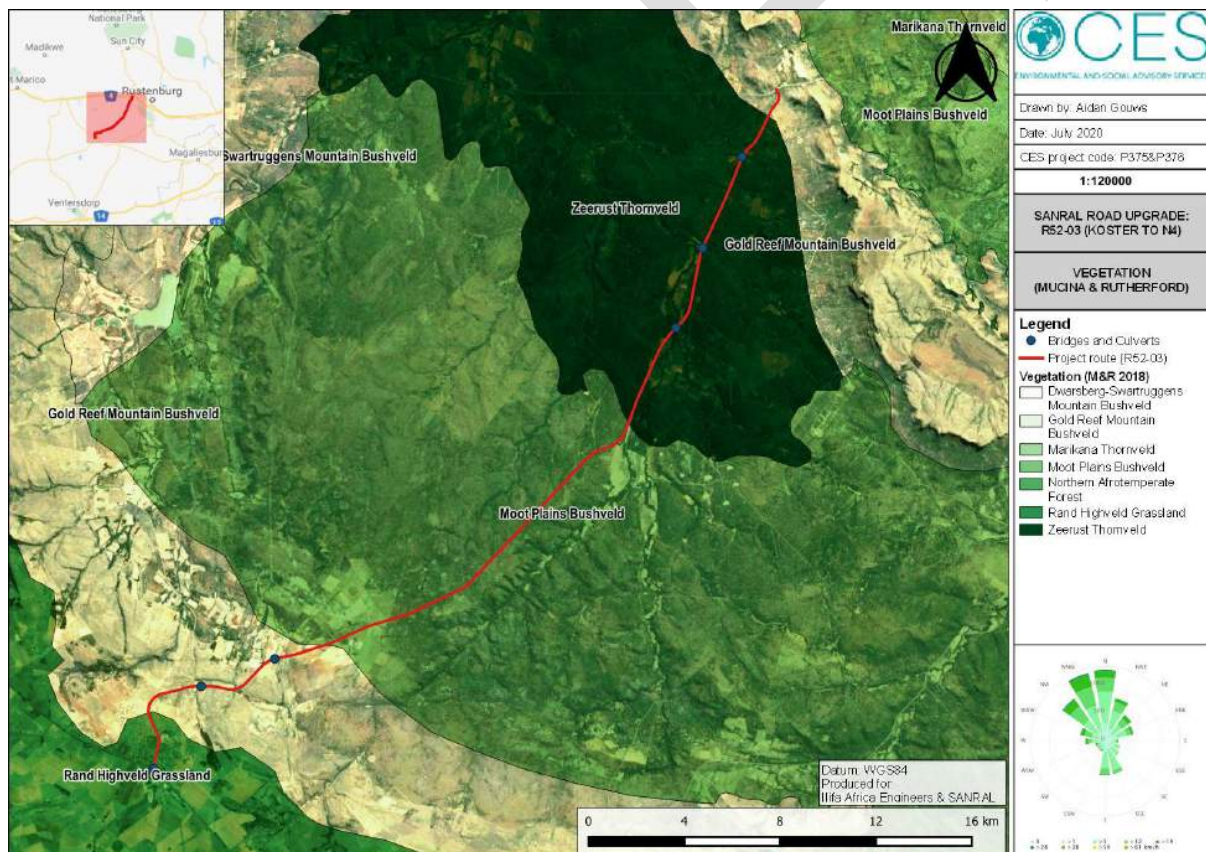


Figure 5.7: Mucina & Rutherford Vegetation Types for the project region.

5.1.5.2 Threatened Ecosystems

The above vegetation type conservation classifications are summarised in Table 5.2 below. Of the four vegetation units mentioned above, the Goldreef Mountain Bushveld and Zeerust Thornveld vegetation types are regarded as the **least sensitive**. These types have a lower conservation priority



status and are fairly well conserved. Although the Rand Highveld Grassland is considered **endangered**, only a small portion of the project area falls within this vegetation type and this is primarily within the Koster built-up area. Regardless, from the above indicators, vegetation concerns for this project type may be limited due to the relative widespread distribution of these vegetation types and the amount of already conserved sections. However, development within this vegetation type should aim to reduce and limit impact and to protect biodiversity, as best practice.

**Table 5.2: Mucina & Rutherford (2018) conservation classification for the project region vegetation types.**

| PROJECT AREA VEGETATION TYPE | CONSERVATION STATUS |
|------------------------------|---------------------|
| Rand Highveld Grassland      | Endangered          |
| Gold Reef Mountain Bushveld  | Least Threatened    |
| Moot Plains Bushveld         | Vulnerable          |
| Zeerust Thornveld            | Least Threatened    |

#### 5.1.5.3 North West Biodiversity Sector Plan (2015)

The R52 project area runs almost entirely across all of the terrestrial CBA and ESA areas, as well as coming in close proximity to the Magaliesberg Protected Natural Environment (Figure 5.8). The majority of the project area is found in the terrestrial CBA 2 region, where the management objective is to maintain the area in a natural state and limit the loss of biodiversity, preserving spatial patterns and ecological processes, including endangered and vulnerable ecosystems, endemic vegetation types and focus wildlife areas (READ, 2015). Portions of the proposed road upgrade also intersect large areas of terrestrial ESA 1 and ESA 2, including natural and altered hills and ridges, biodiversity corridors, and protected area development corridors and their surroundings (READ, 2015). The management mandate for ESA 1 is to maintain at least a semi-natural state and basic natural attributes, while ESA 2 requires maintaining as much ecological functionality as possible as these areas have already been altered (READ, 2015). A relatively small area of CBA 1 is intersected by the road upgrade near the Koster urban area. Here, the management objective is to maintain the area in a natural state and limit the loss of biodiversity and includes critically endangered ecosystems, irreplaceable sites, critical biodiversity corridors and kloofs (READ, 2015).

The Aquatic CBA map (Figure 5.9) shows that the project areas intersects aquatic CBAs 1 and 2 only where the R52 intersects the Koster River (towards the south of the project area, near Koster town) (CES, 2020). Further footprint of the project coincided with the aquatic ESA, which generally surround the river channels and are generally represented by fish catchments, wetland clusters, peat wetland buffers and dolomitic recharge areas (READ, 2015) (CES, 2020). Although the project area intersects the aquatic CBAs and ESAs less than the terrestrial, consideration of the impact of road construction and operation, and the minimisation of the impacts in this region must be considered in the design planning documentation (CES, 2020).

#### 5.1.5.4 Protected areas

The Magaliesberg Protected Natural Environment is located on the land adjacent to the northern section of the R52 route, at approximately KM 38.4 (Figure 5.8).



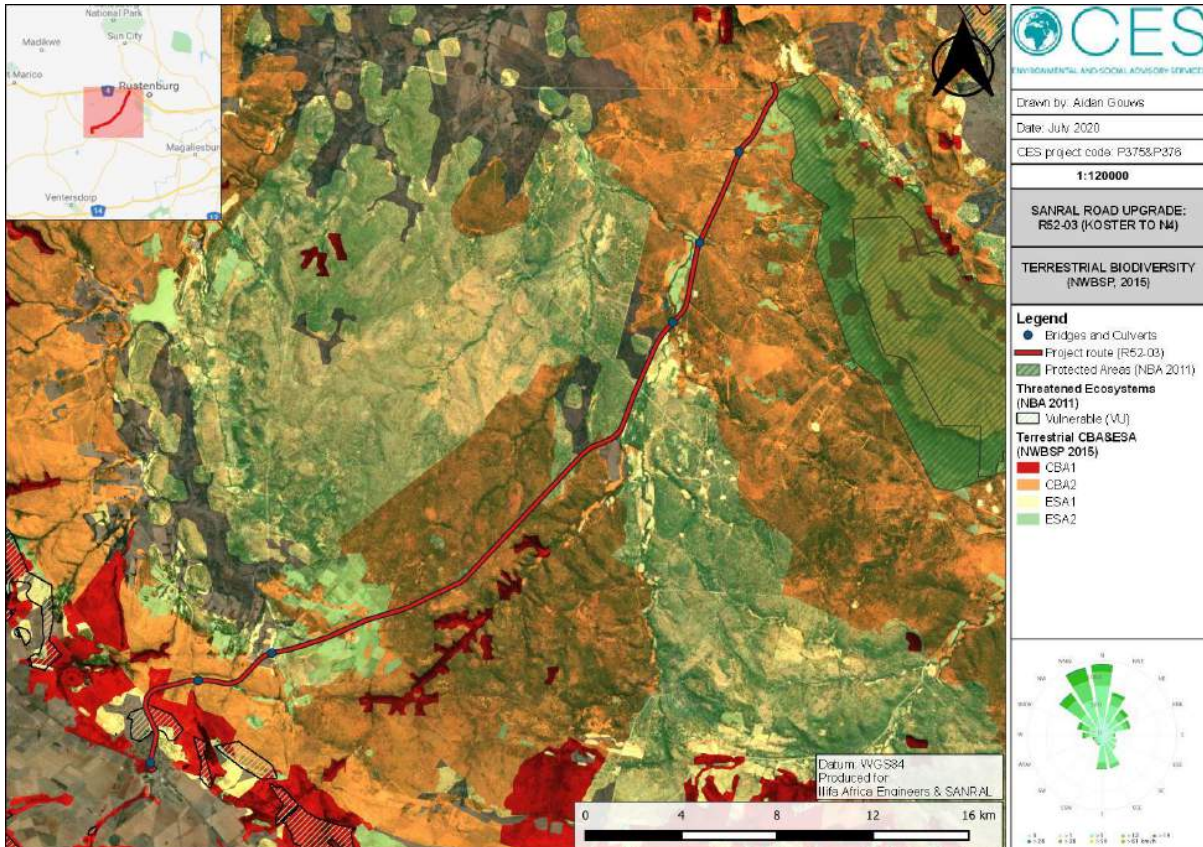


Figure 5.8: Terrestrial CBAs and ESAs for the project area based on the NWBSP (2015).

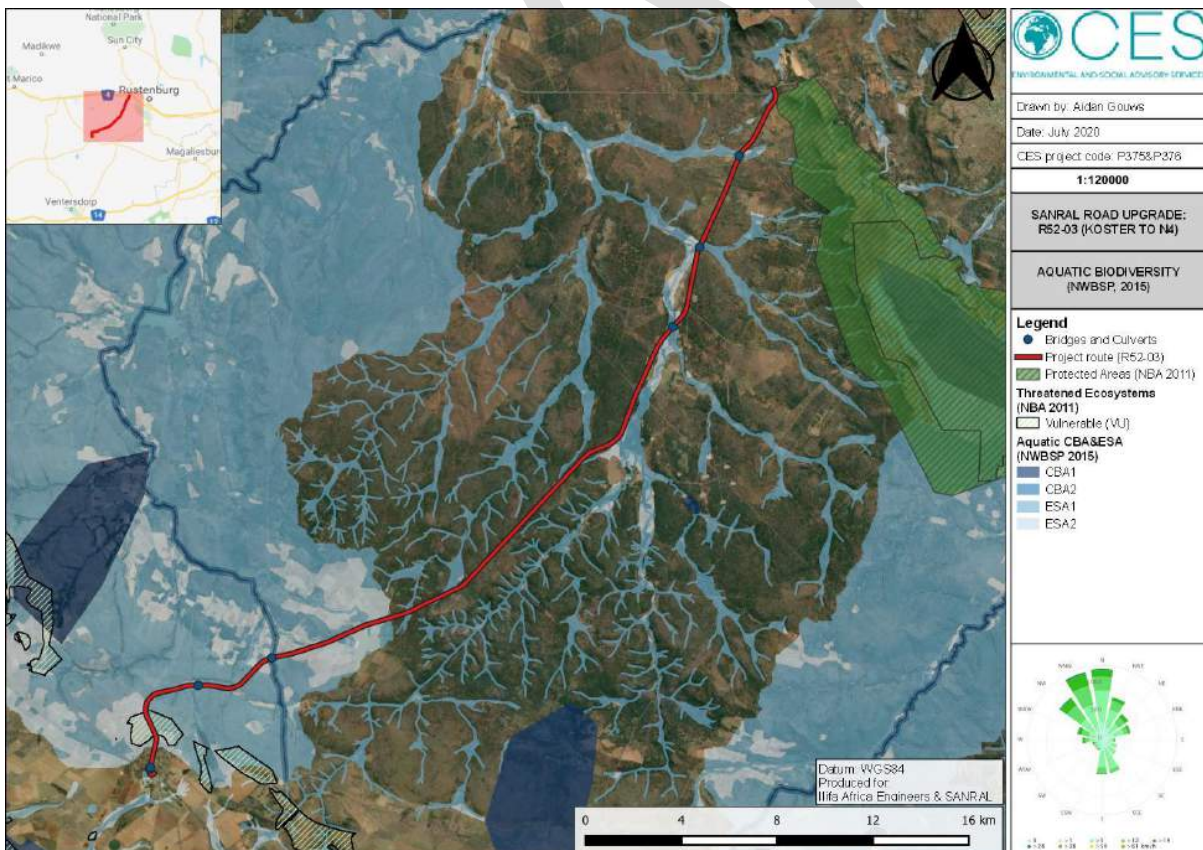


Figure 5.9: Aquatic CBAs and ESAs for the project area based on the NWBSP (2015) (CES, 2020).





#### 5.1.5.5 Species of Conservation Concern

Plant species of conservation concern (SCC) comprise those species that are either threatened (Critically Endangered, Endangered, Vulnerable), rare or declining. The South African National Biodiversity Institute (SANBI) Plants of Southern Africa (POSA) plant database (<http://posa.sanbi.org>) was consulted (Figure 5.10), along with the categories indicated in the SANBI Threatened Species Programme website (<http://redlist.sanbi.org/species.php?species>) to identify potential SCCs within the proposed study area.

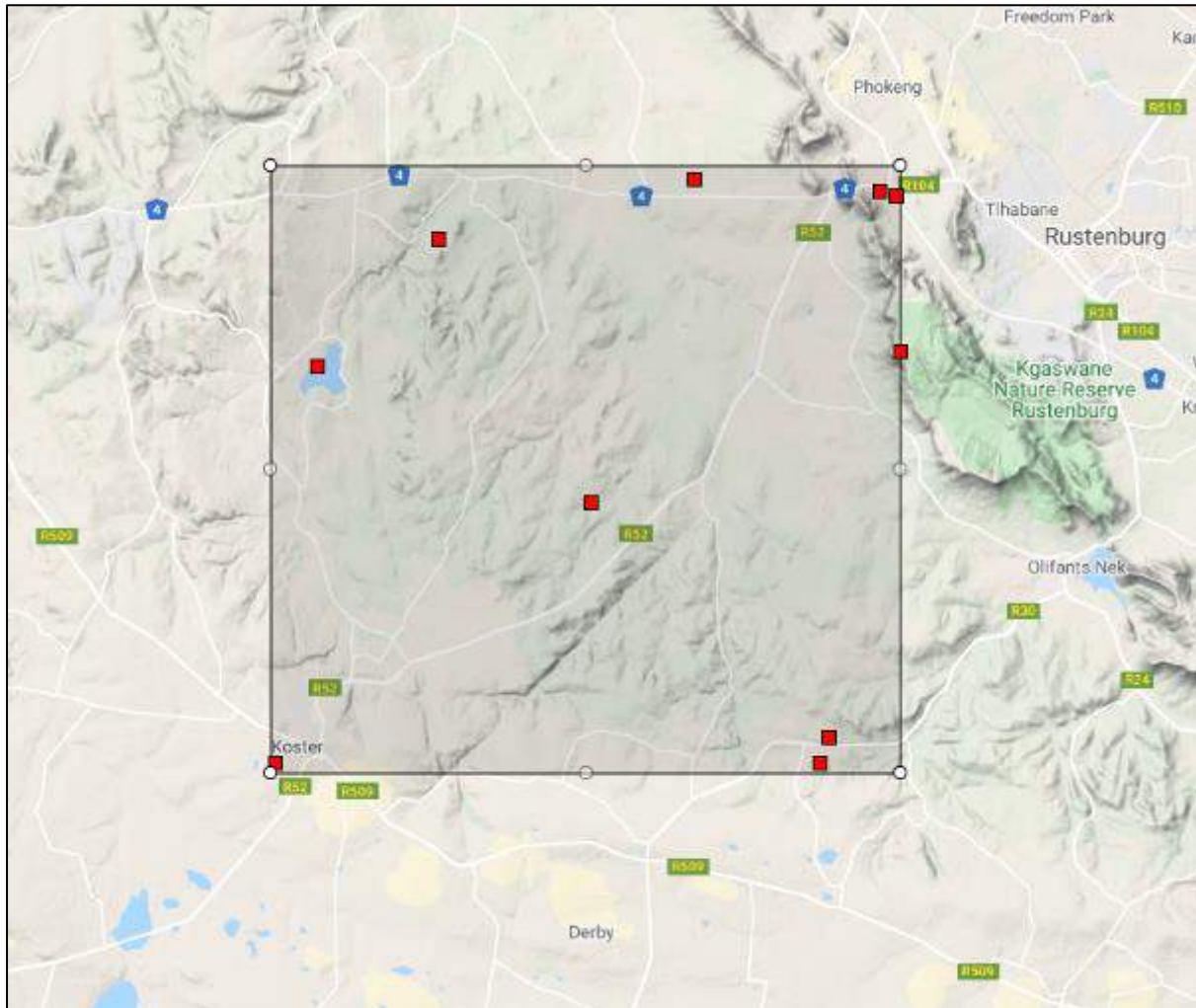


Figure 5.10: POSA search area highlighting botanical records (red).

In addition to SANBI, the international IUCN Red Data list, the Threatened or Protected Species (TOPS) list, the NWBMA (No 4. of 2016) and Convention on International Trade in Endangered Species (CITES), was consulted to compile a list of plant SCCs that may potentially be found within the study area.

Table 5.3 below provides a list of potential plant SCCs likely to occur in close proximity to the proposed development footprint. Four plant SCCs are likely to be found within the study area, including one Near-Threatened Red list species, *Kniphofia typhoides*, which is also a NWBMA Schedule 2 species. Two other species, *Brachystelmia circinatum* and *Euphorbia striata*, are also SCC in terms of NWBMA species because their genera are protected under Schedule 2. *Aloe zebrina* is a CITES Appendix II species. If these or other SCCs are found on site during the construction phase, then these species may



require permits for their destruction and/or relocation. A full list of the potential species found within the study area can be seen in Appendix A.

**Table 5.3: Potential plant SCCs likely to occur within the study area.**

| FAMILY        | GENUS               | SPECIES           | ECOLOGY                | STATUS  |
|---------------|---------------------|-------------------|------------------------|---|
| Apocynaceae   | <i>Brachystelma</i> | <i>circinatum</i> | Indigenous             | - NWBMA Schedule 2                                      |
| Asphodelaceae | <i>Aloe</i>         | <i>zebrina</i>    | Indigenous             | - CITES Appendix II                                     |
| Asphodelaceae | <i>Kniphofia</i>    | <i>typhoides</i>  | Indigenous;<br>Endemic | - SANBI Red List: Near Threatened<br>- NWBMA Schedule 2 |
| Euphorbiaceae | <i>Euphorbia</i>    | <i>striata</i>    | Indigenous             | - NWBMA Schedule 2                                      |

#### 5.1.5.6 Alien Invasive Species

Of the seven non-indigenous species, all are considered naturalised and four are considered invasive (Table 5.4). Only one of these species, *Argemone ochroleuca*, is classified in terms of the NEMBA's Alien Invasive Species Regulations (2014), as a Category 1b species. Species listed as 1b under the regulations require compulsory control as part of an invasive species control programme. This means that no permits are issued for the use of this species and they must be removed and destroyed by the landowner in conjunction with a government sponsored invasive species management programme

**Table 5.4: Potential plant AIS likely to occur within the study area.**

| FAMILY        | GENUS                 | SPECIES            | ECOLOGY                                  | NEMBA AIS (2014) CATEGORY |
|---------------|-----------------------|--------------------|--|---------------------------|
| Amaranthaceae | <i>Alternanthera</i>  | <i>pungens</i>     | Not indigenous;<br>Naturalised           |                           |
| Amaranthaceae | <i>Gomphrena</i>      | <i>celosioides</i> | Not indigenous;<br>Naturalised           |                           |
| Asteraceae    | <i>Acanthospermum</i> | <i>glabratum</i>   | Not indigenous;<br>Naturalised           |                           |
| Lamiaceae     | <i>Salvia</i>         | <i>reflexa</i>     | Not indigenous;<br>Naturalised; Invasive |                           |
| Onagraceae    | <i>Oenothera</i>      | <i>rosea</i>       | Not indigenous;<br>Naturalised; Invasive |                           |
| Papaveraceae  | <i>Argemone</i>       | <i>ochroleuca</i>  | Not indigenous;<br>Naturalised; Invasive | 1b                        |
| Polygonaceae  | <i>Rumex</i>          | <i>crispus</i>     | Not indigenous;<br>Naturalised; Invasive |                           |





## 5.2 SITE INVESTIGATION

Please note: The site visit was initially scheduled for earlier in the year (late March to early April 2020). However, in response to the COVID-19 pandemic, the President of South Africa announced the implementation of a nationwide lockdown period during his national address on 23 March 2020. The lockdown imposed travel restrictions, which prevented the specialist from conducting the site visit prior to the easing of the restrictions. The site assessment was therefore conducted on 3 July 2020 during the dry (winter) season rather than during the wet season when many bushveld plants are flowering. Consequently, it is possible that some species have gone undetected.

While National level vegetation maps have described broad vegetation types, local conditions and micro-habitats (rainfall, soil structure, rocky outcrops, etc.) can result in variations in plant composition. A site investigation was conducted on 3 July 2020 in order to:

- Verify desktop findings;
- Assess the vegetation;
- Assess the current land-use;
- Identify potential sensitive ecosystems; and
- Identify plant species of conservation concern associated with the proposed project activities.

The site visit served to inform potential impacts of the proposed project and to describe the significance of these impacts on the surrounding vegetation. The vegetation composition was assessed within the road reserve footprint, which included a 10-20 m buffer on either side of the R52-03. Nineteen sample points were captured along the project route (Figure 5.11). The vegetation within 200m of the road reserve was mapped using a combination of data from the field assessment, the Mucina and Rutherford (2018) vegetation map and aerial imagery from Google Earth (Figure 5.12 – Figure 5.16). Vegetation types along the R52-03 are described in Table 5.5 below. The vegetation types are described in Table 5.5 below, along with illustrative examples of the species, land uses and general site conditions observed on site.

Table 5.6 provides a list of plant species, along with their protection and NEMBA AIS (2016) statuses, observed along the R52-03 project route. A total of 66 plants were identified during the site visit, none of which were Species of Conservation Concern (SCC). Eighteen Alien Invasive Species (AIS) were observed, including 13 Category 1b species, three Category 2 species and one Category 3 species.

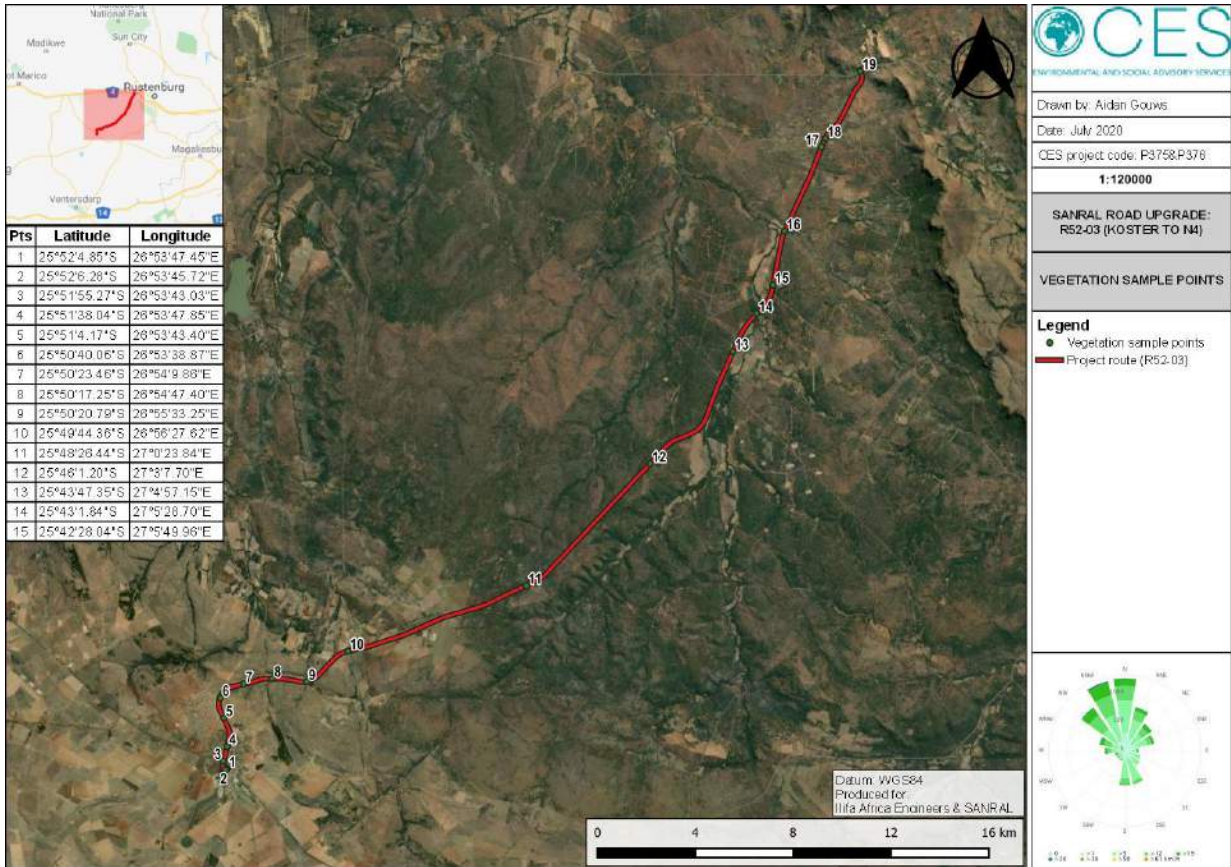


Figure 5.11: Map of the vegetation sample points along the R52-03.



Figure 5.12: Vegetation and general land cover along the R52-03 route (Sample points 1-5).



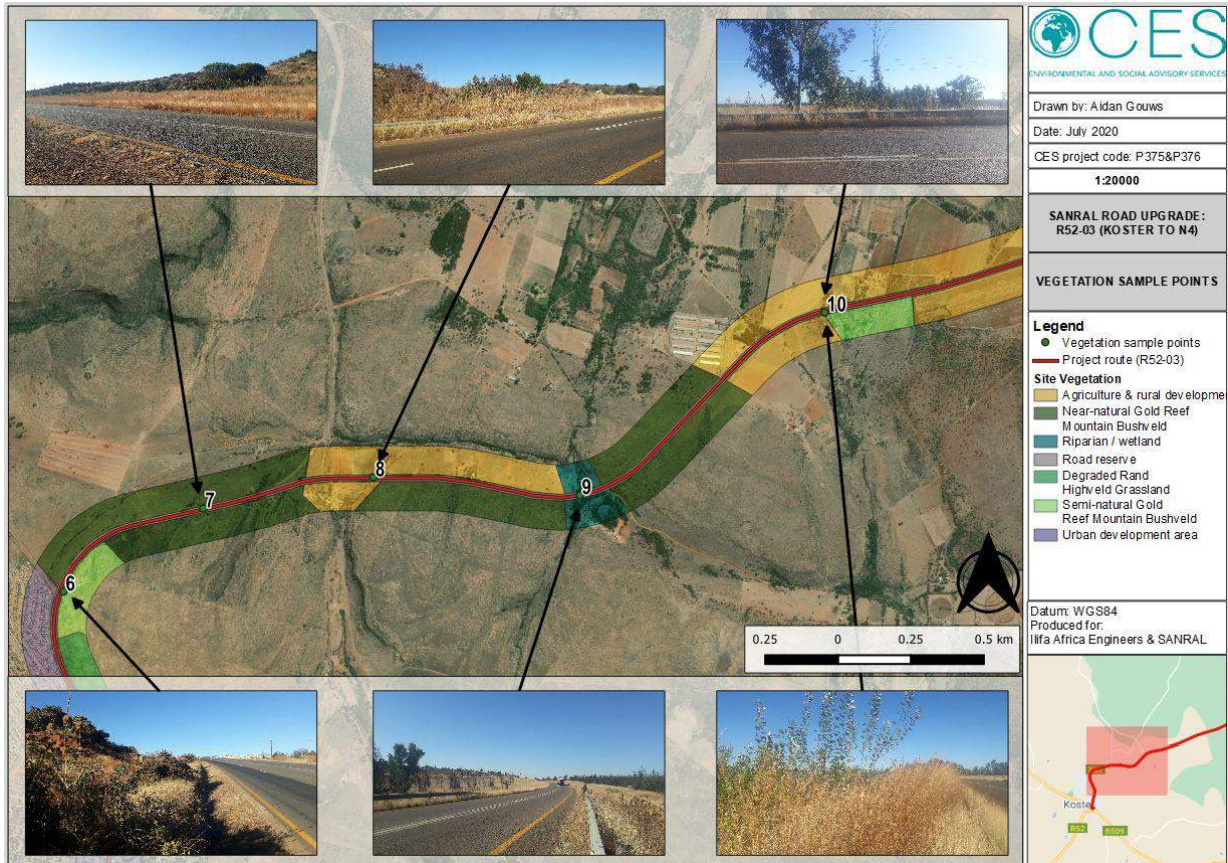


Figure 5.13: Vegetation and general land cover along the R52-03 route (Sample points 6-10).

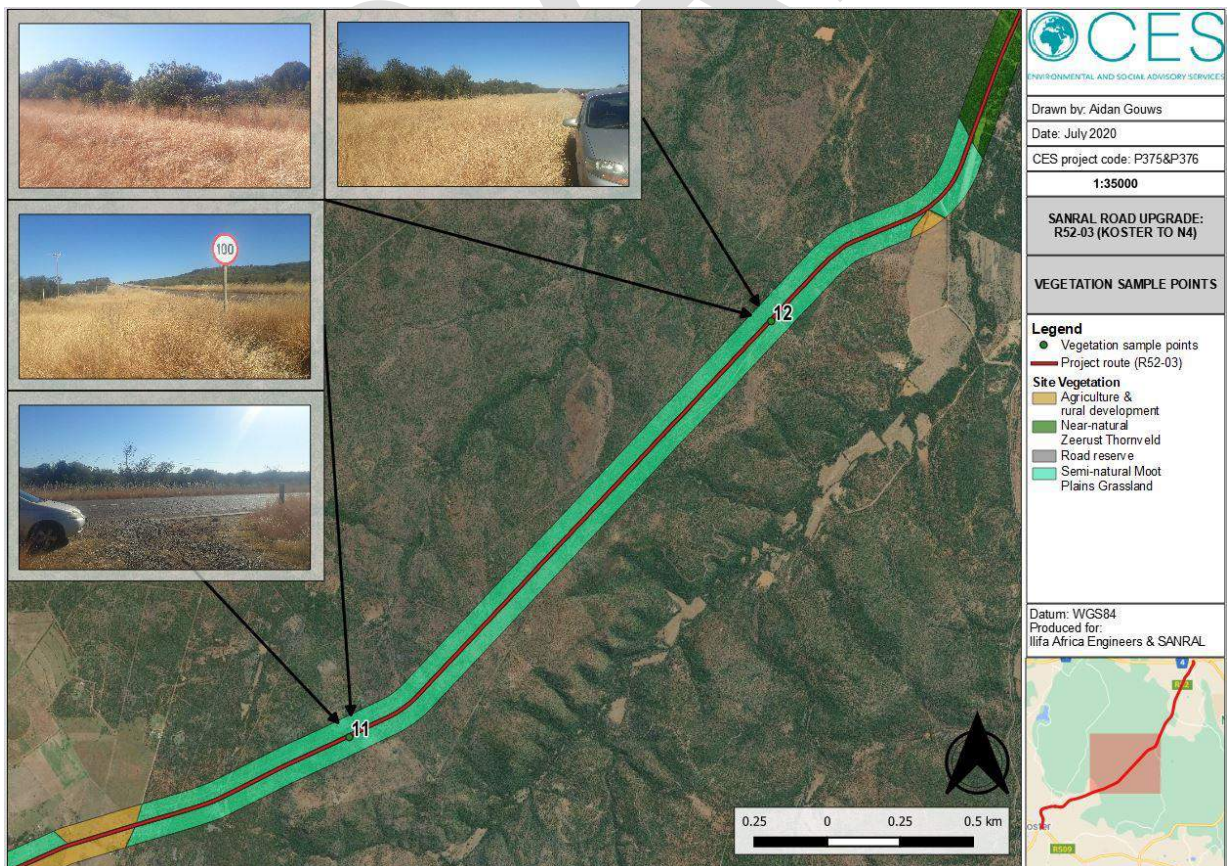


Figure 5.14: Vegetation and general land cover along the R52-03 route (Sample points 11-12).



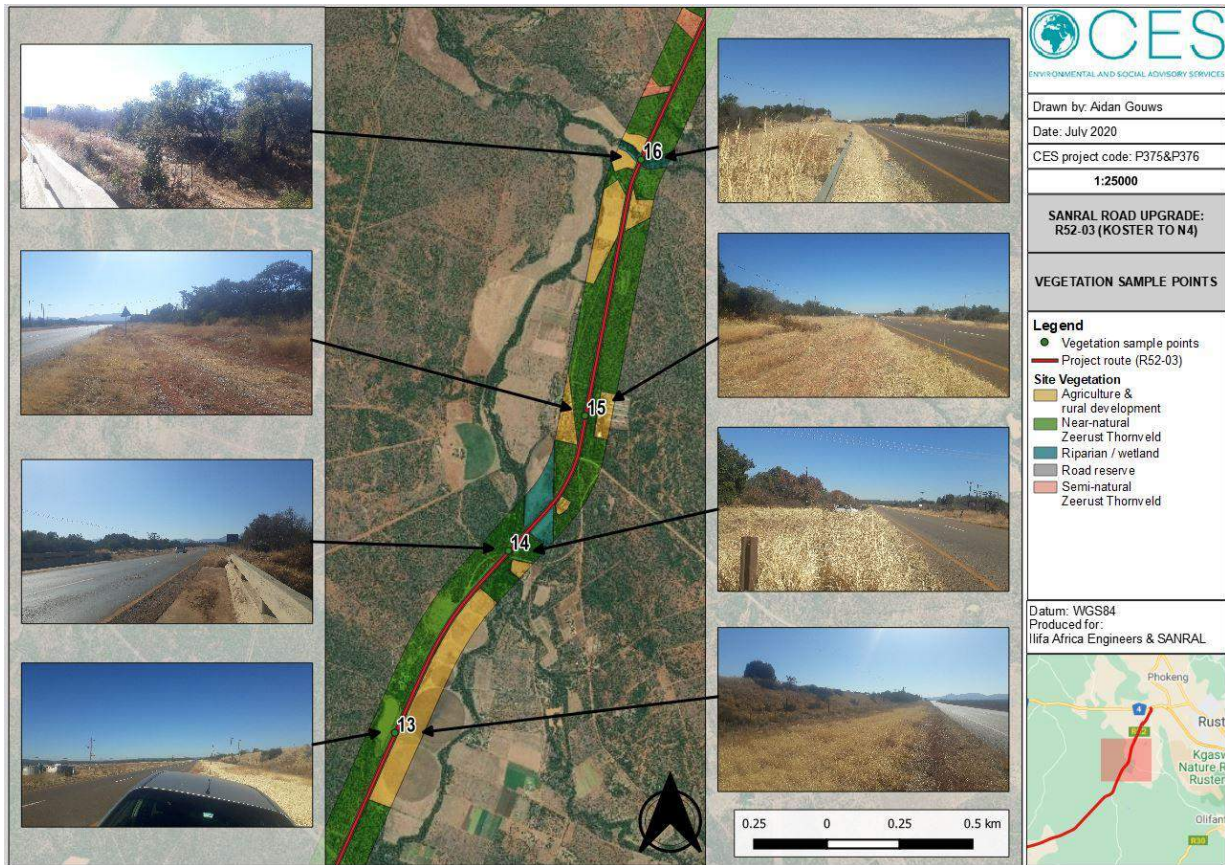


Figure 5.15: Vegetation and general land cover along the R52-03 route (Sample points 13-16).

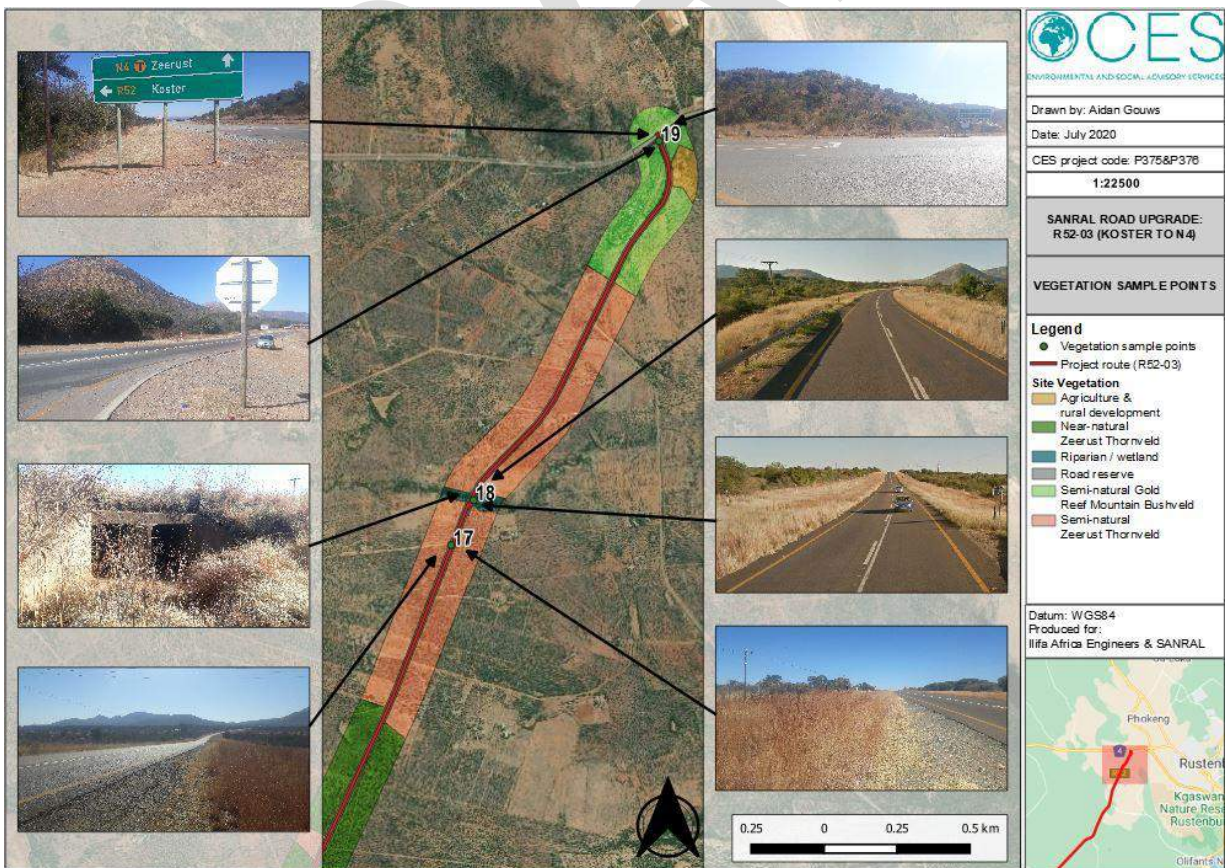


Figure 5.16: Vegetation and general land cover along the R52-03 route (Sample points 17-19).





Table 5.5: Vegetation survey along the R52-03 project route.





| VEG.                | VEGETATION DESCRIPTION   | PHOTOGRAPHS   |  |
|---------------------|--|---|--|
| <p>Road Reserve</p> | <p>The R52-03 road reserve is generally dominated by common grass species (e.g. <i>Eragrostis curvula</i> and <i>Hyparrhenia hirta</i>), with isolated or clustered shrubs and/or trees at some points along the length of the road section.</p> <p>a – Short, mowed grass at the limit of the R52-03 road section in Koster (Sample Point 1 in Figure 5.11).</p> <p>b – <i>Leonotis nepetifolia</i> and other shrubs within the road reserve (Sample Point 6 in Figure 5.11).</p> <p>c – Weedy <i>Tagetes minuta</i> within the road reserve (Sample Point 9 in Figure 5.11).</p> <p>d – Intact, tall grass within the road reserve (Sample Point 12 in Figure 5.11).</p> |   |   |
|                     |  |  |  |

Plate 5.1: Examples of vegetation cover and land-use within the R52-03 road reserve.



| VEG.  | VEGETATION DESCRIPTION  | PHOTOGRAPHS |  |  |  |
|---|---|-------------|--|--|--|
| <p style="writing-mode: vertical-rl; transform: rotate(180deg);">Urban development area</p> | <p>The urban development area includes open space, commercial and residential areas. The park (a), located at the intersection of the R509 and R52-03 onramp, includes a variety of planted shrubs and trees such as <i>Cussonia transvaalensis</i> (b), <i>Photinia serratifolia</i> (c) and <i>Acacia podalyriifolia</i> (d) (refer to Sample Point 1 in Figure 5.11)</p> |             |  |  |  |
|   | <p>The vegetation in the suburban residential section is also comprised of various planted trees, with a row of silver oak (<i>Grevillea robusta</i>, e &amp; f) planted within the narrow road reserve on either side of the road (refer to Sample Point 4 in Figure 5.11)</p>   |             |  |  |  |
|   | <p>Vegetation within and just outside the road reserve in the township section is dominated by mostly-intact, short- to medium-height grassy cover (g &amp; h), with some scattered litter observed in areas (refer to Sample Point 5 in Figure 5.11).</p>  |             |  |  |  |

Plate 5.2: Examples of vegetation cover and land-use within the urban development areas.











| VEG.   | VEGETATION DESCRIPTION  | PHOTOGRAPHS   |  |
|--|---|---|--|
| <p style="writing-mode: vertical-rl; transform: rotate(180deg);">Agriculture &amp; Rural Development</p> | <p>The agricultural and rural development areas include cultivated farmlands, pastures and associated homesteads. These areas were observed adjacent to the road reserve at Sample Points 8 (a &amp; b), 10 (c &amp; d) and 13 (e &amp; f).</p> |   |   |
|  |   |   |   |
|  |   |  |  |

Plate 5.3: Examples of vegetation cover and land-use within the agricultural and rural development areas.












| VEG.  | VEGETATION DESCRIPTION  | PHOTOGRAPHS   |  |   |
|---|---|---|--|---|
| <p style="writing-mode: vertical-rl; transform: rotate(180deg);">Degraded Rand Highveld Grassland</p> | <p>Degraded, discontinuous grassland of the Rand Highveld, with few to moderate naturally-occurring species remaining.</p>  |   |   |  |
|   | <p>The grassy layer is dominated by short- to medium-height <i>Hyparrhenia hirta</i> with some <i>Cymbopogon pospischilii</i> and <i>Eragrostis curvula</i> (a, b, d &amp; e). The woody species layer is comprised of scattered <i>Vachellia karroo</i> (c &amp; f) and <i>Protea c.f. gaguedi</i> (g), as well as clustered alien <i>Acacia mearnsii</i> and <i>Eucalyptus camaldulensis</i> (a) species. The weedy herb, <i>Tagetes minuta</i> is also commonly occurring.</p> |   |   |   |
|   | <p>The photographic examples correspond to the following sample points:</p> <ul style="list-style-type: none"> <li>• Sample point 2 – a, b &amp; c.</li> <li>• Sample point 3 – d &amp; e.</li> <li>• Sample point 5 – f &amp; g.</li> </ul>  |  |  |   |

Plate 5.4: Examples of vegetation cover and land-use within the degraded Rand Highveld Grassland.



| VEG.   | VEGETATION DESCRIPTION  | PHOTOGRAPHS |  |  |  |
|--|---|-------------|--|--|--|
| <p>Semi- to near-natural Gold Reef Mountain Bushveld</p> | <p>Semi- to near-natural mixed savanna of the Gold Reef Mountain Bushveld. The mostly-intact grassy layer (a, e &amp; h) is generally comprised of <i>Cymbopogon pospischilii</i>, <i>Diheteropogon amplexans</i>, <i>Eragrostis curvula</i> and/or <i>Hyparrhenia hirta</i>. Woody species included <i>Photinia serratifolia</i> (b), <i>Seriphium plumosum</i> (c) and <i>Vachellia</i> spp. (e &amp; f), amongst others.</p> <p>A number of AIS were noted during the site visit, including <i>Crotalaria agatiflora</i> (d), <i>Lantana camara</i>, <i>Solanum mauritianum</i> (g), <i>Acacia decurrens</i> (h), <i>Eucalyptus camaldulensis</i> (i) and <i>Populus alba</i> (j). The larger alien tree species were largely concentrated along drainage lines at Sample Points 8 and 10.</p> |             |  |  |  |

Plate 5.5: Examples of vegetation cover and land-use within the Gold Reef Mountain Bushveld.





| VEG.                                      | VEGETATION DESCRIPTION  | PHOTOGRAPHS   |  |  |  |
|---|---|---|--|--|--|
| <p>Semi-natural Moot Plains Grassland</p> | <p>Semi-natural mixed grassland to woodlands of the Moot Plains. The road reserve is dominated by an intact grassy layer of moderately-tall <i>Eragrostis curvula</i> and <i>Hyparrhenia hirta</i> (a &amp; c). Planted <i>Aloe</i> c.f. <i>marlothii</i> (b) mark the entrance to the eastern adjacent farm.</p> <p>A mixture of indigenous trees, such as <i>Searsia lancea</i> (d), <i>Euclea crispa</i> (e) and <i>Vachellia</i> sp. (f), are found within the fenced-off adjacent farms (a &amp; c).</p> |   |   |  |  |
|   |   |  |  |  |  |

Plate 5.6: Examples of vegetation cover and land-use within the Moot Plains Grassland.





| VEG.  | VEGETATION DESCRIPTION   | PHOTOGRAPHS |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |
|---|--|-------------|--|--|--|--|--|--|--|--|---|--|--|--|--|---|--|--|--|--|
| Riparian / Wetland  | <p>The riparian / wetland areas and their surroundings were comprised of diverse vegetation, including:</p> <ul style="list-style-type: none"> <li>Grasses (a &amp; d) and reeds (j), such as <i>Chloris virgata</i>, <i>Pennisetum macrourum</i> and <i>Phragmites australis</i>;</li> <li>Sedges (f &amp; g), such as <i>Cyperus</i> sp. and <i>Fuirena</i> sp.;</li> <li>Bulrushes (c), such as <i>Typha capensis</i>; and</li> <li>Shrubs and trees (d &amp; h), such as <i>Carissa bispinosa</i>, <i>Searsia</i> spp. and <i>Vachellia nilotica</i>.</li> </ul> <p>Several AIS were noted in riparian and wetland areas, including:</p> <ul style="list-style-type: none"> <li><i>Acacia decurrens</i> (a);</li> <li><i>Persicaria capitata</i> (b);</li> <li><i>Opuntia ficus-indica</i> (e);</li> <li><i>Melia azedarach</i> (h &amp; i);</li> <li><i>Lantana camara</i>;</li> <li><i>Solanum sisymbriifolium</i>;</li> <li><i>Eucalyptus camaldulensis</i>; and</li> <li><i>Populus alba</i>.</li> </ul> |             |  |  |  |  |  |  |  |  |   |  |  |  |  | Plate 5.7: Examples of vegetation cover and land-use within the Riparian / Wetland areas. |  |  |  |  |
|   |  |             |  |  |  |  |  |  |  |  | Plate 5.7: Examples of vegetation cover and land-use within the Riparian / Wetland areas. |  |  |  |  |   |  |  |  |  |
|   |  |             |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |
| Plate 5.7: Examples of vegetation cover and land-use within the Riparian / Wetland areas. |  |             |  |  |  |  |  |  |  |  |   |  |  |  |  |   |  |  |  |  |











| VEG.   | VEGETATION DESCRIPTION   | PHOTOGRAPHS   |   |   |
|--|--|---|---|---|
| <p>Semi- to near-natural Zeerust Thornveld</p> | <p>Semi- to near-natural bushveld of the Zeerust Thornveld. The road reserve is dominated by an intact grassy layer of moderately-tall <i>Hyparrhenia hirta</i> (a, d &amp; f). <i>Senegalia caffra</i> and <i>Vachellia karroo</i> dominate the woody species layer within the fenced-off farms (a, d, e and f).</p> <p><i>Aloe greatheadii</i> var. <i>davyana</i> (b), <i>Dombeya rotundifolia</i> and <i>Searsia</i> spp., as well as the alien invasive <i>Cereus jamacaru</i> (c), were also noted during the site assessment.</p> |   |  |  |
|  |  |   |  |   |
|  |  |  |   |   |

Plate 5.8: Examples of vegetation cover and land-use within the Zeerust Thornveld.



Table 5.6: Plant species observed along the R52-03 project route.

| FAMILY           | SPECIES                                     | CONSERVATION STATUS | NEMBA (2016) AIS |
|------------------|---|---------------------|------------------|
| Anacardiaceae    | <i>Searsia lancea</i>                       | Least Concern       |                  |
| Anacardiaceae    | <i>Searsia leptodictya</i>                  | Not Evaluated       |                  |
| Anacardiaceae    | <i>Searsia pyroides</i>                     | Least Concern       |                  |
| Apocynaceae      | <i>Asclepias brevipes</i>                   | Least Concern       |                  |
| Apocynaceae      | <i>Carissa bispinosa</i>                    | Least Concern       |                  |
| Araliaceae       | <i>Cussonia transvaalensis</i>              | Least Concern       |                  |
| Asparagaceae     | <i>Asparagus laricinus</i>                  | Least Concern       |                  |
| Asphodelaceae    | <i>Aloe c.f. marlothii</i>                  | Least Concern       |                  |
| Asphodelaceae    | <i>Aloe greatheadii</i> var. <i>davyana</i> | Least Concern       |                  |
| Asteraceae       | <i>Bidens pilosa</i>                        | Not Evaluated       |                  |
| Asteraceae       | <i>Helichrysum kraussii</i>                 | Least Concern       |                  |
| Asteraceae       | <i>Helichrysum</i> sp.                      | Least Concern       |                  |
| Asteraceae       | <i>Tagetes minuta</i>                       | Not Evaluated       |                  |
| Cactaceae        | <i>Cereus jamacaru</i>                      | Not Evaluated       | Category 1b      |
| Cactaceae        | <i>Opuntia ficus-indica</i>                 | Not Evaluated       | Category 1b      |
| Combretaceae     | <i>Combretum molle</i>                      | Least Concern       |                  |
| Cyperaceae       | <i>Cyperus</i> sp.                          | Least Concern       |                  |
| Cyperaceae       | <i>Fuirena</i> sp.                          | Least Concern       |                  |
| Cyperaceae       | Unidentified sedge                          |                     |                  |
| Dennstaedtiaceae | <i>Pteridium aquilinum</i>                  | Least Concern       |                  |
| Ebenaceae        | <i>Euclea crispa</i>                        | Least Concern       |                  |
| Ebenaceae        | <i>Euclea undulata</i>                      | Least Concern       |                  |
| Elatinaceae      | <i>Bergia decumbens</i>                     | Least Concern       |                  |
| Fabaceae         | <i>Acacia dealbata</i>                      | Not Evaluated       | Category 2       |
| Fabaceae         | <i>Acacia decurrens</i>                     | Not Evaluated       | Category 1b      |
| Fabaceae         | <i>Acacia mearnsii</i>                      | Not Evaluated       | Category 2       |
| Fabaceae         | <i>Acacia podalyriifolia</i>                | Not Evaluated       | Category 1b      |
| Fabaceae         | <i>Burkea africana</i>                      | Least Concern       |                  |
| Fabaceae         | <i>Crotalaria agatiflora</i>                | Not Evaluated       | Category 1b      |
| Fabaceae         | <i>Senegalia caffra</i>                     | Least Concern       |                  |
| Fabaceae         | <i>Vachellia erioloba</i>                   | Least Concern       |                  |
| Fabaceae         | <i>Vachellia karroo</i>                     | Least Concern       |                  |
| Fabaceae         | <i>Vachellia nilotica</i>                   | Least Concern       |                  |
| Hamamelidaceae   | c.f. <i>Trichocladus crinitus</i>           | Least Concern       |                  |
| Lamiaceae        | <i>Leonotis nepetifolia</i>                 | Least Concern       |                  |
| Lauraceae        | <i>Cinnamomum camphora</i>                  | Not Evaluated       | Category 1b      |
| Malvaceae        | <i>Dombeya rotundifolia</i>                 | Least Concern       |                  |
| Meliaceae        | <i>Melia azedarach</i>                      | Not Evaluated       | Category 1b      |
| Myrtaceae        | <i>Eucalyptus camaldulensis</i>             | Not Evaluated       | Category 1b      |
| Oleaceae         | <i>Ligustrum lucidum</i>                    | Least Concern       | Category 1b      |
| Oleaceae         | <i>Olea europaea</i> subsp. <i>africana</i> | Least Concern       |                  |
| Penaeeaceae      | <i>Olinia emarginata</i>                    | Least Concern       |                  |
| Poaceae          | <i>Aristida congesta</i>                    | Least Concern       |                  |
| Poaceae          | c.f. <i>Chloris virgata</i>                 | Least Concern       |                  |
| Poaceae          | c.f. <i>Pennisetum macrourum</i>            | Least Concern       |                  |
| Poaceae          | <i>Cymbopogon pospischilii</i>              | Not Evaluated       |                  |
| Poaceae          | <i>Diheteropogon amplexans</i>              | Least Concern       |                  |
| Poaceae          | <i>Eragrostis curvula</i>                   | Least Concern       |                  |
| Poaceae          | <i>Hyparrhenia hirta</i>                    | Least Concern       |                  |
| Poaceae          | <i>Melinis repens</i>                       | Least Concern       |                  |
| Poaceae          | <i>Panicum maximum</i>                      | Least Concern       |                  |
| Poaceae          | <i>Phragmites australis</i>                 | Least Concern       |                  |



| FAMILY           | SPECIES                        | CONSERVATION STATUS | NEMBA (2016) AIS |
|------------------|--------------------------------|---------------------|------------------|
| Polygalaceae     | <i>Persicaria capitata</i>     | Not Evaluated       | Category 1b      |
| Proteaceae       | <i>Grevillea robusta</i>       | Not Evaluated       | Category 3       |
| Proteaceae       | <i>Protea c.f. gagedi</i>      | Least Concern       |                  |
| Ranunculaceae    | <i>Clematis brachiata</i>      | Least Concern       |                  |
| Rhamnaceae       | <i>Ziziphus mucronata</i>      | Least Concern       |                  |
| Rosaceae         | <i>Photinia serratifolia</i>   |                     |                  |
| Saliaceae        | <i>Populus alba</i>            | Not Evaluated       | Category 2       |
| Scrophulariaceae | <i>Buddleja saligna</i>        | Least Concern       |                  |
| Scrophulariaceae | <i>Buddleja salviifolia</i>    | Least Concern       |                  |
| Solanaceae       | <i>Solanum mauritianum</i>     | Not Evaluated       | Category 1b      |
| Solanaceae       | <i>Solanum sisymbriifolium</i> | Not Evaluated       | Category 1b      |
| Stilbaceae       | <i>Nuxia congesta</i>          | Least Concern       |                  |
| Typhaceae        | <i>Typha capensis</i>          | Least Concern       |                  |
| Verbenaceae      | <i>Lantana camara</i>          | Not Evaluated       | Category 1b      |

DRAFT





## 6 SITE SENSITIVITY

In terms of Appendix 6 of the 2014 NEMA EIA Regulations (2014, as amended) a specialist report must contain-

- (f) Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying alternatives;
- (g) An identification of any areas to be avoided, including buffers;
- (h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;

### 6.1 CONSERVATION AND SPATIAL PLANNING TOOLS

Several conservation planning tools are available for the study area. These tools allow for the potential identification of any sensitive and important areas from an ecological perspective at the early stage of a development and allow for the fine-tuning of plans and infrastructure layouts. The following tools were identified as relevant to the site and are summarised below:

- SANBI Vegetation threat status;
- NEMBA Protected Ecosystems; and
- NWBSP 2015.

### 6.2 SENSITIVITY ALLOCATION

The site sensitivity assessment and mapping was developed based on the methodology presented in Section **Error! Reference source not found.**4.5 for the vegetation and land cover categories described above. **Error! Reference source not found.** below details the sensitivity criteria allocated for the proposed upgrade of the R52-03. The allocation of criteria was based on both the desktop biophysical description of the site as well as observations made during the site visit. The sensitivity of the vegetation along the R52-03 project route is mapped in Figure 6.1 - Figure 6.4 below.



Table 6-1: Sensitivity assessment along the R52-03 project route.

| CRITERIA   | ROAD RESERVE                                | URBAN DEVELOPMENT AREA                                   | AGRICULTURE & RURAL DEVELOPMENT             | DEGRADED RAND HIGHVELD GRASSLAND   | SEMI-NATURAL GOLD REEF MOUNTAIN BUSHVELD   | NEAR-NATURAL GOLD REEF MOUNTAIN BUSHVELD   | SEMI-NATURAL MOOT PLAINS GRASSLAND  | RIPARIAN / WETLAND   | SEMI-NATURAL ZEERUST THORNVELD   | NEAR-NATURAL ZEERUST THORNVELD   |
|--|---|--|---|--|--|--|---|--|--|--|
| <b>Topography</b>  | Undulating; fairly steep slopes             | Level or even  | Level or even                               | Undulating; fairly steep slopes  | Undulating; fairly steep slopes  | Undulating; fairly steep slopes  | Complex and uneven with steep slopes  | Undulating; fairly steep slopes  | Complex and uneven with steep slopes   | Complex and uneven with steep slopes   |
| <b>Vegetation</b> - Extent or habitat type in the region           | Extensive                                   | Restricted to a particular region / zone                 | Extensive                                   | Restricted to a particular region / zone   | Extensive  | Restricted to a particular region / zone   | Extensive   | Restricted to a particular region / zone   | Extensive  | Restricted to a particular region / zone   |
| <b>Conservation status</b> of fauna / flora or habitats            | N/A   | Well conserved independent of conservation value         | N/A   | Not conserved - has a high conservation value  | Well conserved independent of conservation value   | Well conserved independent of conservation value   | Not well conserved, moderate conservation value   | Not conserved - has a high conservation value  | Well conserved independent of conservation value   | Well conserved independent of conservation value   |
| <b>Species of special concern</b> - Presence and number            | None, although occasional regional endemics | None, although occasional regional endemics              | None, although occasional regional endemics | None, although occasional regional endemics  | None, although occasional regional endemics  | None, although occasional regional endemics  | None, although occasional regional endemics   | None, although occasional regional endemics  | None, although occasional regional endemics  | None, although occasional regional endemics  |
| <b>Habitat fragmentation</b> leading to loss of viable populations | N/A   | N/A  | N/A   | Reasonably extensive areas of preferred habitat elsewhere and habitat susceptible to fragmentation | Reasonably extensive areas of preferred habitat elsewhere and habitat susceptible to fragmentation | Reasonably extensive areas of preferred habitat elsewhere and habitat susceptible to fragmentation | Extensive areas of preferred habitat present elsewhere in region not susceptible to fragmentation | Reasonably extensive areas of preferred habitat elsewhere and habitat susceptible to fragmentation | Reasonably extensive areas of preferred habitat elsewhere and habitat susceptible to fragmentation | Reasonably extensive areas of preferred habitat elsewhere and habitat susceptible to fragmentation |
| <b>Biodiversity contribution</b>                                   | Low diversity or species richness           | Moderate diversity, and moderately high species richness | Low diversity or species richness           | Moderate diversity, and moderately high species richness   | Moderate diversity, and moderately high species richness   | High species diversity, complex plant and animal communities                                       | High species diversity, complex plant and animal communities                                      | High species diversity, complex plant and animal communities                                       | Moderate diversity, and moderately high species richness   | High species diversity, complex plant and animal communities                                       |



| CRITERIA  | ROAD RESERVE   | URBAN DEVELOPMENT AREA                                  | AGRICULTURE & RURAL DEVELOPMENT                              | DEGRADED RAND HIGHVELD GRASSLAND   | SEMI-NATURAL GOLD REEF MOUNTAIN BUSHVELD   | NEAR-NATURAL GOLD REEF MOUNTAIN BUSHVELD   | SEMI-NATURAL MOOT PLAINS GRASSLAND   | RIPARIAN / WETLAND   | SEMI-NATURAL ZEERUST THORNVELD   | NEAR-NATURAL ZEERUST THORNVELD   |
|---|--|---|--|--|--|--|--|--|--|--|
| <b>Erosion potential</b> or instability of the region                                   | Some possibility of erosion or change due to episodic events | Very stable and an area not subjected to erosion        | Some possibility of erosion or change due to episodic events | Some possibility of erosion or change due to episodic events   | Some possibility of erosion or change due to episodic events   | Some possibility of erosion or change due to episodic events   | Some possibility of erosion or change due to episodic events   | Large possibility of erosion to the site or destruction due to climatic or other factors                 | Some possibility of erosion or change due to episodic events   | Some possibility of erosion or change due to episodic events   |
| <b>Rehabilitation potential</b> of the area or region                                   | Site is easily rehabilitated                                 | Site is easily rehabilitated                            | Site is easily rehabilitated                                 | There is some degree of difficulty in rehabilitation of the site                                       | There is some degree of difficulty in rehabilitation of the site                                       | There is some degree of difficulty in rehabilitation of the site                                       | There is some degree of difficulty in rehabilitation of the site                                       | Site is difficult to rehabilitate due to the terrain, type of habitat or species required to reintroduce | There is some degree of difficulty in rehabilitation of the site                                       | There is some degree of difficulty in rehabilitation of the site                                       |
| <b>Disturbance</b> due to human habitation or other influences (alien invasive species) | Site is very disturbed or degraded                           | Site is very disturbed or degraded                      | Site is very disturbed or degraded                           | Site is very disturbed or degraded   | There is some degree of disturbance of the site  | The site is hardly or very slightly impacted upon by human disturbance                                 | There is some degree of disturbance of the site  | Site is very disturbed or degraded   | There is some degree of disturbance of the site  | The site is hardly or very slightly impacted upon by human disturbance                                 |
| <b>Ecological function</b> in the landscape (corridor, niche habitats)                  | Low ecological function. No corridors or niche habitats      | Low ecological function. No corridors or niche habitats | Low ecological function. No corridors or niche habitats      | High ecological function. Portions of entire sections of the site contains corridors or niche habitats | High ecological function. Portions of entire sections of the site contains corridors or niche habitats | High ecological function. Portions of entire sections of the site contains corridors or niche habitats | High ecological function. Portions of entire sections of the site contains corridors or niche habitats | High ecological function. Portions of entire sections of the site contains corridors or niche habitats   | High ecological function. Portions of entire sections of the site contains corridors or niche habitats | High ecological function. Portions of entire sections of the site contains corridors or niche habitats |
| <b>Ecological services</b> (food, water filter, grazing, etc.)                          | Low to no ecological services on site                        | Low to no ecological services on site                   | Low to no ecological services on site                        | Some sections of the site contain ecological services  | Some sections of the site contain ecological services  | Most of the site contains ecological services  | Some sections of the site contain ecological services  | Most of the site contains ecological services  | Some sections of the site contain ecological services  | Most of the site contains ecological services  |
| <b>OVERALL SENSITIVITY</b>  | <b>LOW</b>   | <b>LOW</b>  | <b>LOW</b>   | <b>MODERATE</b>  | <b>MODERATE</b>  | <b>HIGH</b>  | <b>MODERATE</b>  | <b>HIGH</b>  | <b>MODERATE</b>  | <b>HIGH</b>  |



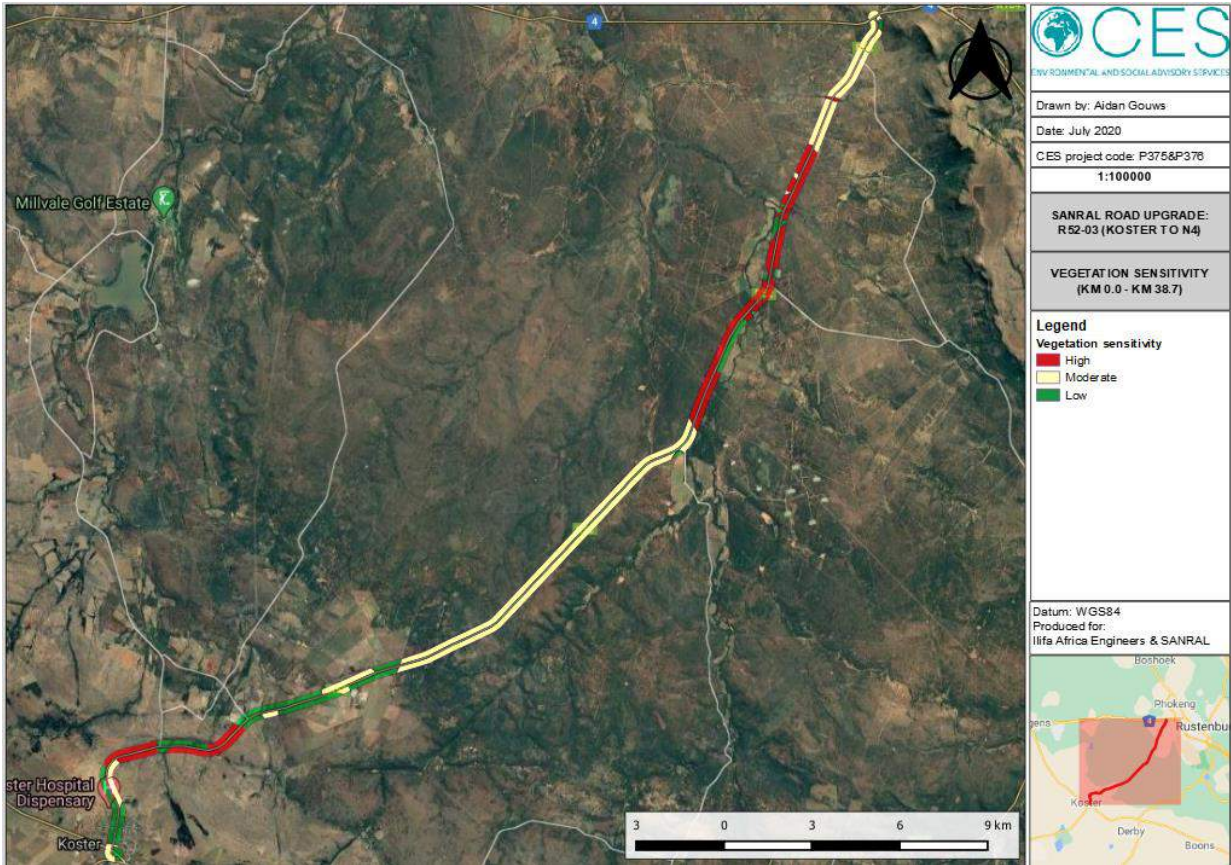


Figure 6.1 Sensitivity map of the entire R52 study area (KM 0.0 – KM 38.7).

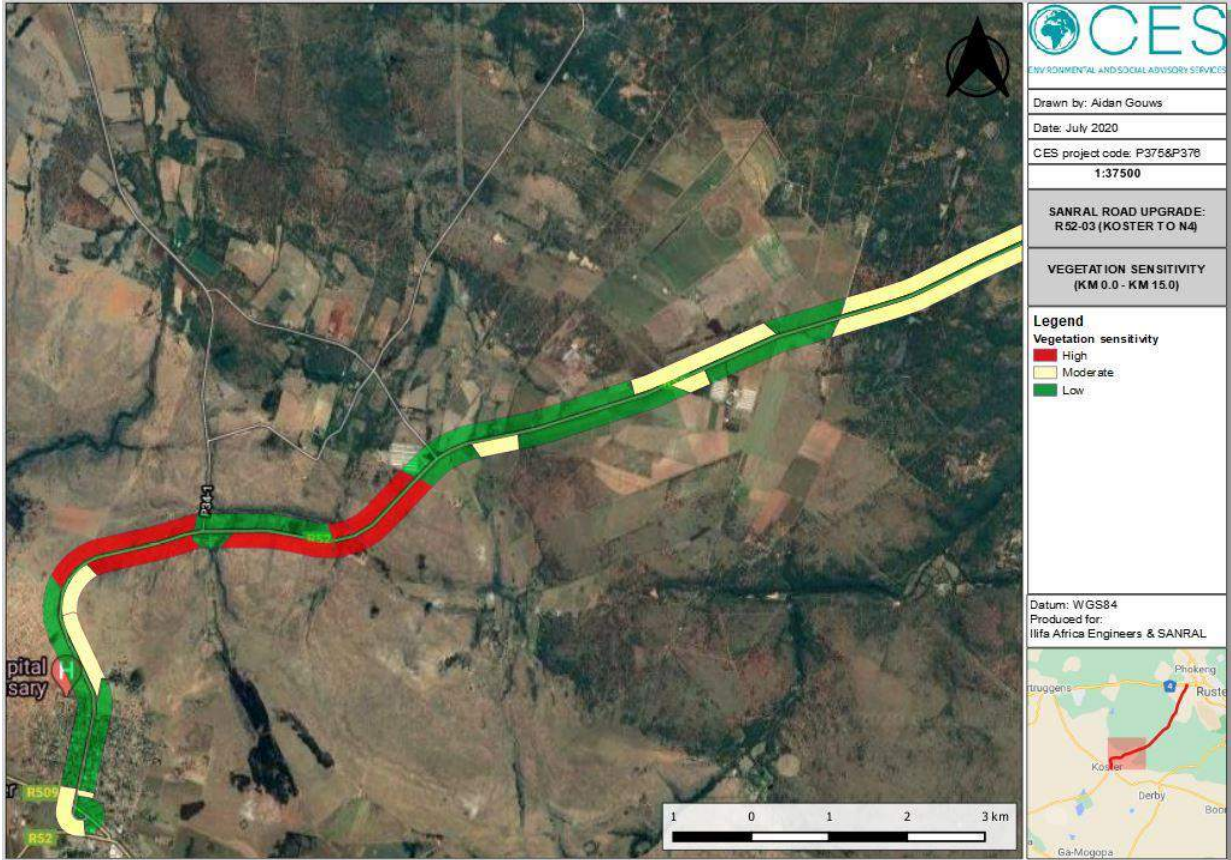


Figure 6.2 Sensitivity map of the R52 study area (KM 0.0 – KM 15.0).



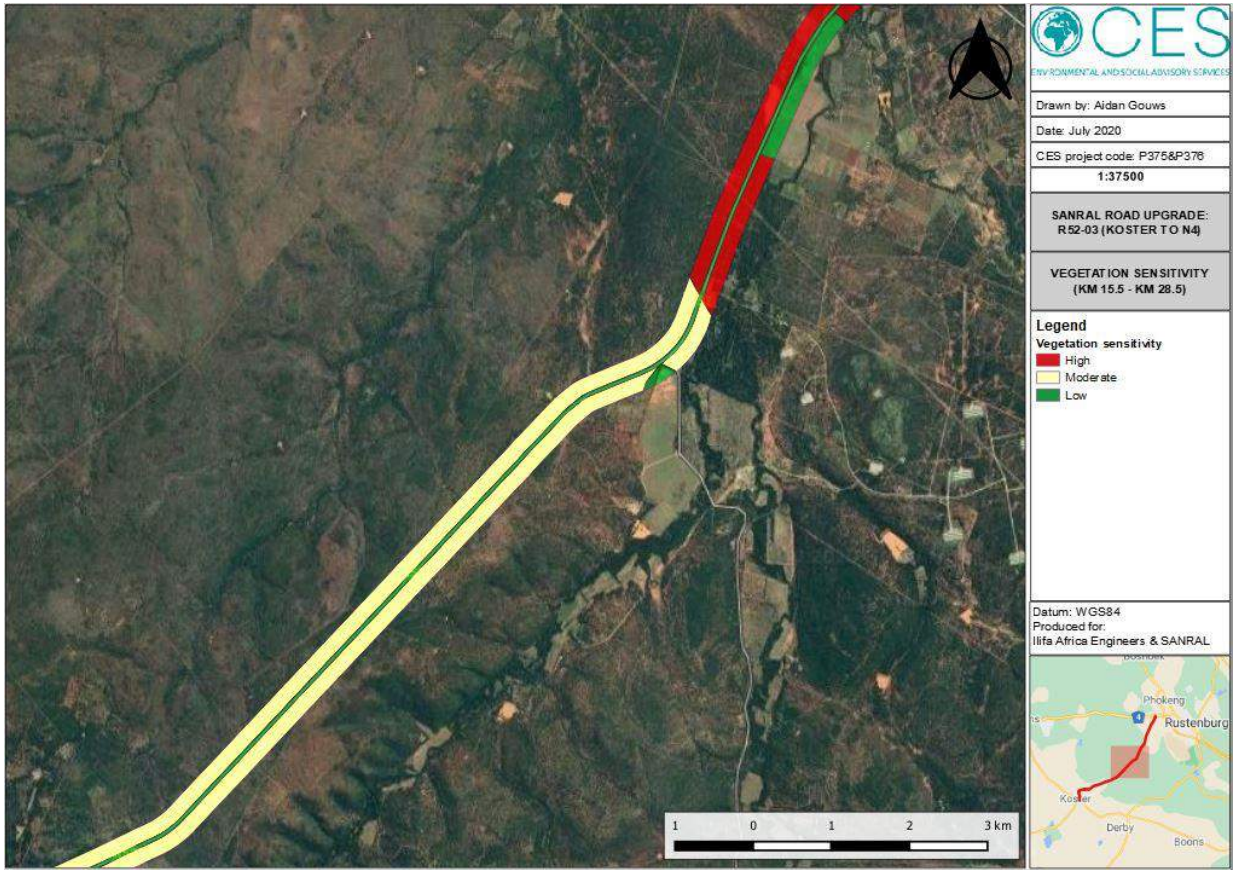


Figure 6.3 Sensitivity map of the R52 study area (KM 15.5 – KM 28.5).

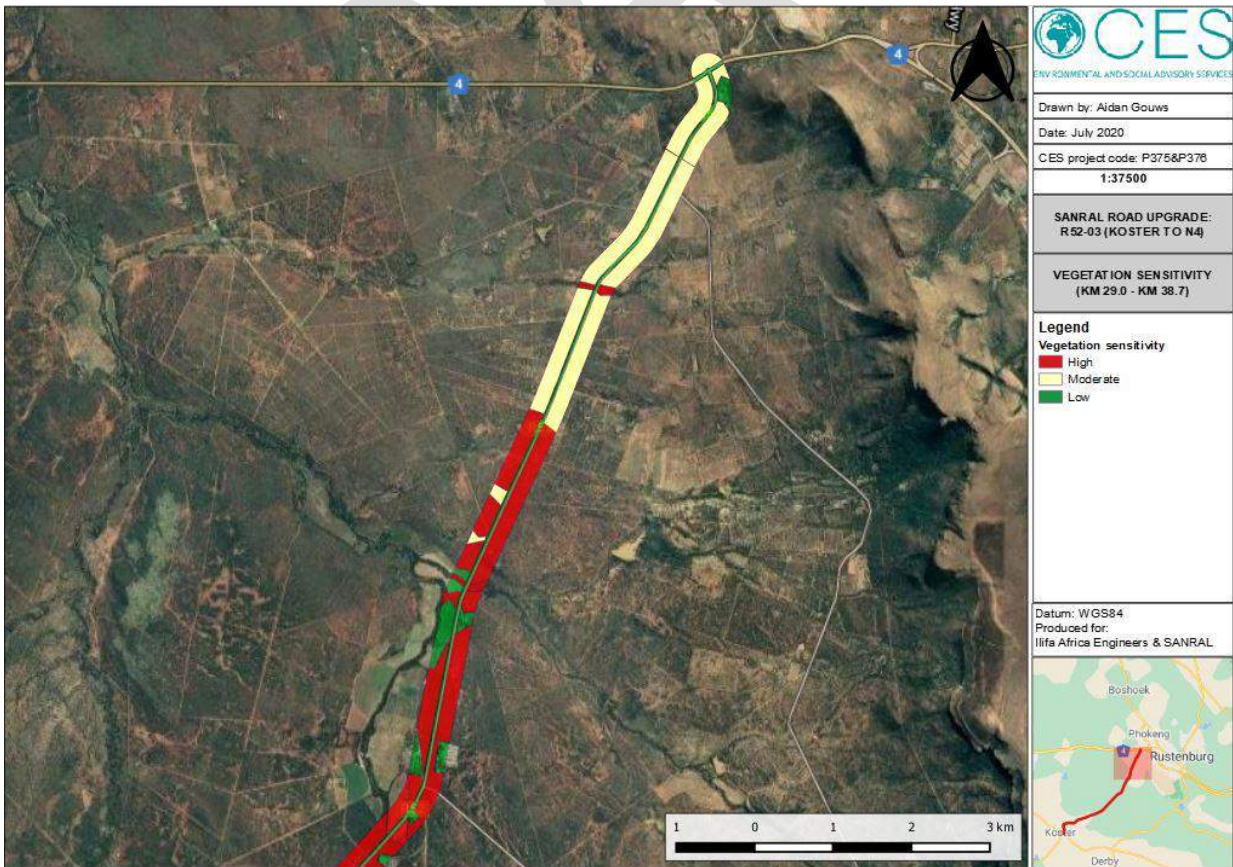


Figure 6.4 Sensitivity map of the R52 study area (KM 29.0 – KM 38.7).



## 7 VEGETATION IMPACT ASSESSMENT

In terms of Appendix 6 of the 2014 NEMA EIA Regulations (2014, as amended) a specialist report must contain-

- (cB) A description of the existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;
- (j) A description of the findings and potential implications of such findings on the impact of the proposed activity or activities;
- (k) Any mitigation measures for inclusion in the EMPr;

### 7.1 POTENTIAL ISSUES

Impacts that could be a direct or indirect result of the proposed activity were identified for the Planning and Design, Construction and Operation Phase. These included the consideration of direct, indirect and cumulative impacts that may occur, and also considers the no-go or existing impacts. Table 7.1 below provides a summary of the potential issues identified and their applicability to each phase of the proposed activity.

These impacts were assessed using the methodology outlined in Section 4.56 of this report. The impact ratings before and after the implementation of mitigation measures are provided for the Planning and Design, Construction and Operation Phases in Table 7.2, Table 7.3 and Table 7.4, respectively. The impacts associated with the no-go alternative are provided in Table 7.5.



Table 7.1: Technical scope of the impacts on the vegetation for all phases of the proposed R52 upgrade.

| THEME                                 | POTENTIAL ISSUES                              | SOURCE OF ISSUE  | POTENTIAL RECEPTORS  | PHASE               |              |             | ASSESSMENT ACTIONS  |
|---------------------------------------|---|--|--|---------------------|--------------|-------------|---|
|                                       |   |  |  | PLANNING AND DESIGN | CONSTRUCTION | OPERATIONAL |   |
| <b>Environmental policy</b>           | Legal and policy compliance                   | <ul style="list-style-type: none"> <li>Permits and authorisations</li> </ul>   | <ul style="list-style-type: none"> <li>Developer</li> </ul>  | X                   | X            | X           | Assessment of permits required for any SCC, and WULA.                               |
| <b>Soils</b>                          | Erosion and sedimentation                     | <ul style="list-style-type: none"> <li>Vegetation clearance</li> <li>Soil disturbance</li> <li>Topsoil loss</li> </ul>                                   | <ul style="list-style-type: none"> <li>Steeper slopes</li> <li>Riparian areas</li> <li>Terrestrial and riparian environment</li> </ul> | X                   | X            | X           | Assessment of the affected terrestrial environment in the current specialist study. |
| <b>Vegetation</b>                     | Loss of natural vegetation                    | <ul style="list-style-type: none"> <li>Vegetation clearance</li> </ul>   | <ul style="list-style-type: none"> <li>Flora in development footprint</li> </ul>   | X                   | X            | X           | Assessment of the affected terrestrial environment in the current specialist study. |
|                                       | Loss of Species of Conservation Concern (SCC) | <ul style="list-style-type: none"> <li>Vegetation clearance</li> </ul>   | <ul style="list-style-type: none"> <li>SCCs in development footprint</li> </ul>  | X                   | X            |             |   |
|                                       | Habitat loss and degradation                  | <ul style="list-style-type: none"> <li>Vegetation clearance</li> </ul>   | <ul style="list-style-type: none"> <li>Habitats within development footprint</li> </ul>  |                     | X            |             |   |
|                                       | Establishment of alien vegetation             | <ul style="list-style-type: none"> <li>Inappropriate planning for management/rehabilitation of alien vegetation</li> <li>Vegetation clearance</li> </ul> | <ul style="list-style-type: none"> <li>Terrestrial and riparian environment</li> </ul>   | X                   | X            | X           |   |
| <b>Rehabilitation and maintenance</b> | Inadequate rehabilitation and maintenance     | <ul style="list-style-type: none"> <li>Inadequate planning and provisioning</li> <li>Lack of maintenance of infrastructure</li> </ul>                    | <ul style="list-style-type: none"> <li>Terrestrial and riparian environment</li> </ul>   | X                   | X            | X           | Rehabilitation plan as provided in the EMP.   |





## 7.2 IMPACTS

Table 7.2: Impacts and mitigation measures for the Planning and Design Phase.

| POTENTIAL ISSUE                    | SOURCE OF ISSUE  | NATURE   | TYPE   | CONSEQUENCE OF IMPACT | EXTENT OF IMPACT | DURATION OF IMPACT | PROBABILITY OF IMPACT | REVERSIBILITY | IRREPLACEABLE LOSS           | MITIGATION POTENTIAL | SIGNIFICANCE WITHOUT MITIGATION | MITIGATION MEASURES   | SIGNIFICANCE OF IMPACT WITH MITIGATION |
|------------------------------------|--|----------|--------|-----------------------|------------------|--------------------|-----------------------|---------------|------------------------------|----------------------|---------------------------------|---|--|
| <b>Legal and policy compliance</b> | During the planning and design phase, failure to adhere to existing policies and legal obligations and obtain the necessary authorisations could lead to the project conflicting with local, provincial and national policies, legislation, etc. This could result in lack of institutional support for the project, overall project failure and undue disturbance to the natural environment. | Negative | Direct | Severe                | National         | Long-term          | Possible              | Reversible    | Resource will be partly lost | Achievable           | <b>HIGH -</b>                   | <ul style="list-style-type: none"> <li>All relevant legislation and policy must be consulted, and the proponent must ensure that the project is compliant with such legislation and policy.</li> <li>These should include (but are not restricted to): NEMA, North West Biodiversity Sector Plan (NW BSP), Local Municipal bylaws.</li> <li>All relevant permits and authorisations including Water Use Licences and plant removal permits (if required) must be in place prior to commencement of construction.</li> </ul> | <b>LOW -</b>                           |



| POTENTIAL ISSUE                  | SOURCE OF ISSUE  | NATURE   | TYPE             | CONSEQUENCE OF IMPACT | EXTENT OF IMPACT | DURATION OF IMPACT | PROBABILITY OF IMPACT | REVERSIBILITY | IRREPLACEABLE LOSS           | MITIGATION POTENTIAL | SIGNIFICANCE WITHOUT MITIGATION | MITIGATION MEASURES  | SIGNIFICANCE OF IMPACT WITH MITIGATION |
|----------------------------------|--|----------|------------------|-----------------------|------------------|--------------------|-----------------------|---------------|------------------------------|----------------------|---------------------------------|--|--|
| <b>Erosion and sedimentation</b> | During the planning and design phase, inappropriate design plans may result in increased levels of erosion and sedimentation of the surrounding environment. Insufficient planning for stormwater management and erosion prevention within steeper gradients and river crossings will result in erosion that may eventually impair the safety of the road. | Negative | Direct, Indirect | Moderate              | Localised        | Long-term          | Possible              | Irreversible  | Resource will be partly lost | Achievable           | <b>MODERATE -</b>               | <ul style="list-style-type: none"> <li>A Stormwater Management Plan and an Erosion Management Plan must be developed by the Engineer/Contractor during the final design stages to control runoff and prevent erosion of the surrounding environment and sedimentation of surrounding watercourses.</li> <li>These plans must be approved by the appointed ECO.</li> <li>The stormwater management plan must include appropriately designed culvert/bridges for all watercourse/river crossings including scour counter measures and bank stabilisation measures.</li> <li>All necessary Water Use Authorisations must be obtained for any activities within or in close proximity to a watercourse.</li> </ul> | <b>LOW -</b>                           |



| POTENTIAL ISSUE                   | SOURCE OF ISSUE   | NATURE   | TYPE                         | CONSEQUENCE OF IMPACT | EXTENT OF IMPACT | DURATION OF IMPACT | PROBABILITY OF IMPACT | REVERSIBILITY | IRREPLACEABLE LOSS           | MITIGATION POTENTIAL | SIGNIFICANCE WITHOUT MITIGATION | MITIGATION MEASURES   | SIGNIFICANCE OF IMPACT WITH MITIGATION |
|-----------------------------------|---|----------|------------------------------|-----------------------|------------------|--------------------|-----------------------|---------------|------------------------------|----------------------|---------------------------------|---|--|
| <b>Loss of natural vegetation</b> | During the planning and design phase, the inappropriate design of the project infrastructure and demarcation of project boundaries will lead to the unnecessary loss of natural vegetation and habitat supporting other taxonomic groups. | Negative | Direct, Indirect, Cumulative | Severe                | Localised        | Permanent          | Possible              | Irreversible  | Resource will be lost        | Easily Achievable    | <b>MODERATE -</b>               | <ul style="list-style-type: none"> <li>During the planning and design phase, the construction footprint must be clearly demarcated and must be designed to avoid the loss of indigenous vegetation as far as possible.</li> </ul>   | <b>LOW -</b>                           |
| <b>Loss of plant SCCs</b>         | During the planning and design phase, the inadequate planning for search and rescue operations and permitting for the removal of any SCC may result in non-compliances being issued and the unintended loss of SCC.                       | Negative | Direct, Cumulative           | Severe                | Localised        | Long-term          | Possible              | Irreversible  | Resource will be partly lost | Easily Achievable    | <b>MODERATE -</b>               | <ul style="list-style-type: none"> <li>Planning for any search and rescue operations must be conducted prior to the commencement of construction activities.</li> <li>All necessary permits must be obtained for the removal of any identified SCC prior to the commencement of construction activities.</li> </ul> | <b>LOW -</b>                           |





| POTENTIAL ISSUE                                  | SOURCE OF ISSUE  | NATURE   | TYPE                 | CONSEQUENCE OF IMPACT | EXTENT OF IMPACT | DURATION OF IMPACT | PROBABILITY OF IMPACT | REVERSIBILITY | IRREPLACEABLE LOSS           | MITIGATION POTENTIAL | SIGNIFICANCE WITHOUT MITIGATION | MITIGATION MEASURES  | SIGNIFICANCE OF IMPACT WITH MITIGATION |
|--|--|----------|----------------------|-----------------------|------------------|--------------------|-----------------------|---------------|------------------------------|----------------------|---------------------------------|--|--|
| <b>Establishment of alien vegetation</b>         | During the planning and design phase, the failure to plan for the removal and management of alien vegetation could result in the invasion of alien vegetation in sensitive areas during the construction and operational phases. | Negative | Indirect, Cumulative | Severe                | Study area       | Long-term          | Probable              | Reversible    | Resource will not be lost    | Easily Achievable    | <b>MODERATE -</b>               | <ul style="list-style-type: none"> <li>An Alien Vegetation Management Plan must be developed by the Contractor prior to construction to mitigate the establishment and spread of undesirable alien plant species during all phases of the project.</li> <li>The Alien Vegetation Management Plan must be approved by the appointed ECO prior to implementation.</li> <li>Regular monitoring of the implementation of this plan for the rehabilitation of disturbed areas must be conducted throughout construction and rehabilitation by the appointed ECO.</li> </ul> | <b>LOW -</b>                           |
| <b>Inadequate rehabilitation and maintenance</b> | During the planning and design phase, the failure to plan for the rehabilitation of impacted areas may lead to erosion of disturbed areas and unnecessary loss of soil and sedimentation of watercourses.                        | Negative | Direct, Indirect     | Moderate              | Study area       | Medium-term        | Possible              | Reversible    | Resource will be partly lost | Easily Achievable    | <b>MODERATE -</b>               | <ul style="list-style-type: none"> <li>During the planning and design phase, a Rehabilitation Plan must be developed and implemented during construction and operation phases.</li> <li>Regular monitoring of implementation of this plan for the rehabilitation of disturbed areas must be conducted.</li> </ul>  | <b>LOW -</b>                           |



Table 7.3: Impacts and mitigation measures for the Construction Phase.

| POTENTIAL ISSUE             | SOURCE OF ISSUE  | NATURE   | TYPE   | CONSEQUENCE OF IMPACT | EXTENT OF IMPACT | DURATION OF IMPACT | PROBABILITY OF IMPACT | REVERSIBILITY | IRREPLACEABLE LOSS           | MITIGATION POTENTIAL | SIGNIFICANCE WITHOUT MITIGATION | MITIGATION MEASURES   | SIGNIFICANCE OF IMPACT WITH MITIGATION |
|-----------------------------|--|----------|--------|-----------------------|------------------|--------------------|-----------------------|---------------|------------------------------|----------------------|---------------------------------|---|--|
| Legal and policy compliance | During the construction phase, failure to adhere to existing policies and existing authorisations could lead to the project conflicting with local, provincial and national policies, legislation, etc. This could result in lack of institutional support for the project, penalties, and overall project failure and undue disturbance to the natural environment. | Negative | Direct | Severe                | National         | Long-term          | Possible              | Reversible    | Resource will be partly lost | Achievable           | HIGH -                          | <ul style="list-style-type: none"> <li>All relevant legislation and policy must be consulted, and the proponent must ensure that the project is compliant with such legislation and policy, as well as the conditions contained in authorisations/licenses obtained.</li> <li>An ECO must be appointed for the duration of the construction phase to ensure compliance with the EA and EMPr.</li> </ul> | LOW -                                  |



| POTENTIAL ISSUE                   | SOURCE OF ISSUE  | NATURE   | TYPE                         | CONSEQUENCE OF IMPACT | EXTENT OF IMPACT | DURATION OF IMPACT | PROBABILITY OF IMPACT | REVERSIBILITY | IRREPLACEABLE LOSS           | MITIGATION POTENTIAL | SIGNIFICANCE WITHOUT MITIGATION | MITIGATION MEASURES  | SIGNIFICANCE OF IMPACT WITH MITIGATION |
|-----------------------------------|--|----------|------------------------------|-----------------------|------------------|--------------------|-----------------------|---------------|------------------------------|----------------------|---------------------------------|--|--|
| <b>Erosion and sedimentation</b>  | During the construction phase, construction works, stockpiling of materials within 50 m of the river, inappropriate stormwater management and vegetation clearing may result in loss of topsoil, erosion and sedimentation of nearby watercourses. | Negative | Direct, Indirect             | Moderate              | Localised        | Long-term          | Possible              | Reversible    | Resource will be partly lost | Achievable           | <b>MODERATE -</b>               | <ul style="list-style-type: none"> <li>The Stormwater Management Plan and Erosion Management Plan must be implemented during construction and monitored by the appointed ECO.</li> <li>No stockpiles must be placed within 50 m of a watercourse/wetland.</li> <li>The first 150-200mm of soil is generally classified as topsoil. This must be removed and stockpiled separately to the remaining subsoil.</li> <li>Topsoil must not be stockpiled higher than 2m or for longer than 1 year.</li> </ul> | <b>LOW -</b>                           |
| <b>Loss of natural vegetation</b> | During the construction phase, the clearing of natural vegetation outside the approved development footprint will lead to the unnecessary loss of vegetation.  | Negative | Direct, Indirect, Cumulative | Severe                | Localised        | Permanent          | Possible              | Reversible    | Resource will be partly lost | Easily Achievable    | <b>MODERATE -</b>               | <ul style="list-style-type: none"> <li>The construction activities must remain within the approved demarcated development footprint, and no vegetation clearance is to be permitted outside of the approved development footprint.</li> </ul>  | <b>LOW -</b>                           |





| POTENTIAL ISSUE    | SOURCE OF ISSUE  | NATURE   | TYPE               | CONSEQUENCE OF IMPACT | EXTENT OF IMPACT | DURATION OF IMPACT | PROBABILITY OF IMPACT | REVERSIBILITY | IRREPLACEABLE LOSS           | MITIGATION POTENTIAL | SIGNIFICANCE WITHOUT MITIGATION | MITIGATION MEASURES  | SIGNIFICANCE OF IMPACT WITH MITIGATION |
|--------------------|--|----------|--------------------|-----------------------|------------------|--------------------|-----------------------|---------------|------------------------------|----------------------|---------------------------------|--|--|
| Loss of plant SCCs | During the construction phase, the inadequate planning for search and rescue operations and permitting for the removal of any SCC may result in non-compliances being issued and the unintended loss of SCC. | Negative | Direct, Cumulative | Severe                | Localised        | Long-term          | Possible              | Irreversible  | Resource will be partly lost | Easily Achievable    | <b>MODERATE -</b>               | <ul style="list-style-type: none"> <li>No plant SCCs may be removed from the development footprint unless the relevant permits have been obtained.</li> <li>The ECO must monitor for potential additional plant SCCs not found during search and rescue activities.</li> </ul> | <b>LOW -</b>                           |



| POTENTIAL ISSUE              | SOURCE OF ISSUE   | NATURE   | TYPE                 | CONSEQUENCE OF IMPACT | EXTENT OF IMPACT | DURATION OF IMPACT | PROBABILITY OF IMPACT | REVERSIBILITY | IRREPLACEABLE LOSS           | MITIGATION POTENTIAL | SIGNIFICANCE WITHOUT MITIGATION | MITIGATION MEASURES   | SIGNIFICANCE OF IMPACT WITH MITIGATION |
|------------------------------|---|----------|----------------------|-----------------------|------------------|--------------------|-----------------------|---------------|------------------------------|----------------------|---------------------------------|---|--|
| Habitat loss and degradation | During the construction phase, the construction related activities may result in the loss and/or degradation of natural habitats for specific flora and/or fauna. | Negative | Indirect, Cumulative | Moderate              | Study area       | Long-term          | Possible              | Irreversible  | Resource will be partly lost | Achievable           | <b>MODERATE -</b>               | <ul style="list-style-type: none"> <li>The contractor must ensure that vegetation clearance of natural and riparian vegetation is restricted to the approved development footprint only.</li> <li>The site camp must target already disturbed areas.</li> <li>Construction vehicles and machinery must not be permitted outside of the development footprint, as much as practically possible.</li> <li>The ECO must monitor that all construction activities are conducted within the development footprint.</li> <li>All impacted areas must be rehabilitated as per the Rehabilitation Plan, as soon as construction has been completed within each area.</li> </ul> | <b>LOW -</b>                           |



| POTENTIAL ISSUE                          | SOURCE OF ISSUE  | NATURE   | TYPE     | CONSEQUENCE OF IMPACT | EXTENT OF IMPACT | DURATION OF IMPACT | PROBABILITY OF IMPACT | REVERSIBILITY | IRREPLACEABLE LOSS        | MITIGATION POTENTIAL | SIGNIFICANCE WITHOUT MITIGATION | MITIGATION MEASURES   | SIGNIFICANCE OF IMPACT WITH MITIGATION |
|--|--|----------|----------|-----------------------|------------------|--------------------|-----------------------|---------------|---------------------------|----------------------|---------------------------------|---|--|
| <b>Establishment of alien vegetation</b> | During the construction phase, the removal of natural vegetation creates open habitats that favour the establishment of undesirable alien plant species. | Negative | Indirect | Severe                | Study area       | Long-term          | Probable              | Reversible    | Resource will not be lost | Easily Achievable    | <b>MODERATE -</b>               | <ul style="list-style-type: none"> <li>The Contractor must implement the Alien Vegetation Management Plan.</li> <li>The ECO must monitor for the adequate implementation of this plan.</li> <li>All previously infested areas must be rehabilitated as per the Rehabilitation Plan, to the satisfaction of the appointed ECO, as soon as construction has been completed within each area.</li> </ul> | <b>LOW -</b>                           |





| POTENTIAL ISSUE                           | SOURCE OF ISSUE  | NATURE   | TYPE             | CONSEQUENCE OF IMPACT | EXTENT OF IMPACT | DURATION OF IMPACT | PROBABILITY OF IMPACT | REVERSIBILITY | IRREPLACEABLE LOSS           | MITIGATION POTENTIAL | SIGNIFICANCE WITHOUT MITIGATION | MITIGATION MEASURES   | SIGNIFICANCE OF IMPACT WITH MITIGATION |
|---|--|----------|------------------|-----------------------|------------------|--------------------|-----------------------|---------------|------------------------------|----------------------|---------------------------------|---|--|
| Inadequate rehabilitation and maintenance | During the construction phase, inadequate implementation of rehabilitation measures in disturbed areas may lead to the degradation of the surrounding environment and establishment of alien invasive plant species. | Negative | Direct, Indirect | Moderate              | Study area       | Medium-term        | Possible              | Reversible    | Resource will be partly lost | Easily Achievable    | <b>MODERATE -</b>               | <ul style="list-style-type: none"> <li>The Contractor must implement the Rehabilitation Plan.</li> <li>The ECO must monitor for the adequate implementation of this plan for disturbed/impacted areas resulting from the road construction and related activities.</li> <li>All impacted areas must be rehabilitated with indigenous vegetation in accordance with that of the immediate surrounding environment.</li> <li>Where vegetation has been cleared, site rehabilitation in terms of soil stabilisation and re-vegetation must be undertaken. Where soil compaction has occurred, the surface of the subsoil must be ripped, and covered with 150-200 mm layer of topsoil rehabilitation.</li> <li>Only topsoil from the immediate area must be used for rehabilitation.</li> <li>Rehabilitation must be conducted as soon as construction has been completed within each area.</li> </ul> | <b>LOW -</b>                           |



Table 7.4: Impacts and mitigation measures for the Operation Phase.

| POTENTIAL ISSUE             | SOURCE OF ISSUE   | NATURE   | TYPE   | CONSEQUENCE OF IMPACT | EXTENT OF IMPACT | DURATION OF IMPACT | PROBABILITY OF IMPACT | REVERSIBILITY | IRREPLACEABLE LOSS           | MITIGATION POTENTIAL | SIGNIFICANCE WITHOUT MITIGATION | MITIGATION MEASURES   | SIGNIFICANCE OF IMPACT WITH MITIGATION |
|-----------------------------|---|----------|--------|-----------------------|------------------|--------------------|-----------------------|---------------|------------------------------|----------------------|---------------------------------|---|--|
| Legal and policy compliance | During the operation phase, failure to adhere to existing authorisations/license and management plans could result in lack of institutional support for the project, penalties, overall project failure and undue disturbance to the natural environment. This is unlikely to have a severe impact because all risks would have been dealt with during planning and design and construction | Negative | Direct | Slight                | Study area       | Short-term         | Unlikely              | Reversible    | Resource will be partly lost | Achievable           | LOW -                           | <ul style="list-style-type: none"> <li>All relevant legislation, and relevant licenses/authorisations and management plans must be adhered to to ensure that the project is compliant.</li> </ul> | LOW -                                  |



| POTENTIAL ISSUE                          | SOURCE OF ISSUE   | NATURE   | TYPE               | CONSEQUENCE OF IMPACT | EXTENT OF IMPACT | DURATION OF IMPACT | PROBABILITY OF IMPACT | REVERSIBILITY | IRREPLACEABLE LOSS           | MITIGATION POTENTIAL | SIGNIFICANCE WITHOUT MITIGATION | MITIGATION MEASURES   | SIGNIFICANCE OF IMPACT WITH MITIGATION |
|--|---|----------|--------------------|-----------------------|------------------|--------------------|-----------------------|---------------|------------------------------|----------------------|---------------------------------|---|--|
| <b>Erosion and sedimentation</b>         | During the operational phase, inadequate implementation and maintenance of the stormwater management infrastructure and erosion prevention measures may result in uncontrolled runoff, erosion and sedimentation into watercourses. Erosion and sedimentation may also occur as a result of poor slope stabilisation. | Negative | Direct, Indirect   | Moderate              | Localised        | Long-term          | Possible              | Reversible    | Resource will be partly lost | Achievable           | <b>MODERATE -</b>               | <ul style="list-style-type: none"> <li>The condition of the road infrastructure, including stormwater and bridge/culvert structures must undergo regular inspection and maintenance, particularly after heavy rainfall events.</li> </ul> | <b>LOW -</b>                           |
| <b>Loss of natural vegetation</b>        | During the operation phase, vegetation control outside of the road reserve will lead to the loss of natural vegetation.   | Negative | Direct, Cumulative | Severe                | Localised        | Medium-term        | Possible              | Irreversible  | Resource will be lost        | Easily Achievable    | <b>MODERATE -</b>               | <ul style="list-style-type: none"> <li>Vegetation clearing must be done according the approved management plan and must be restricted to within the road reserve only.</li> </ul>   | <b>LOW -</b>                           |
| <b>Establishment of alien vegetation</b> | During the operation phase, the failure to plan for the removal and management of alien vegetation could result in the widespread invasion of alien vegetation during the operational phases.   | Negative | Indirect           | Severe                | Study area       | Long-term          | Probable              | Reversible    | Resource will not be lost    | Achievable           | <b>MODERATE -</b>               | <ul style="list-style-type: none"> <li>Alien invasive vegetation control must be included as part of routine operational maintenance of the road infrastructure.</li> </ul>   | <b>LOW -</b>                           |



| POTENTIAL ISSUE                                  | SOURCE OF ISSUE   | NATURE   | TYPE             | CONSEQUENCE OF IMPACT | EXTENT OF IMPACT | DURATION OF IMPACT | PROBABILITY OF IMPACT | REVERSIBILITY | IRREPLACEABLE LOSS           | MITIGATION POTENTIAL | SIGNIFICANCE WITHOUT MITIGATION | MITIGATION MEASURES  | SIGNIFICANCE OF IMPACT WITH MITIGATION |
|--|---|----------|------------------|-----------------------|------------------|--------------------|-----------------------|---------------|------------------------------|----------------------|---------------------------------|--|--|
| <b>Inadequate rehabilitation and maintenance</b> | During the operation phase, inadequate rehabilitation of impacted areas and routine maintenance of the road infrastructure may result in the degradation of the study area and surrounds. | Negative | Direct, Indirect | Moderate              | Study area       | Medium-term        | Possible              | Reversible    | Resource will be partly lost | Easily Achievable    | <b>MODERATE -</b>               | <ul style="list-style-type: none"> <li>The Rehabilitation Plan must include measures for routine maintenance of the road infrastructure to prevent uncontrolled stormwater runoff, erosion and sedimentation of nearby watercourses.</li> <li>All cleared areas must be continuously rehabilitated with indigenous vegetation for 6 months after the start of the Operational Phase, or until such time that the ECO is satisfied the all affected areas have been rehabilitated.</li> </ul> | <b>LOW -</b>                           |





Table 7.5: Impacts and mitigation measures for the No-Go Alternative.

| POTENTIAL ISSUE | SOURCE OF ISSUE   | NATURE   | TYPE   | CONSEQUENCE OF IMPACT | EXTENT OF IMPACT | DURATION OF IMPACT | PROBABILITY OF IMPACT | REVERSIBILITY | IRREPLACEABLE LOSS           | MITIGATION POTENTIAL | SIGNIFICANCE WITHOUT MITIGATION | MITIGATION MEASURES   | SIGNIFICANCE OF IMPACT WITH MITIGATION |
|-----------------|---|----------|--------|-----------------------|------------------|--------------------|-----------------------|---------------|------------------------------|----------------------|---------------------------------|---|--|
| No-Go option    | Should the proposed development not proceed, there will be no ecological impacts to the existing natural environment. | Positive | Direct | Severe                | Localised        | Long-term          | Definite              | Reversible    | Resource will be partly lost | Achievable           | LOW +                           | <ul style="list-style-type: none"> <li>None required</li> </ul> | LOW +                                  |
|                 | Should the proposed development not proceed, the affected residents will continue to have no/inadequate road access.  | Negative | Direct | Severe                | Localised        | Long-term          | Definite              | Reversible    | Resource will be partly lost | Achievable           | LOW -                           | <ul style="list-style-type: none"> <li>None required</li> </ul> | LOW -                                  |



### 7.3 ASSESSMENT OF CUMULATIVE IMPACTS

In terms of Environmental Impact Assessment, Cumulative Impact is defined as:

*“The past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities”.*

The proposed R52 road upgrade may lead to potential cumulative impacts such as:

- The clearing of natural vegetation leading to the loss of the natural vegetation, plant SCCs as well as habitat loss;
- Surface water impacts, such as sedimentation (increased dust and sediment generation), may extend beyond the immediate project site;
- Changes to surface flow dynamics may have negative effects on the aquatic environment beyond the immediate project site; and
- Local land capability may be reduced due to loss of topsoil, erosion and soil contamination.

The following cumulative impacts were identified as a result of the proposed upgrade (Table 7.6).

**Table 7.6: Cumulative impacts of the proposed road upgrade.**

| THEME                                 | DESCRIPTION OF IMPACT  | CUMULATIVE IMPACT  |
|---------------------------------------|--|--|
| Natural vegetation                    | Inappropriate design of the project infrastructure and demarcation of project boundaries as well as the clearance of natural vegetation outside of the demarcated project boundary will lead to the unnecessary loss of natural vegetation and habitat supporting other taxonomic groups.  | Loss of ecosystems and ecological infrastructure through direct physical removal and indirect impacts on ecological infrastructure.  |
| Species of Conservation Concern       | The inadequate planning for search and rescue operations and permitting for the removal of any SCC may result in non-compliances being issued and the unintended loss of SCC.  | Permanent loss of SCC. Delays in development/ operational processes due to the non-compliances issued.   |
| Rehabilitation of disturbed areas     | Inadequate planning for rehabilitation and failing to implement ongoing rehabilitation measures during construction may lead to degradation of the study area and establishment of alien invasive vegetation.  | Disturbance to the riparian vegetation due to alien plant species infestation, erosion of the river banks and sedimentation of the watercourse may result in the long term degradation of the natural environment of the study area and surrounds. |
| Establishments of alien plant species | The removal of natural vegetation creates open habitats that favour the establishment of undesirable alien plant species in areas that are typically very difficult to eradicate and may pose a threat to neighbouring ecosystems. Together with poor rehabilitation of disturbed areas may lead to the permanent degradation of ecosystems as well as allow alien vegetation species to expand. | Establishment of alien invasive vegetation and permanent degradation of the ecosystems.  |



## 8 IMPACT STATEMENT, CONCLUSION AND RECOMMENDATIONS

In terms of Appendix 6 of 2014 NEMA EIA Regulations (2014, as amended) a specialist report must contain-

- (l) Any conditions for inclusion in the environmental authorisation;
- (m) Any monitoring requirements for inclusion in the EMPr or environmental authorisation;
- (n) A reasoned opinion as to-
  - (i) whether the proposed activity, activities or portions thereof should be authorised; and
  - (iA) regarding the acceptability of the proposed activity or activities, and
  - (ii) If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;
- (q) Any other information requested by the competent authority.

### 8.1 CUMULATIVE IMPACTS

The proposed R52 road upgrade may lead to potential cumulative impacts such as:

- The clearing of natural vegetation leading to the loss of the natural vegetation, plant SCCs as well as habitat loss;
- Surface water impacts, such as sedimentation (increased dust and sediment generation), may extend beyond the immediate project site;
- Changes to surface flow dynamics may have negative effects on the aquatic environment beyond the immediate project site; and
- Local land capability may be reduced due to loss of topsoil, erosion and soil contamination.

### 8.2 NO GO AREAS

The development site (including temporary impacted areas such as site camps and laydown areas) must be demarcated prior to commencement of construction and the site location approved by the appointed ECO. All areas outside the approved demarcation must be considered as NO-GO areas. All areas indicated as likely to contain plant SCCs must be considered NO-GO areas until necessary permits are obtained for their removal.

### 8.3 ALTERNATIVES

The preferred alternative and No-Go alternatives were the only alternatives assessed for the proposed R52 road upgrade.

### 8.4 SUMMARY OF IMPACT SIGNIFICANCE

Table 8.1 provides a summary of the negative impacts of the proposed R52 route upgrade on the vegetation along the project route, pre- and post-mitigation, during the planning and design, construction and operation phases. Prior to mitigation, the proposed upgrade is anticipated to have one impact of LOW significance, 14 impacts of MODERATE significance and two impacts of HIGH significance. All impacts would be reduced to a LOW significance post-mitigation, provided that the proposed mitigation measures are implemented and adhered to.



Table 8.1: Assessment of pre- and post-mitigation impact significance.

| PHASE               | PRE-MITIGATION |            |           | POST-MITIGATION |          |          |
|---------------------|----------------|------------|-----------|-----------------|----------|----------|
|                     | LOW            | MODERATE   | HIGH      | LOW             | MODERATE | HIGH     |
| Planning and Design |                | -5         | -1        | -6              |          |          |
| Construction        |                | -6         | -1        | -7              |          |          |
| Operational         | -1             | -4         |           | -4              |          |          |
| <b>TOTAL</b>        | <b>-1</b>      | <b>-14</b> | <b>-2</b> | <b>-17</b>      | <b>0</b> | <b>0</b> |

## 8.5 RECOMMENDATIONS FOR THE PROPOSED ACTIVITY

The following recommendations must be included into the final EMPr:

- The project construction site must be demarcated prior to commencement of activities on site. All areas outside the demarcation will be considered as No-Go areas during construction;
- A qualified, independent ECO must be appointed prior to commencement of any activity on site;
- All mitigation measures indicated in this report must be included into the EMPr; and
- The following Management Plans must be developed prior to clearing and implemented during construction and operations of the proposed development. These management plans must be incorporated into the EMPr:
  - Storm Water Management Plan;
  - Erosion Management Plan;
  - Rehabilitation Management Plan; and
  - Alien Vegetation Management Plan

## 8.6 MITIGATION MEASURES

All the mitigation measures provided below must be implemented during the planning and design, construction, operational phases of the proposed R52 road upgrade.

Table 8.2: Mitigation measures for the Planning and Design phase.

| PLANNING AND DESIGN PHASE   |   |
|-----------------------------|---|
| ISSUE                       | MITIGATION MEASURES   |
| Legal and policy compliance | <ul style="list-style-type: none"> <li>• All relevant legislation and policy must be consulted, and the proponent must ensure that the project is compliant with such legislation and policy.</li> <li>• These should include (but are not restricted to): NEMA, North West Biodiversity Sector Plan (NW BSP), Local Municipal bylaws.</li> <li>• All relevant permits and authorisations including Water Use Licences and plant removal permits must be in place prior to commencement of construction.</li> </ul> |
| Erosion and sedimentation   | <ul style="list-style-type: none"> <li>• A Stormwater Management Plan and an Erosion Management Plan must be developed by the Engineer/Contractor during the final design stages to control runoff and prevent erosion of the surrounding environment and sedimentation of surrounding watercourses.</li> <li>• These plans must be approved by the appointed ECO.</li> </ul>   |





| PLANNING AND DESIGN PHASE                        |  |
|--|--|
| ISSUE  | MITIGATION MEASURES  |
|  | <ul style="list-style-type: none"> <li>The stormwater management plan must include appropriately designed culvert/bridges for all watercourse/river crossings including scour counter measures and bank stabilisation measures.</li> <li>All necessary Water Use Authorisations must be obtained for any activities within or in close proximity to a watercourse.</li> </ul>  |
| <b>Loss of natural and riparian vegetation</b>   | <ul style="list-style-type: none"> <li>During the planning and design phase, the construction footprint must be clearly demarcated and must be designed to avoid the loss of indigenous vegetation as far as possible.</li> </ul>  |
| <b>Loss of plant SCCs</b>                        | <ul style="list-style-type: none"> <li>Planning for any search and rescue operations must be conducted prior to the commencement of construction activities.</li> <li>All necessary permits must be obtained for the removal of any identified SCC prior to the commencement of construction activities.</li> </ul>  |
| <b>Establishment of alien vegetation</b>         | <ul style="list-style-type: none"> <li>An Alien Vegetation Management Plan must be developed by the Contractor prior to construction to mitigate the establishment and spread of undesirable alien plant species during all phases of the project.</li> <li>The Alien Vegetation Management Plan must be approved by the appointed ECO prior to implementation.</li> <li>Regular monitoring of the implementation of this plan for the rehabilitation of disturbed areas must be conducted throughout construction and rehabilitation by the appointed ECO.</li> </ul> |
| <b>Inadequate rehabilitation and maintenance</b> | <ul style="list-style-type: none"> <li>During the planning and design phase, a Rehabilitation Plan must be developed and implemented during construction and operation phases.</li> <li>Regular monitoring of implementation of this plan for the rehabilitation of disturbed areas must be conducted.</li> </ul>  |

Table 8.3: Mitigation measures for the Construction phase.

| CONSTRUCTION PHASE                             |  |
|--|--|
| ISSUE  | MITIGATION MEASURES  |
| <b>Legal and policy compliance</b>             | <ul style="list-style-type: none"> <li>All relevant legislation and policy must be consulted, and the proponent must ensure that the project is compliant with such legislation and policy, as well as the conditions contained in authorisations/licenses obtained.</li> </ul>  |
| <b>Erosion and sedimentation</b>               | <ul style="list-style-type: none"> <li>The Stormwater Management Plan and Erosion Management Plan must be implemented during construction and monitored by the appointed ECO.</li> <li>No stockpiles must be placed within 50 m of a watercourse/wetland.</li> <li>The first 150-200mm of soil is generally classified as topsoil. This must be removed and stockpiled separately to the remaining subsoil.</li> <li>Topsoil must not be stockpiled higher than 2m or for longer than 1 year.</li> </ul> |
| <b>Loss of natural and riparian vegetation</b> | <ul style="list-style-type: none"> <li>The construction activities must remain within the approved demarcated development footprint, and no vegetation clearance is to be permitted outside of the approved development footprint.</li> </ul>  |



| CONSTRUCTION PHASE                |   |
|-----------------------------------|---|
| ISSUE                             | MITIGATION MEASURES   |
| Loss of plant SCCs                | <ul style="list-style-type: none"> <li>No plant SCCs may be removed from the development footprint unless the relevant permits have been obtained.</li> <li>The ECO must monitor for potential additional plant SCCs not found during search and rescue activities.</li> </ul>  |
| Habitat loss and degradation      | <ul style="list-style-type: none"> <li>The contractor must ensure that vegetation clearance of natural and riparian vegetation is restricted to the approved development footprint only.</li> <li>The site camp must target already disturbed areas.</li> <li>Construction vehicles and machinery must not be permitted outside of the development footprint, as much as practically possible.</li> <li>The ECO must monitor that all construction activities are conducted within the development footprint.</li> <li>All impacted areas must be rehabilitated as per the Rehabilitation Plan, as soon as construction has been completed within each area.</li> </ul> |
| Establishment of alien vegetation | <ul style="list-style-type: none"> <li>The Contractor must implement the Alien Vegetation Management Plan.</li> <li>The ECO must monitor for the adequate implementation of this plan.</li> <li>All previously infested areas must be rehabilitated as per the Rehabilitation Plan, to the satisfaction of the appointed ECO, as soon as construction has been completed within each area.</li> </ul>   |

Table 8.4: Mitigation measures for the Operation phase.

| OPERATION PHASE                           |  |
|---|--|
| ISSUE                                     | MITIGATION MEASURES  |
| Legal and policy compliance               | <ul style="list-style-type: none"> <li>All relevant legislation, and relevant licenses/authorisations and management plans must be adhered to ensure that the project is compliant.</li> </ul>   |
| Erosion and sedimentation                 | <ul style="list-style-type: none"> <li>The condition of the road infrastructure, including stormwater and bridge/culvert structures must undergo regular inspection and maintenance, particularly after heavy rainfall events.</li> </ul>  |
| Loss of natural and riparian vegetation   | <ul style="list-style-type: none"> <li>Vegetation clearing must be done according the approved management and maintenance plan and must be restricted to within the road reserve only.</li> </ul>  |
| Establishment of alien vegetation         | <ul style="list-style-type: none"> <li>Alien invasive vegetation control must be included as part of routine operational maintenance of the road infrastructure.</li> </ul>  |
| Inadequate rehabilitation and maintenance | <ul style="list-style-type: none"> <li>The Rehabilitation Plan must include measures for routine maintenance of the road infrastructure to prevent uncontrolled stormwater runoff, erosion and sedimentation of nearby watercourses.</li> <li>All cleared areas must be continuously rehabilitated with indigenous vegetation for 6 months after the start of the Operational Phase, or until such time that the ECO is satisfied the all affected areas have been rehabilitated.</li> </ul> |



## 8.7 ECOLOGICAL STATEMENT AND OPINION OF THE SPECIALIST

The vegetation impacts relating to the proposed R52 road upgrade were assessed and considered to be ecologically acceptable, provided that mitigation measures outlined in this report are implemented.

All impacts identified as HIGH or MODERATE pre-mitigation can be reduced to a LOW significance post-mitigation, provided that the proposed mitigation measures are implemented and adhered to.

All regions demarcated as HIGH sensitivity in Section 6 of this report must be avoided as far as possible. The application of the appropriate mitigation measures provided in Section 8 for these sensitive areas is of critical importance for the integrity of the environment to be sustained throughout the development of the R52-03. Specific mitigations are required for any plant SCC and/or communities identified onsite.

Minor location deviations from the proposed works are deemed acceptable provided that they are approved by the appointed ECO and the recommended mitigation measures contained in this report are implemented for such deviations.

The proposed development is **NOT considered to be Fatally Flawed** in terms of its potential impact on vegetation along the project route.

The **No-Go option** refers to the R52-03 road not being upgraded. This option has both a positive and a negative outcome, as the natural vegetation within the development footprint will remain, however, the existing situation of deteriorating infrastructure.



## 9 REFERENCES

- Animal Demography Unit, 2019. *FrogMAP Virtual Museum*. [Online]  
Available at: <http://vmus.adu.org.za/?vm=FrogMAP>  
[Accessed 13 February 2019].
- Animal Demography Unit, 2019. *MammalMAP Virtual Museum*<http://vmus.adu.org.za/?vm=MammalMAP>. [Online]  
Available at: <http://vmus.adu.org.za/?vm=MammalMAP>  
[Accessed 13 February 2019].
- Animal Demography Unit, 2019. *ReptileMAP Virtual Museum*. [Online]  
Available at: <http://vmus.adu.org.za/?vm=ReptileMAP>  
[Accessed 13 February 2019].
- Avenant, N. et al., 2016. A conservation assessment of *Mystromys albicaudatus*. In: M. F. R. L. Child, E. Do Linh San, D. Raimondo & H. T. Davies-Mostert, eds. *The Red List of Mammals of South Africa, Swaziland and Lesotho*. South Africa: South African National Biodiversity Institute and Endangered Wildlife Trust.
- Bates, M. F. et al., 2014. *Atlas and red list of the reptiles of South Africa, Lesotho and Swaziland*. Pretoria: South African National Biodiversity Institute (SANBI).
- CES, 2020. *SANRAL Ilifa Koster R52 Upgrade Aquatic and Wetland Impact Assessment*, Centurion: CES.
- Department of Economic Development, Environment, Conservation and Tourism (DEDECT), 2015. *North West Biodiversity Sector Plan 2015*. [Online]  
Available at:  
<http://www.nwpg.gov.za/Agriculture/documents/2016/Environmental%20Policy%20Planning%20and%20Coordination/New%20Documents/North%20West%20Biodiversity%20Sector%20Plan%202015.pdf>  
[Accessed 16 January 2019].
- IUCN, 2019. *IUCN Red List*. [Online]  
Available at: <https://www.iucnredlist.org/search/map>  
[Accessed 13 May 2019].
- Jacques, H., Reed-Smith, J. & Somers, M. J., 2015. *Aonyx capensis*. *The IUCN Red List of Threatened Species 2015: e.T1793A21938767*. [Online]  
Available at: <http://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T1793A21938767.en>  
[Accessed 28 February 2019].
- Lepage, D., 2019. *Checklist of the birds of Madikwe*. *Avibase, the world bird database*. [Online]  
Available at: <https://avibase.bsc-eoc.org/checklist.jsp?region=ZAnw09&list=clements&format=1>  
[13/02/2019]  
[Accessed 13 February 2019].
- Mucina, L. & Rutherford, M. C., 2012. *The Vegetation of South Africa, Lesotho and Swaziland*. Pretoria: South African National Biodiversity Institute (SANBI).
- Mucina, L. & Rutherford, M. C., 2018. *The Vegetation of South Africa, Lesotho and Swaziland*. Pretoria: South African National Biodiversity Institute (SANBI).





Mucina, L. & Rutherford, M. C., 2018. *The Vegetation of South Africa, Lesotho and Swaziland*. Pretoria: South African National Biodiversity Institute (SANBI).

Power, R. J., 2013. *The distribution and status of mammals in the North West*, Mahikeng: Department of Economic Development, Environment, Conservation & Tourism, North West Provincial Government.

Power, R. J. & Verbugt, L., 2014. *The Herpetofauna of the North West: a literature survey*, Mahikeng: Department of Economic Development, Environment, Conservation and Tourism. North West Provincial Government.

Rural, Environment and Agricultural Development (READ), 2015. *North West Biodiversity Sector Plan 2015*. [Online]

Available at:

<http://www.nwpg.gov.za/Agriculture/documents/2016/Environmental%20Policy%20Planning%20and%20Coordination/New%20Documents/North%20West%20Biodiversity%20Sector%20Plan%202015.pdf>

[Accessed 16 January 2019].

South African National Biodiversity Institute (SANBI), 2019. *Red List of South African Plants*. [Online]

Available at: <http://redlist.sanbi.org/redcat.php>

[Accessed 12 March 2019].

StatsSA, 2011. *Census 2011: Census in Brief*. [Online]

Available at:

[http://www.statssa.gov.za/census/census\\_2011/census\\_products/Census\\_2011\\_Census\\_in\\_brief.pdf](http://www.statssa.gov.za/census/census_2011/census_products/Census_2011_Census_in_brief.pdf)

[Accessed 13 May 2019].

Stein, A. B. et al., 2016. *Panthera pardus (errata version published in 2016). The IUCN Red List of Threatened Species 2016: e.T15954A102421779*. [Online]

Available at: <http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T15954A50659089.en>

[Accessed 28 February 2019].

Wiesel, I., 2015. *Parahyaena brunnea. The IUCN Red List of Threatened Species 2015: e.T10276A82344448*. [Online]

Available at: <http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T10276A82344448.en>

[Accessed 28 February 2019].



## 10 APPENDIX A: LIST OF PLANT SPECIES

The following list of plant species may occur within the study area of the proposed Koster R52-03 development (Source: <http://posa.sanbi.org/searchsp.php>).

**Table 10.1** List of species that may occur within the proposed development area.

| FAMILY         | GENUS                | SPECIES              | ECOLOGY                        | STATUS                  |
|----------------|----------------------|----------------------|--------------------------------|-------------------------|
| Acanthaceae    | <i>Barleria</i>      | <i>macrostegia</i>   | Indigenous                     | LC                      |
| Acanthaceae    | <i>Blepharis</i>     | <i>squarrosa</i>     | Indigenous;<br>Endemic         | LC                      |
| Acanthaceae    | <i>Crabbea</i>       | <i>angustifolia</i>  | Indigenous;<br>Endemic         | LC                      |
| Acanthaceae    | <i>Dyschoriste</i>   | <i>costata</i>       | Indigenous;<br>Endemic         | LC                      |
| Acanthaceae    | <i>Justicia</i>      | <i>orchioides</i>    | Indigenous;<br>Endemic         | LC                      |
| Acanthaceae    | <i>Ruellia</i>       | <i>setosa</i>        | Indigenous                     | LC                      |
| Agavaceae      | <i>Chlorophytum</i>  | <i>cooperi</i>       | Indigenous                     | LC                      |
| Agavaceae      | <i>Chlorophytum</i>  | <i>fasciculatum</i>  | Indigenous                     | LC                      |
| Aizoaceae      | <i>Trianthema</i>    | <i>salsoides</i>     | Indigenous                     | LC                      |
| Amaranthaceae  | <i>Aerva</i>         | <i>leucura</i>       | Indigenous                     | LC                      |
| Amaranthaceae  | <i>Alternanthera</i> | <i>pungens</i>       | Not indigenous;<br>Naturalised | Not<br>Evaluated        |
| Amaranthaceae  | <i>Cyathula</i>      | <i>uncinulata</i>    | Indigenous                     | LC                      |
| Amaranthaceae  | <i>Gomphrena</i>     | <i>celosioides</i>   | Not indigenous;<br>Naturalised | Not<br>Evaluated        |
| Amaranthaceae  | <i>Pupalia</i>       | <i>lappacea</i>      | Indigenous                     | LC                      |
| Amaranthaceae  | <i>Salsola</i>       | <i>glabrescens</i>   | Indigenous                     | LC                      |
| Amaryllidaceae | <i>Boophone</i>      | <i>disticha</i>      | Indigenous                     | LC                      |
| Anacardiaceae  | <i>Ozoroa</i>        | <i>paniculosa</i>    | Indigenous                     | LC                      |
| Anacardiaceae  | <i>Searsia</i>       | <i>discolor</i>      | Indigenous                     | LC                      |
| Anacardiaceae  | <i>Searsia</i>       | <i>pyroides</i>      | Indigenous                     | LC                      |
| Apiaceae       | <i>Choritaenia</i>   | <i>capensis</i>      | Indigenous;<br>Endemic         | LC                      |
| Apiaceae       | <i>Deverra</i>       | <i>burchellii</i>    | Indigenous                     | LC                      |
| Apocynaceae    | <i>Acokanthera</i>   | <i>oppositifolia</i> | Indigenous                     | LC                      |
| Apocynaceae    | <i>Asclepias</i>     | <i>aurea</i>         | Indigenous                     | LC                      |
| Apocynaceae    | <i>Aspidoglossum</i> | <i>glabrescens</i>   | Indigenous;<br>Endemic         | LC                      |
| Apocynaceae    | <i>Brachystelma</i>  | <i>circinatum</i>    | Indigenous                     | LC; NWBMA<br>Schedule 2 |
| Apocynaceae    | <i>Ceropegia</i>     | <i>multiflora</i>    | Indigenous                     | LC                      |
| Apocynaceae    | <i>Gomphocarpus</i>  | <i>fruticosus</i>    | Indigenous                     | LC                      |
| Apocynaceae    | <i>Pachycarpus</i>   | <i>schinzianus</i>   | Indigenous                     | LC                      |
| Apocynaceae    | <i>Stenostelma</i>   | <i>corniculatum</i>  | Indigenous                     | LC                      |
| Apocynaceae    | <i>Xysmalobium</i>   | <i>undulatum</i>     | Indigenous                     | LC                      |
| Aquifoliaceae  | <i>Ilex</i>          | <i>mitis</i>         | Indigenous                     | LC                      |



| FAMILY          | GENUS                   | SPECIES                  | ECOLOGY                        | STATUS                   |
|-----------------|-------------------------|--------------------------|--------------------------------|--------------------------|
| Araliaceae      | <i>Cussonia</i>         | <i>transvaalensis</i>    | Indigenous;<br>Endemic         | LC                       |
| Asphodelaceae   | <i>Aloe</i>             | <i>zebrina</i>           | Indigenous                     | LC; CITES<br>Appendix II |
| Asphodelaceae   | <i>Kniphofia</i>        | <i>ensifolia</i>         | Indigenous                     | LC                       |
| Asphodelaceae   | <i>Kniphofia</i>        | <i>typhoides</i>         | Indigenous;<br>Endemic         | NT; NWBMA<br>Schedule 2  |
| Asteraceae      | <i>Acanthospermum</i>   | <i>glabratum</i>         | Not indigenous;<br>Naturalised | Not<br>Evaluated         |
| Asteraceae      | <i>Arctotis</i>         | <i>microcephala</i>      | Indigenous                     | LC                       |
| Asteraceae      | <i>Berkheya</i>         | <i>pinnatifida</i>       | Indigenous                     | LC                       |
| Asteraceae      | <i>Conyza</i>           | <i>podocephala</i>       | Indigenous                     | LC                       |
| Asteraceae      | <i>Felicia</i>          | <i>muricata</i>          | Indigenous                     | LC                       |
| Asteraceae      | <i>Gazania</i>          | <i>krebsiana</i>         | Indigenous                     | LC                       |
| Asteraceae      | <i>Geigeria</i>         | <i>brevifolia</i>        | Indigenous                     | LC                       |
| Asteraceae      | <i>Geigeria</i>         | <i>burkei</i>            | Indigenous                     | Not<br>Evaluated         |
| Asteraceae      | <i>Haplocarpha</i>      | <i>scaposa</i>           | Indigenous                     | LC                       |
| Asteraceae      | <i>Helichrysum</i>      | <i>argyrosphaerum</i>    | Indigenous                     | LC                       |
| Asteraceae      | <i>Helichrysum</i>      | <i>caespitium</i>        | Indigenous                     | LC                       |
| Asteraceae      | <i>Helichrysum</i>      | <i>callicomum</i>        | Indigenous                     | LC                       |
| Asteraceae      | <i>Helichrysum</i>      | <i>cerastioides</i>      | Indigenous                     | LC                       |
| Asteraceae      | <i>Helichrysum</i>      | <i>nudifolium</i>        | Indigenous                     | LC                       |
| Asteraceae      | <i>Helichrysum</i>      | <i>rugulosum</i>         | Indigenous                     | LC                       |
| Asteraceae      | <i>Hertia</i>           | <i>pallens</i>           | Indigenous                     | LC                       |
| Asteraceae      | <i>Macledium</i>        | <i>zeyheri</i>           | Indigenous                     | LC                       |
| Asteraceae      | <i>Nidorella</i>        | <i>hottentotica</i>      | Indigenous                     | LC                       |
| Asteraceae      | <i>Nidorella</i>        | <i>resedifolia</i>       | Indigenous                     | LC                       |
| Asteraceae      | <i>Nolletia</i>         | <i>ciliaris</i>          | Indigenous                     | LC                       |
| Asteraceae      | <i>Osteospermum</i>     | <i>scariosum</i>         | Indigenous                     | Not<br>Evaluated         |
| Asteraceae      | <i>Phymaspermum</i>     | <i>athanasioides</i>     | Indigenous                     | LC                       |
| Asteraceae      | <i>Pseudognaphalium</i> | <i>oligandrum</i>        | Indigenous                     | LC                       |
| Asteraceae      | <i>Schistostephium</i>  | <i>crataegifolium</i>    | Indigenous                     | LC                       |
| Asteraceae      | <i>Seriphium</i>        | <i>plumosum</i>          | Indigenous                     | LC                       |
| Asteraceae      | <i>Tolpis</i>           | <i>capensis</i>          | Indigenous                     | LC                       |
| Asteraceae      | <i>Ursinia</i>          | <i>nana</i>              | Indigenous                     | LC                       |
| Boraginaceae    | <i>Heliotropium</i>     | <i>lineare</i>           | Indigenous                     | LC                       |
| Boraginaceae    | <i>Trichodesma</i>      | <i>angustifolium</i>     | Indigenous                     | LC                       |
| Campanulaceae   | <i>Wahlenbergia</i>     | <i>magaliesbergensis</i> | Indigenous;<br>Endemic         | LC                       |
| Campanulaceae   | <i>Wahlenbergia</i>     | <i>undulata</i>          | Indigenous                     | LC                       |
| Capparaceae     | <i>Maerua</i>           | <i>cafra</i>             | Indigenous                     | LC                       |
| Caryophyllaceae | <i>Pollichia</i>        | <i>campestris</i>        | Indigenous                     | LC                       |



| FAMILY         | GENUS                 | SPECIES               | ECOLOGY                | STATUS           |
|----------------|-----------------------|-----------------------|------------------------|------------------|
| Celastraceae   | <i>Mystroxylon</i>    | <i>aethiopicum</i>    | Indigenous;<br>Endemic | LC               |
| Cleomaceae     | <i>Cleome</i>         | <i>maculata</i>       | Indigenous             | LC               |
| Cleomaceae     | <i>Cleome</i>         | <i>monophylla</i>     | Indigenous             | LC               |
| Commelinaceae  | <i>Commelina</i>      | <i>africana</i>       | Indigenous             | LC               |
| Commelinaceae  | <i>Commelina</i>      | <i>africana</i>       | Indigenous             | LC               |
| Commelinaceae  | <i>Commelina</i>      | <i>africana</i>       | Indigenous             | LC               |
| Commelinaceae  | <i>Commelina</i>      | <i>livingstonii</i>   | Indigenous             | LC               |
| Convolvulaceae | <i>Convolvulus</i>    | <i>aschersonii</i>    | Indigenous             | LC               |
| Convolvulaceae | <i>Convolvulus</i>    | <i>sagittatus</i>     | Indigenous             | LC               |
| Convolvulaceae | <i>Falkia</i>         | <i>oblonga</i>        | Indigenous             | LC               |
| Convolvulaceae | <i>Ipomoea</i>        | <i>bathycolpos</i>    | Indigenous;<br>Endemic | LC               |
| Convolvulaceae | <i>Ipomoea</i>        | <i>bolusiana</i>      | Indigenous             | LC               |
| Convolvulaceae | <i>Ipomoea</i>        | <i>crassipes</i>      | Indigenous             | LC               |
| Convolvulaceae | <i>Ipomoea</i>        | <i>obscura</i>        | Indigenous             | LC               |
| Convolvulaceae | <i>Ipomoea</i>        | <i>ommanneyi</i>      | Indigenous             | LC               |
| Convolvulaceae | <i>Ipomoea</i>        | <i>papilio</i>        | Indigenous             | LC               |
| Crassulaceae   | <i>Cotyledon</i>      | <i>orbiculata</i>     | Indigenous             | LC               |
| Crassulaceae   | <i>Crassula</i>       | <i>lanceolata</i>     | Indigenous             | LC               |
| Crassulaceae   | <i>Crassula</i>       | <i>natans</i>         | Indigenous             | LC               |
| Crassulaceae   | <i>Kalanchoe</i>      | <i>thyrsiflora</i>    | Indigenous             | LC               |
| Cucurbitaceae  | <i>Cucumis</i>        | <i>hirsutus</i>       | Indigenous             | LC               |
| Cucurbitaceae  | <i>Cucumis</i>        | <i>zeyheri</i>        | Indigenous             | LC               |
| Cyperaceae     | <i>Bulbostylis</i>    | <i>burchellii</i>     | Indigenous             | LC               |
| Cyperaceae     | <i>Bulbostylis</i>    | <i>oritrepes</i>      | Indigenous             | LC               |
| Cyperaceae     | <i>Cyperus</i>        | <i>esculentus</i>     | Indigenous             | LC               |
| Cyperaceae     | <i>Cyperus</i>        | <i>fastigiatus</i>    | Indigenous             | LC               |
| Cyperaceae     | <i>Cyperus</i>        | <i>indecorus</i>      | Indigenous             | Not<br>Evaluated |
| Cyperaceae     | <i>Cyperus</i>        | <i>marginatus</i>     | Indigenous             | LC               |
| Cyperaceae     | <i>Cyperus</i>        | <i>sphaerospermus</i> | Indigenous             | LC               |
| Cyperaceae     | <i>Isolepis</i>       | <i>cernua</i>         | Indigenous             | LC               |
| Cyperaceae     | <i>Isolepis</i>       | <i>costata</i>        | Indigenous             | LC               |
| Cyperaceae     | <i>Kyllinga</i>       | <i>alba</i>           | Indigenous             | LC               |
| Cyperaceae     | <i>Kyllinga</i>       | <i>melanosperma</i>   | Indigenous             | LC               |
| Cyperaceae     | <i>Pycreus</i>        | <i>nitidus</i>        | Indigenous             | LC               |
| Cyperaceae     | <i>Schoenoplectus</i> | <i>corymbosus</i>     | Indigenous             | LC               |
| Cyperaceae     | <i>Schoenoplectus</i> | <i>muricinux</i>      | Indigenous             | LC               |
| Cyperaceae     | <i>Schoenoplectus</i> | <i>muriculatus</i>    | Indigenous             | LC               |
| Dipsacaceae    | <i>Cephalaria</i>     | <i>zeyheriana</i>     | Indigenous             | LC               |
| Dipsacaceae    | <i>Scabiosa</i>       | <i>columbaria</i>     | Indigenous             | LC               |
| Ebenaceae      | <i>Diospyros</i>      | <i>lycioides</i>      | Indigenous             | LC               |
| Ebenaceae      | <i>Diospyros</i>      | <i>lycioides</i>      | Indigenous             | LC               |





| FAMILY           | GENUS                | SPECIES                | ECOLOGY             | STATUS                          |
|------------------|----------------------|------------------------|---------------------|---------------------------------|
| Ebenaceae        | <i>Euclea</i>        | <i>crispa</i>          | Indigenous          | LC                              |
| Ebenaceae        | <i>Euclea</i>        | <i>undulata</i>        | Indigenous          | LC                              |
| Elatinaceae      | <i>Bergia</i> sp.    |                        |                     | Unclassified                    |
| Euphorbiaceae    | <i>Acalypha</i>      | <i>angustata</i>       | Indigenous          | LC                              |
| Euphorbiaceae    | <i>Acalypha</i>      | <i>glabrata</i>        | Indigenous          | LC                              |
| Euphorbiaceae    | <i>Euphorbia</i>     | <i>striata</i>         | Indigenous          | Not Evaluated; NWBMA Schedule 2 |
| Fabaceae         | <i>Crotalaria</i>    | <i>distans</i>         | Indigenous          | LC                              |
| Fabaceae         | <i>Crotalaria</i>    | <i>lotoides</i>        | Indigenous          | LC                              |
| Fabaceae         | <i>Dichilus</i>      | <i>lebeckioides</i>    | Indigenous          | LC                              |
| Fabaceae         | <i>Dolichos</i>      | <i>angustifolius</i>   | Indigenous          | LC                              |
| Fabaceae         | <i>Dolichos</i>      | <i>falciformis</i>     | Indigenous          | LC                              |
| Fabaceae         | <i>Eriosema</i>      | <i>cordatum</i>        | Indigenous          | LC                              |
| Fabaceae         | <i>Indigofera</i>    | <i>comosa</i>          | Indigenous          | LC                              |
| Fabaceae         | <i>Indigofera</i>    | <i>egens</i>           | Indigenous; Endemic | LC                              |
| Fabaceae         | <i>Indigofera</i>    | <i>hedyantha</i>       | Indigenous          | LC                              |
| Fabaceae         | <i>Indigofera</i>    | <i>mollicoma</i>       | Indigenous          | LC                              |
| Fabaceae         | <i>Indigofera</i>    | <i>zeyheri</i>         | Indigenous          | LC                              |
| Fabaceae         | <i>Lessertia</i>     | <i>frutescens</i>      | Indigenous          | LC                              |
| Fabaceae         | <i>Lessertia</i>     | <i>perennans</i>       | Indigenous          | Not Evaluated                   |
| Fabaceae         | <i>Mundulea</i>      | <i>sericea</i>         | Indigenous          | LC                              |
| Fabaceae         | <i>Ophrestia</i>     | <i>oblongifolia</i>    | Indigenous          | LC                              |
| Fabaceae         | <i>Rhynchosia</i>    | <i>adenodes</i>        | Indigenous          | LC                              |
| Fabaceae         | <i>Senegalia</i>     | <i>caffra</i>          | Indigenous          | LC                              |
| Fabaceae         | <i>Teramnus</i>      | <i>labialis</i>        | Indigenous          | LC                              |
| Fabaceae         | <i>Vigna</i> sp.     |                        |                     | Unclassified                    |
| Gentianaceae     | <i>Chironia</i>      | <i>palustris</i>       | Indigenous          | LC                              |
| Gentianaceae     | <i>Sebaea</i>        | <i>leiostyla</i>       | Indigenous          | LC                              |
| Geraniaceae      | <i>Monsonia</i>      | <i>angustifolia</i>    | Indigenous          | LC                              |
| Gesneriaceae     | <i>Streptocarpus</i> | <i>vandeleurii</i>     | Indigenous; Endemic | LC                              |
| Hydrocharitaceae | <i>Lagarosiphon</i>  | <i>major</i>           | Indigenous          | LC                              |
| Hypericaceae     | <i>Hypericum</i>     | <i>aethiopicum</i>     | Indigenous          | LC                              |
| Hypericaceae     | <i>Hypericum</i>     | <i>lalandii</i>        | Indigenous          | LC                              |
| Hypoxidaceae     | <i>Hypoxis</i>       | <i>hemerocallidea</i>  | Indigenous          | LC                              |
| Iridaceae        | <i>Gladiolus</i>     | <i>sericeovillosus</i> | Indigenous          | LC                              |
| Juncaceae        | <i>Juncus</i>        | <i>exsertus</i>        | Indigenous          | LC                              |
| Lamiaceae        | <i>Leonotis</i>      | <i>pentadentata</i>    | Indigenous          | LC                              |
| Lamiaceae        | <i>Leonotis</i>      | <i>schinzii</i>        | Indigenous          | LC                              |
| Lamiaceae        | <i>Plectranthus</i>  | <i>hereroensis</i>     | Indigenous          | LC                              |
| Lamiaceae        | <i>Pycnostachys</i>  | <i>reticulata</i>      | Indigenous          | LC                              |



| FAMILY         | GENUS                | SPECIES                | ECOLOGY                                     | STATUS                                       |
|----------------|----------------------|------------------------|---|--|
| Lamiaceae      | <i>Salvia</i>        | <i>reflexa</i>         | Not indigenous;<br>Naturalised;<br>Invasive | Not<br>Evaluated                             |
| Lamiaceae      | <i>Salvia</i>        | <i>runcinata</i>       | Indigenous                                  | LC   |
| Lamiaceae      | <i>Salvia</i>        | <i>stenophylla</i>     | Indigenous                                  | Unclassified                                 |
| Lamiaceae      | <i>Stachys</i>       | <i>spathulata</i>      | Indigenous                                  | LC   |
| Lamiaceae      | <i>Syncolostemon</i> | <i>canescens</i>       | Indigenous                                  | LC   |
| Lamiaceae      | <i>Teucrium</i>      | <i>trifidum</i>        | Indigenous                                  | LC   |
| Leucobryaceae  | <i>Campylopus</i>    | <i>pyriformis</i>      | Indigenous                                  | LC   |
| Lobeliaceae    | <i>Lobelia</i>       | <i>sonderiana</i>      | Indigenous                                  | LC   |
| Loranthaceae   | <i>Agelanthus</i>    | <i>natalitius</i>      | Indigenous                                  | LC   |
| Malvaceae      | <i>Corchorus</i>     | <i>asplenifolius</i>   | Indigenous                                  | LC   |
| Malvaceae      | <i>Grewia</i>        | <i>flava</i>           | Indigenous                                  | LC   |
| Malvaceae      | <i>Hibiscus</i>      | <i>marlothianus</i>    | Indigenous;<br>Endemic                      | LC   |
| Malvaceae      | <i>Hibiscus</i>      | <i>microcarpus</i>     | Indigenous                                  | LC   |
| Malvaceae      | <i>Hibiscus</i>      | <i>pusillus</i>        | Indigenous                                  | LC   |
| Oleaceae       | <i>Jasminum</i>      | <i>breviflorum</i>     | Indigenous                                  | LC   |
| Oleaceae       | <i>Menodora</i>      | <i>africana</i>        | Indigenous                                  | LC   |
| Oleaceae       | <i>Olea</i>          | <i>europaea</i>        | Indigenous                                  | LC   |
| Onagraceae     | <i>Oenothera</i>     | <i>rosea</i>           | Not indigenous;<br>Naturalised;<br>Invasive | Not<br>Evaluated                             |
| Orchidaceae    | <i>Disperis</i>      | <i>anthoceros</i>      | Indigenous                                  | LC   |
| Orobanchaceae  | <i>Cycnium</i>       | <i>tubulosum</i>       | Indigenous                                  | LC   |
| Orobanchaceae  | <i>Striga</i>        | <i>bilabiata</i>       | Indigenous                                  | LC   |
| Orobanchaceae  | <i>Striga</i>        | <i>gesnerioides</i>    | Indigenous                                  | LC   |
| Osmundaceae    | <i>Osmunda</i>       | <i>regalis</i>         | Indigenous                                  | LC   |
| Papaveraceae   | <i>Argemone</i>      | <i>ochroleuca</i>      | Not indigenous;<br>Naturalised;<br>Invasive | Not<br>Evaluated;<br>NEMBA Cat<br>1b Invader |
| Peraceae       | <i>Clutia</i>        | <i>pulchella</i>       | Indigenous                                  | LC   |
| Phyllanthaceae | <i>Phyllanthus</i>   | <i>maderaspatensis</i> | Indigenous                                  | LC   |
| Poaceae        | <i>Alloteropsis</i>  | <i>semialata</i>       | Indigenous                                  | LC   |
| Poaceae        | <i>Andropogon</i>    | <i>appendiculatus</i>  | Indigenous                                  | LC   |
| Poaceae        | <i>Andropogon</i>    | <i>chinensis</i>       | Indigenous                                  | LC   |
| Poaceae        | <i>Aristida</i>      | <i>bipartita</i>       | Indigenous                                  | LC   |
| Poaceae        | <i>Aristida</i>      | <i>congesta</i>        | Indigenous                                  | LC   |
| Poaceae        | <i>Aristida</i>      | <i>scabrivalvis</i>    | Indigenous                                  | LC   |
| Poaceae        | <i>Brachiaria</i>    | <i>eruciformis</i>     | Indigenous                                  | LC   |
| Poaceae        | <i>Bromus</i>        | <i>leptoclados</i>     | Indigenous                                  | LC   |
| Poaceae        | <i>Chloris</i>       | <i>virgata</i>         | Indigenous                                  | LC   |
| Poaceae        | <i>Cymbopogon</i>    | <i>caesius</i>         | Indigenous                                  | LC   |



| FAMILY        | GENUS                 | SPECIES                | ECOLOGY                                     | STATUS        |
|---------------|-----------------------|------------------------|---|---------------|
| Poaceae       | <i>Cymbopogon</i>     | <i>pospischilii</i>    | Indigenous                                  | Not Evaluated |
| Poaceae       | <i>Cynodon</i>        | <i>dactylon</i>        | Indigenous                                  | LC            |
| Poaceae       | <i>Digitaria</i>      | <i>eriantha</i>        | Indigenous                                  | LC            |
| Poaceae       | <i>Digitaria</i>      | <i>tricholaenoides</i> | Indigenous                                  | LC            |
| Poaceae       | <i>Eleusine</i>       | <i>coracana</i>        | Indigenous                                  | LC            |
| Poaceae       | <i>Elionurus</i>      | <i>muticus</i>         | Indigenous                                  | LC            |
| Poaceae       | <i>Enneapogon</i>     | <i>scoparius</i>       | Indigenous                                  | LC            |
| Poaceae       | <i>Eragrostis</i>     | <i>curvula</i>         | Indigenous                                  | LC            |
| Poaceae       | <i>Eragrostis</i>     | <i>gummiflua</i>       | Indigenous                                  | LC            |
| Poaceae       | <i>Eragrostis</i>     | <i>inamoena</i>        | Indigenous                                  | LC            |
| Poaceae       | <i>Eragrostis</i>     | <i>plana</i>           | Indigenous                                  | LC            |
| Poaceae       | <i>Eragrostis</i>     | <i>racemosa</i>        | Indigenous                                  | LC            |
| Poaceae       | <i>Hemarthria</i>     | <i>altissima</i>       | Indigenous                                  | LC            |
| Poaceae       | <i>Hyparrhenia</i>    | <i>hirta</i>           | Indigenous                                  | LC            |
| Poaceae       | <i>Hyparrhenia</i>    | <i>schimperi</i>       | Indigenous                                  | LC            |
| Poaceae       | <i>Leersia</i>        | <i>hexandra</i>        | Indigenous                                  | LC            |
| Poaceae       | <i>Melinis</i>        | <i>nerviglumis</i>     | Indigenous                                  | LC            |
| Poaceae       | <i>Panicum</i>        | <i>maximum</i>         | Indigenous                                  | LC            |
| Poaceae       | <i>Panicum</i>        | <i>schinzii</i>        | Indigenous                                  | LC            |
| Poaceae       | <i>Panicum</i> sp.    |                        |   | Unclassified  |
| Poaceae       | <i>Schizachyrium</i>  | <i>sanguineum</i>      | Indigenous                                  | LC            |
| Poaceae       | <i>Setaria</i>        | <i>pumila</i>          | Indigenous                                  | LC            |
| Poaceae       | <i>Setaria</i>        | <i>sphacelata</i>      | Indigenous                                  | Not Evaluated |
| Poaceae       | <i>Sporobolus</i>     | <i>fimbriatus</i>      | Indigenous                                  | LC            |
| Poaceae       | <i>Sporobolus</i>     | <i>natalensis</i>      | Indigenous                                  | LC            |
| Poaceae       | <i>Sporobolus</i>     | <i>nitens</i>          | Indigenous                                  | LC            |
| Poaceae       | <i>Sporobolus</i>     | <i>pectinatus</i>      | Indigenous;<br>Endemic                      | LC            |
| Poaceae       | <i>Sporobolus</i> sp. |                        |   | Unclassified  |
| Poaceae       | <i>Trachypogon</i>    | <i>spicatus</i>        | Indigenous                                  | LC            |
| Poaceae       | <i>Tragus</i>         | <i>racemosus</i>       | Indigenous                                  | LC            |
| Poaceae       | <i>Tristachya</i>     | <i>rehmannii</i>       | Indigenous                                  | LC            |
| Poaceae       | <i>Urochloa</i>       | <i>panicoides</i>      | Indigenous                                  | LC            |
| Polygalaceae  | <i>Polygala</i>       | <i>capillaris</i>      | Indigenous                                  | LC            |
| Polygalaceae  | <i>Polygala</i>       | <i>hottentotta</i>     | Indigenous                                  | LC            |
| Polygonaceae  | <i>Persicaria</i>     | <i>decipiens</i>       | Indigenous                                  | LC            |
| Polygonaceae  | <i>Persicaria</i>     | <i>hystricula</i>      | Indigenous                                  | LC            |
| Polygonaceae  | <i>Rumex</i>          | <i>crispus</i>         | Not indigenous;<br>Naturalised;<br>Invasive | Not Evaluated |
| Portulacaceae | <i>Portulaca</i>      | <i>quadrifida</i>      | Indigenous                                  | LC            |
| Proteaceae    | <i>Faurea</i>         | <i>saligna</i>         | Indigenous                                  | LC            |
| Proteaceae    | <i>Protea</i>         | <i>caffra</i>          | Indigenous                                  | LC            |



| FAMILY           | GENUS                 | SPECIES                | ECOLOGY                | STATUS       |
|------------------|-----------------------|------------------------|------------------------|--------------|
| Proteaceae       | <i>Protea</i>         | <i>gaguedi</i>         | Indigenous             | LC           |
| Proteaceae       | <i>Protea</i>         | <i>welwitschii</i>     | Indigenous             | LC           |
| Pteridaceae      | <i>Cheilanthes</i>    | <i>viridis</i>         | Indigenous             | LC           |
| Rhamnaceae       | <i>Phylica</i>        | <i>paniculata</i>      | Indigenous             | LC           |
| Rhamnaceae       | <i>Ziziphus</i>       | <i>mucronata</i>       | Indigenous             | LC           |
| Ricciaceae       | <i>Riccia</i>         | <i>atropurpurea</i>    | Indigenous             | Unclassified |
| Ricciaceae       | <i>Riccia</i>         | <i>macrocarpa</i>      | Indigenous             | LC           |
| Ricciaceae       | <i>Riccia</i>         | <i>nigrella</i>        | Indigenous             | LC           |
| Ricciaceae       | <i>Riccia</i>         | <i>okahandjana</i>     | Indigenous             | Unclassified |
| Rosaceae         | <i>Cliffortia</i>     | <i>linearifolia</i>    | Indigenous             | LC           |
| Rubiaceae        | <i>Anthospermum</i>   | <i>hispidulum</i>      | Indigenous             | LC           |
| Rubiaceae        | <i>Anthospermum</i>   | <i>rigidum</i>         | Indigenous             | LC           |
| Rubiaceae        | <i>Kohautia</i>       | <i>caespitosa</i>      | Indigenous             | LC           |
| Rubiaceae        | <i>Otiophora</i>      | <i>calycophylla</i>    | Indigenous;<br>Endemic | LC           |
| Rubiaceae        | <i>Pavetta</i>        | <i>gardeniifolia</i>   | Indigenous             | LC           |
| Rubiaceae        | <i>Pavetta</i>        | <i>zeyheri</i>         | Indigenous             | LC           |
| Rubiaceae        | <i>Pentanisia</i>     | <i>angustifolia</i>    | Indigenous             | LC           |
| Rubiaceae        | <i>Pygmaeothamnus</i> | <i>zeyheri</i>         | Indigenous             | LC           |
| Santalaceae      | <i>Thesium</i>        | <i>utile</i>           | Indigenous             | LC           |
| Sapotaceae       | <i>Englerophytum</i>  | <i>magalismontanum</i> | Indigenous             | LC           |
| Scrophulariaceae | <i>Chaenostoma</i>    | <i>leve</i>            | Indigenous             | LC           |
| Scrophulariaceae | <i>Jamesbrittenia</i> | <i>burkeana</i>        | Indigenous             | LC           |
| Scrophulariaceae | <i>Selago</i>         | <i>densiflora</i>      | Indigenous             | LC           |
| Scrophulariaceae | <i>Selago</i>         | <i>mixta</i>           | Indigenous;<br>Endemic | LC           |
| Scrophulariaceae | <i>Selago</i> sp.     |                        |                        | Unclassified |
| Selaginellaceae  | <i>Selaginella</i>    | <i>caffrorum</i>       | Indigenous             | LC           |
| Solanaceae       | <i>Solanum</i>        | <i>campylacanthum</i>  | Indigenous             | LC           |
| Solanaceae       | <i>Solanum</i>        | <i>lichtensteinii</i>  | Indigenous             | LC           |
| Stilbaceae       | <i>Nuxia</i>          | <i>congesta</i>        | Indigenous             | LC           |
| Thymelaeaceae    | <i>Lasiosiphon</i>    | <i>polycephalus</i>    | Indigenous             | LC           |
| Thymelaeaceae    | <i>Lasiosiphon</i>    | <i>sericocephalus</i>  | Indigenous             | LC           |
| Vahliaceae       | <i>Vahlia</i>         | <i>capensis</i>        | Indigenous             | LC           |
| Velloziaceae     | <i>Xerophyta</i>      | <i>viscosa</i>         | Indigenous             | LC           |
| Verbenaceae      | <i>Chascanum</i>      | <i>pinnatifidum</i>    | Indigenous             | LC           |
| Verbenaceae      | <i>Lippia</i>         | <i>javanica</i>        | Indigenous             | LC           |
| Verbenaceae      | <i>Lippia</i>         | <i>scaberrima</i>      | Indigenous             | LC           |
| Xyridaceae       | <i>Xyris</i>          | <i>gerrardii</i>       | Indigenous             | LC           |





11 APPENDIX B: A3 PROJECT MAPS

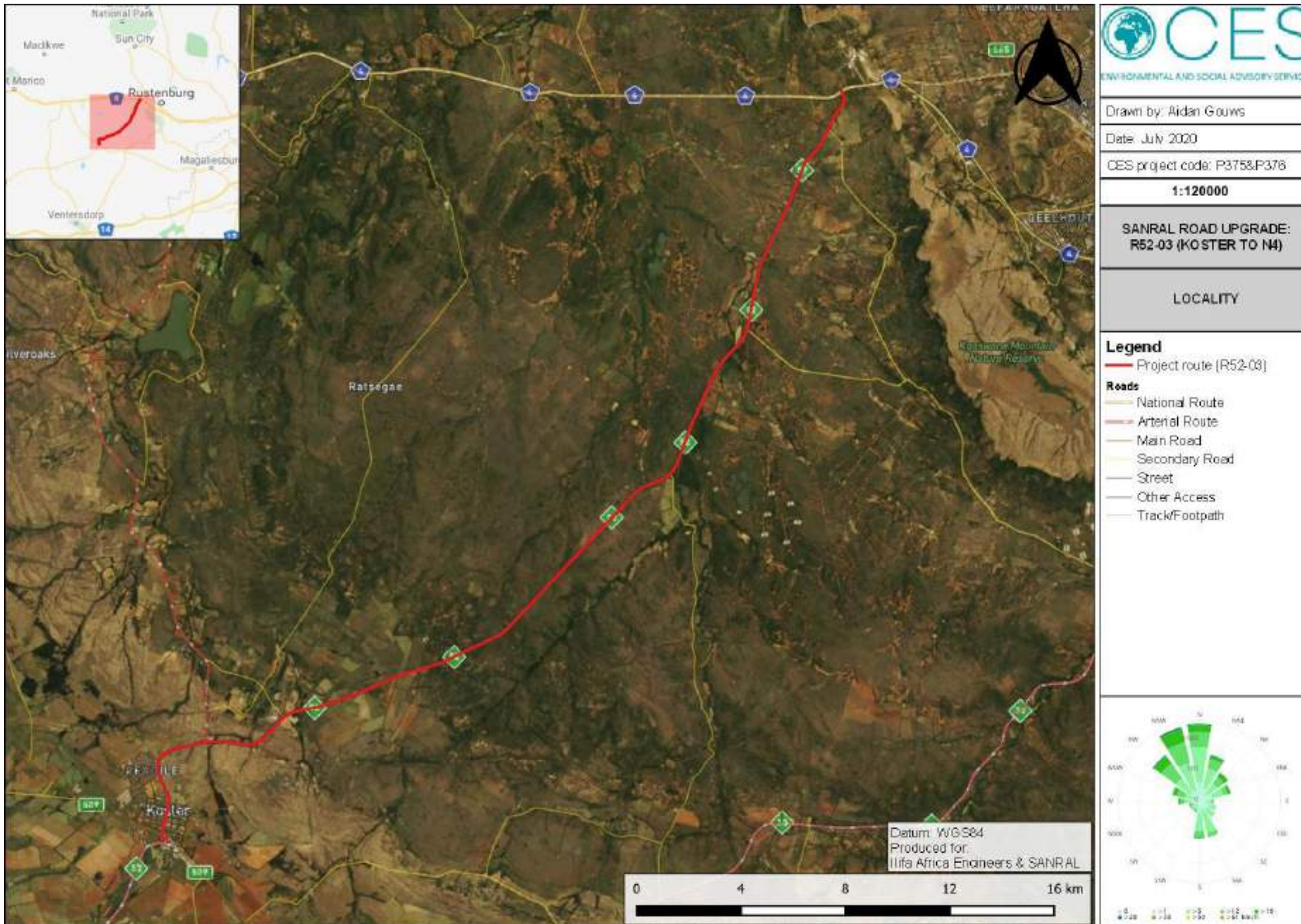


Figure 11.1: Locality map of the proposed development.



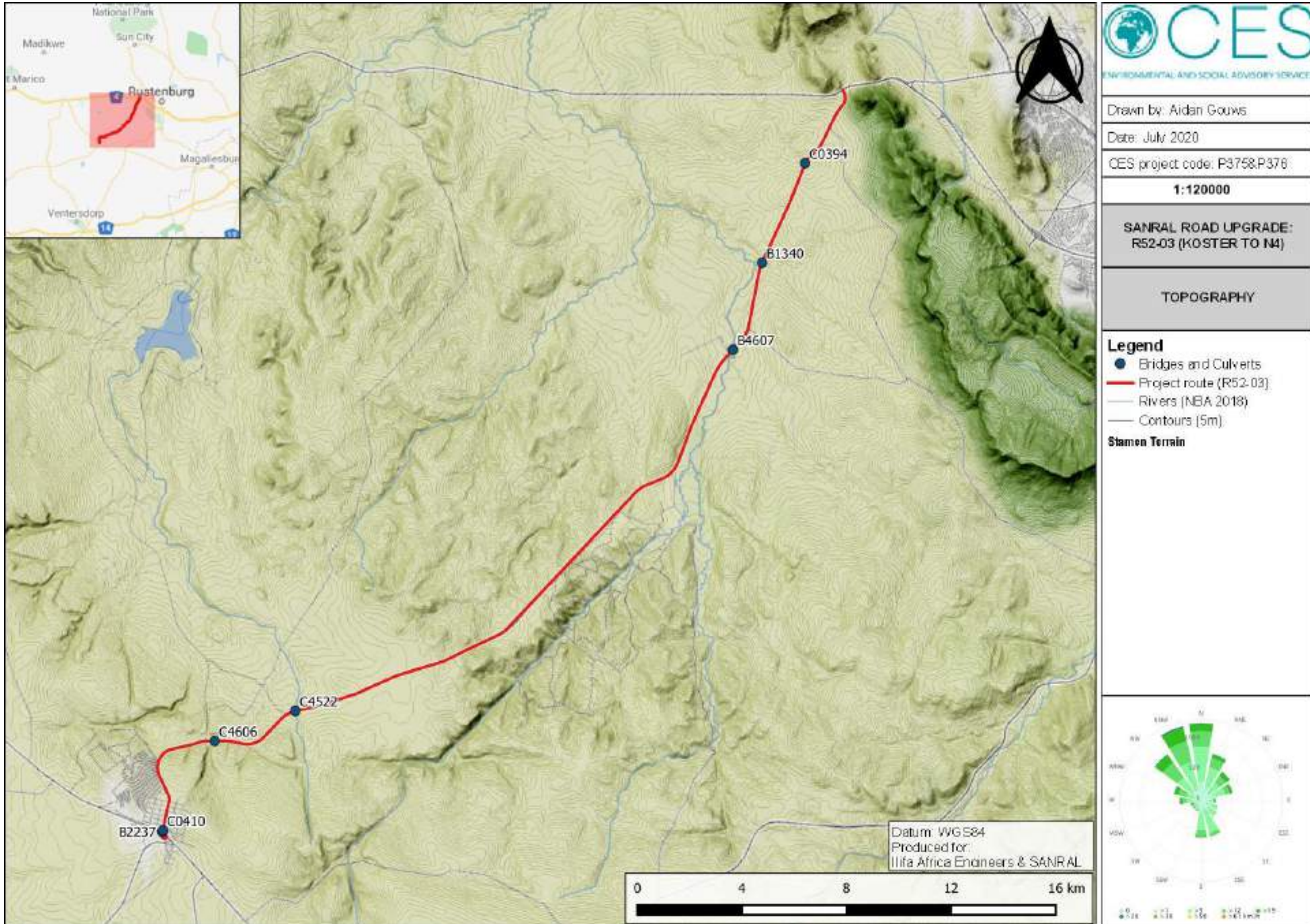


Figure 11.2: Topographic map of the project region along the R52 road.



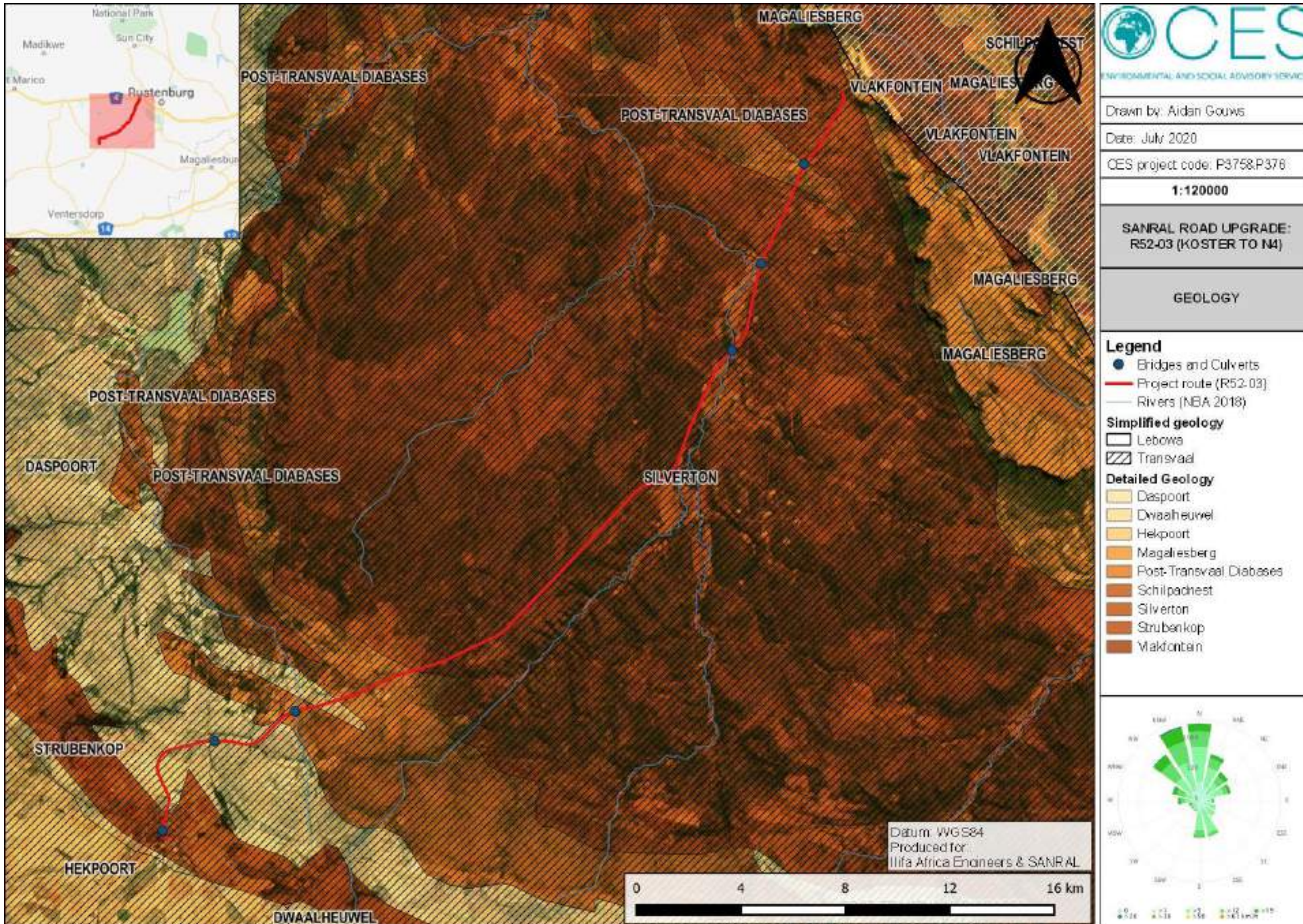


Figure 11.3: Geology map of the project region along the R52 road (Source: AGIS, 2017).



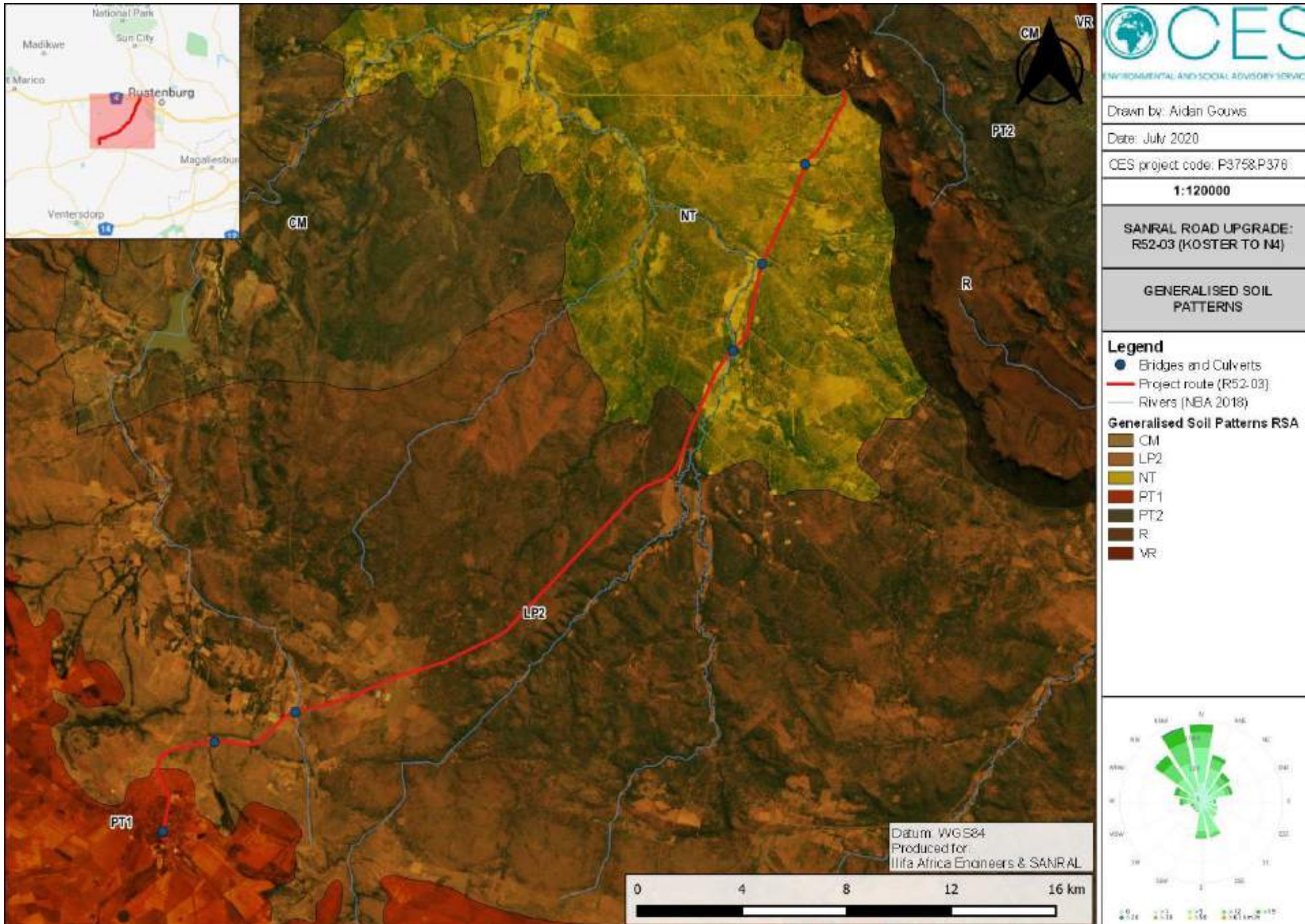


Figure 11.4: Generalised soil patterns map of the project region along the R52 road (Source: AGIS, 2017).



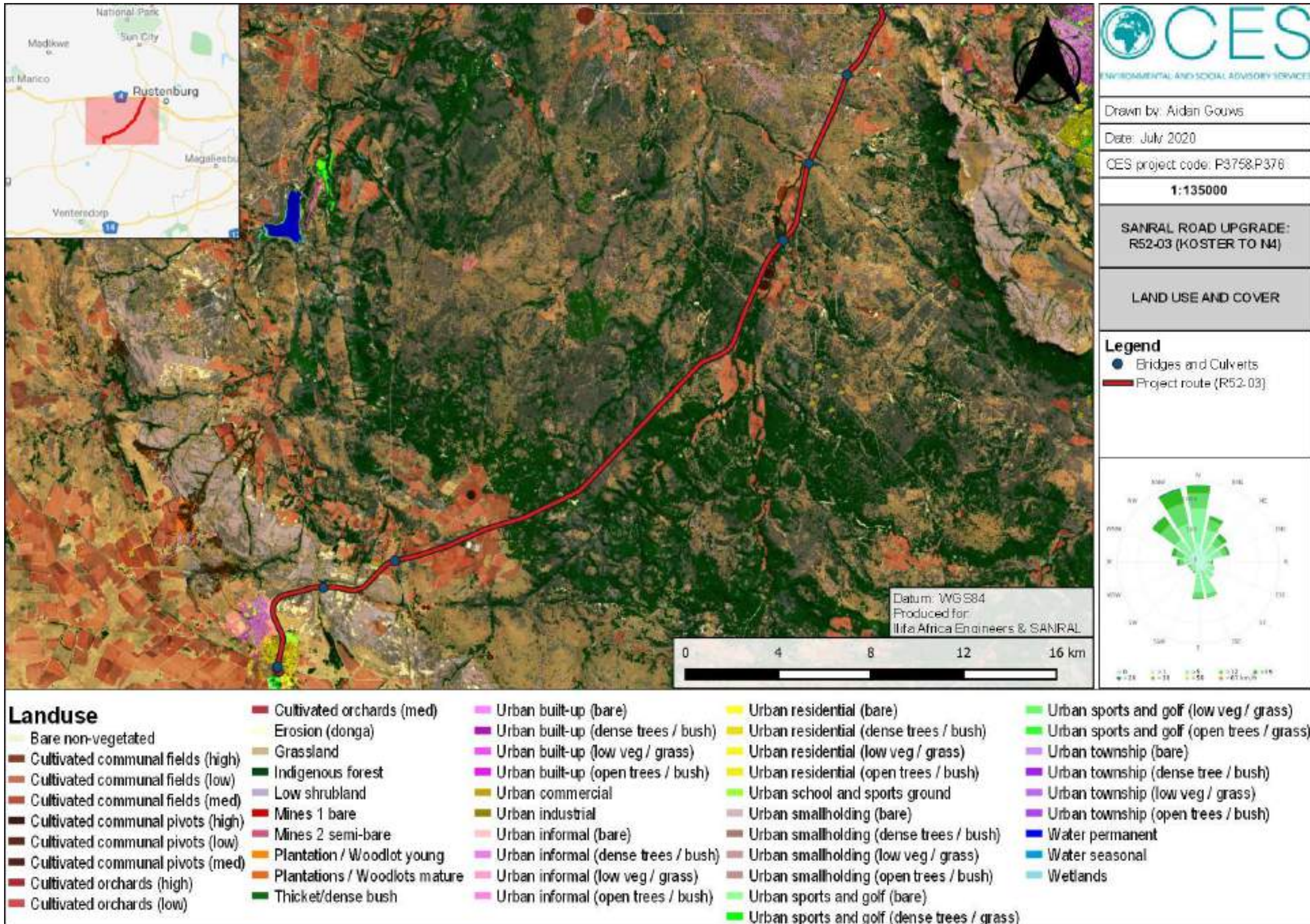


Figure 11.5: Land use map of the project region along the R52 road.



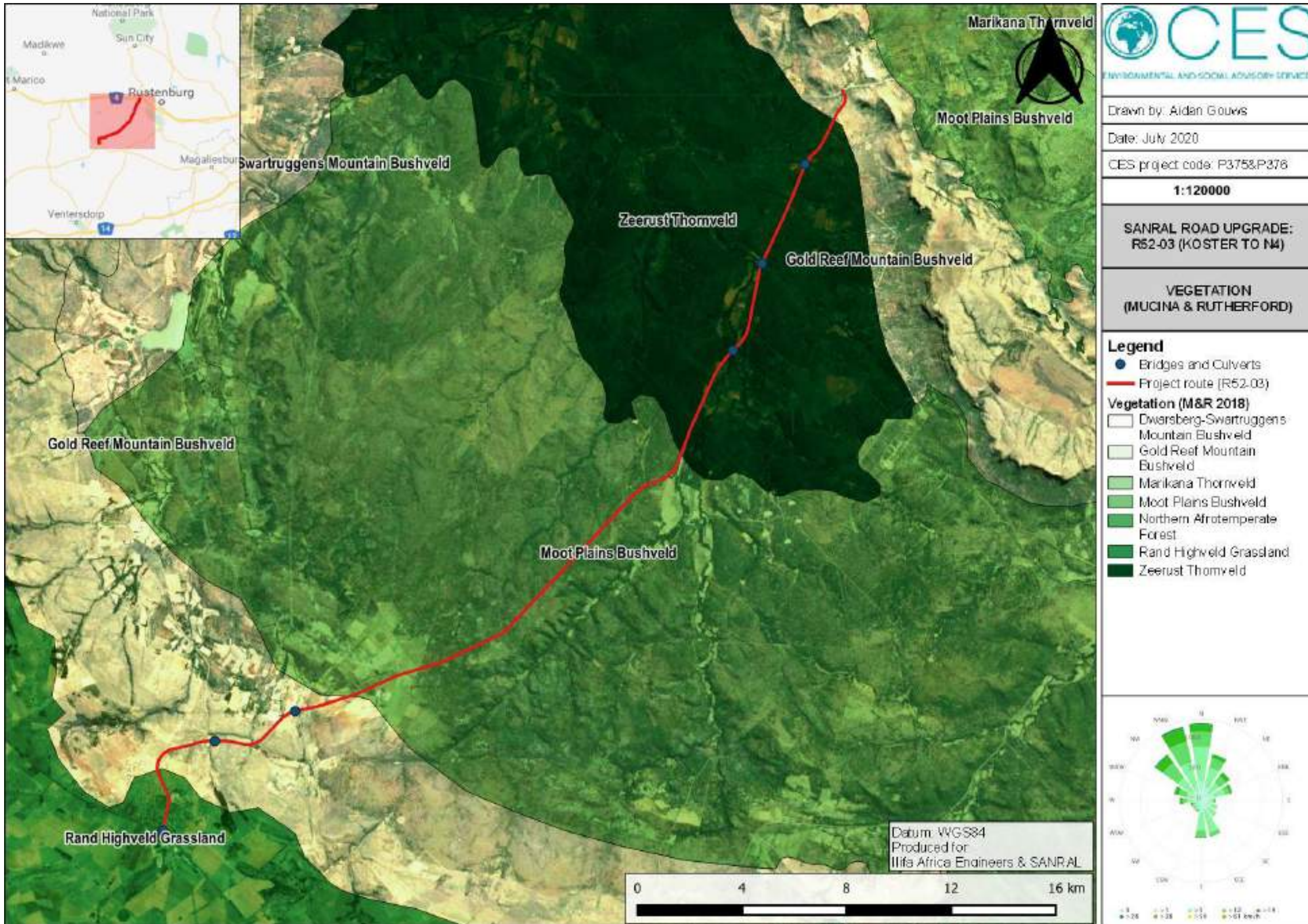
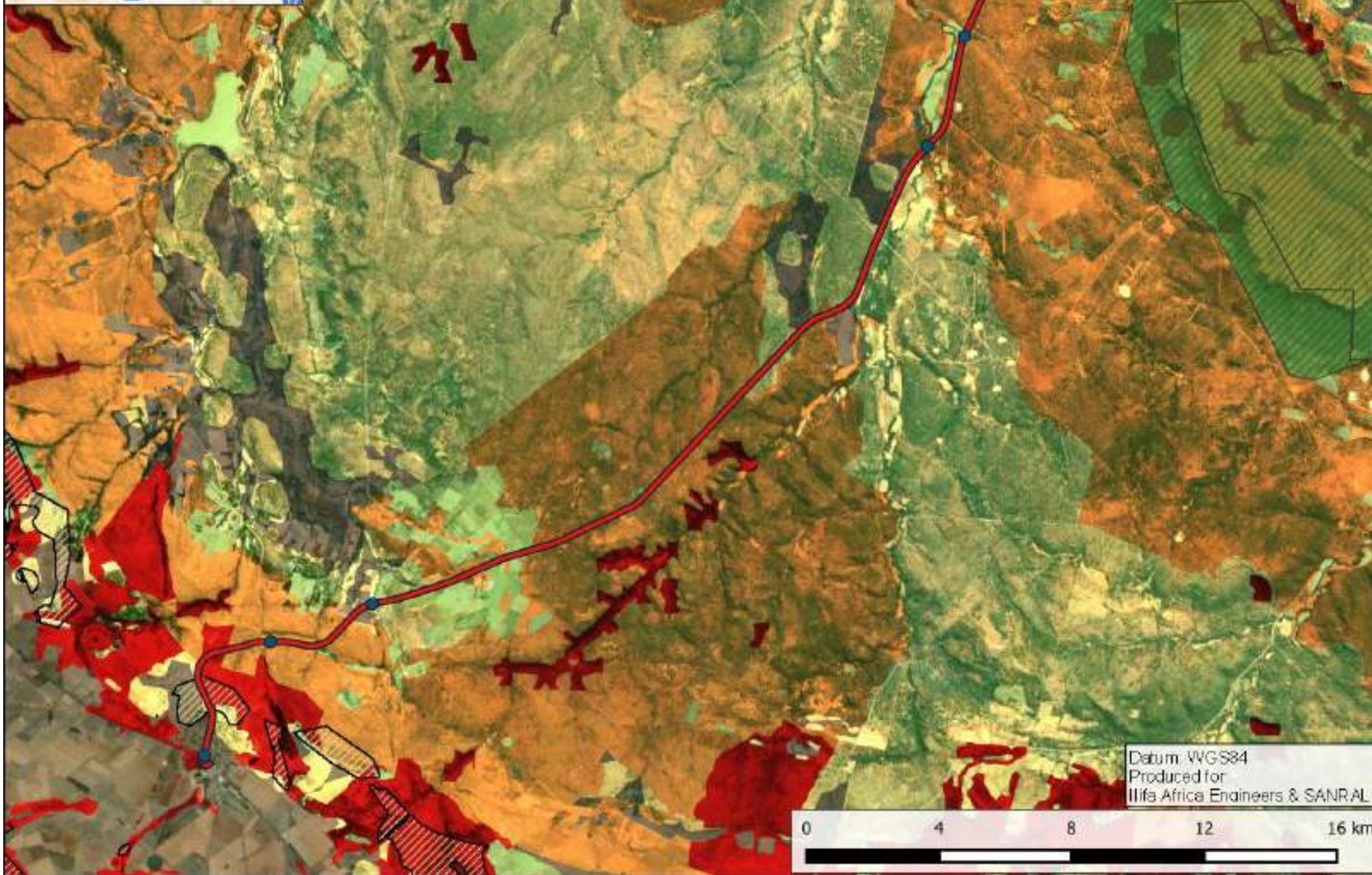


Figure 11.6: Mucina & Rutherford Vegetation Types for the project region.





**ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES**

---

Drawn by: Aidan Gouws

---

Date: July 2020

---

CES project code: P375&P376

---

**1:120000**

---

**SANRAL ROAD UPGRADE:  
R52-03 (KOSTER TO N4)**

---

**TERRESTRIAL BIODIVERSITY  
(NWbsp, 2015)**

---

**Legend**

- Bridges and Culverts
- Project route (R52-03)
- ▨ Protected Areas (NBA 2011)

**Threatened Ecosystems (NBA 2011)**

- ▭ Vulnerable (VU)

**Terrestrial CBA&ESA (NWbsp 2015)**

- CBA1
- CBA2
- ESA1
- ESA2

---

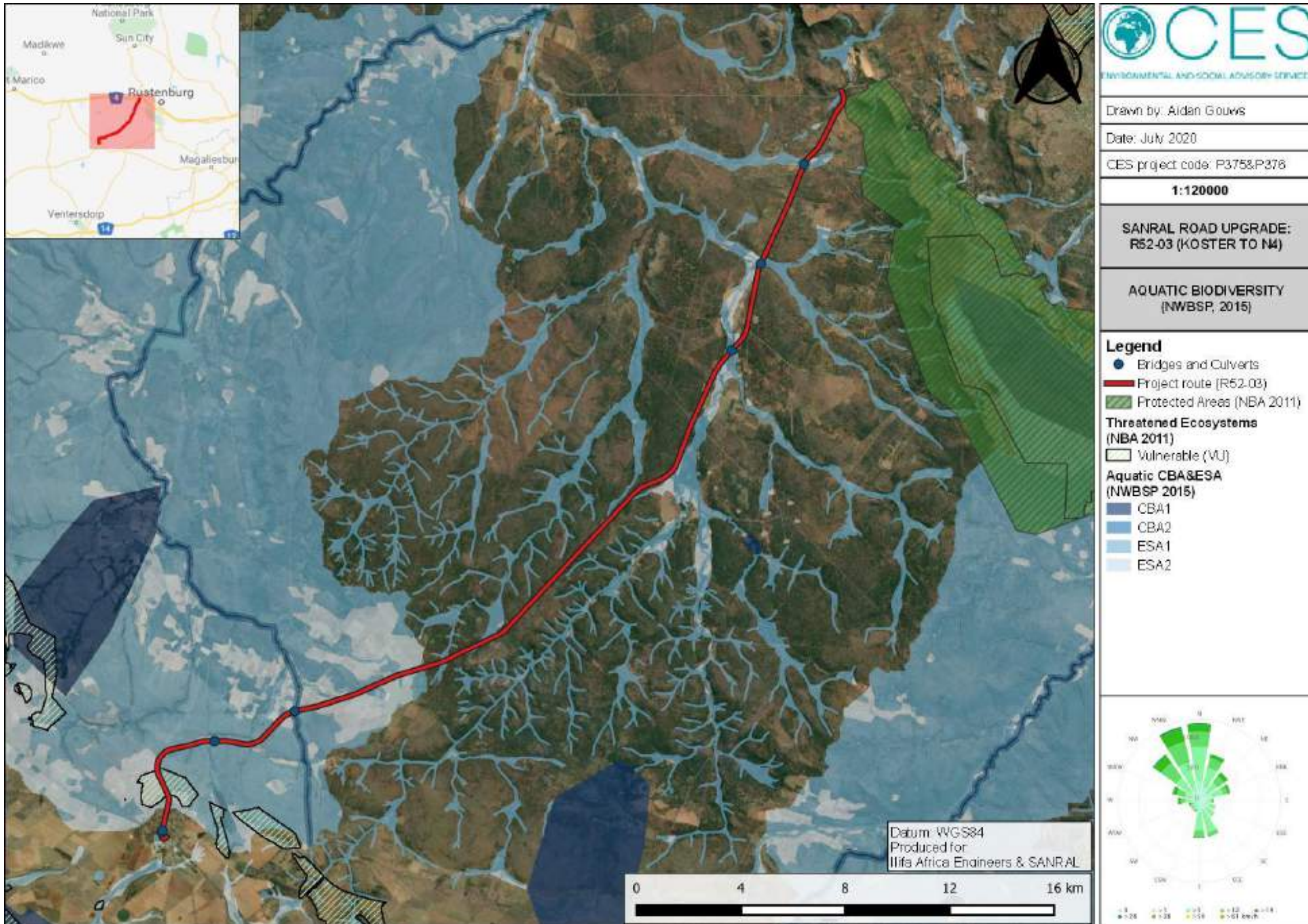




Figure 11.7: Terrestrial CBAs and ESAs for the project area based on the NWBSP (2015).

DRAFT





**CES**  
ENVIRONMENTAL AND SOCIAL ADVISORY SERVICES

Drawn by: Aidan Gouws

Date: July 2020

CES project code: P375&P376

**1:120000**

**SANRAL ROAD UPGRADE:  
R52-03 (KOSTER TO N4)**

**AQUATIC BIODIVERSITY  
(NW BSP, 2015)**

- Legend**
- Bridges and Culverts
  - Project route (R52-03)
  - ▨ Protected Areas (NBA 2011)
  - Threatened Ecosystems (NBA 2011)**
  - Vulnerable (VU)
  - Aquatic CBA&ESA (NW BSP 2015)**
  - CBA1
  - CBA2
  - ESA1
  - ESA2

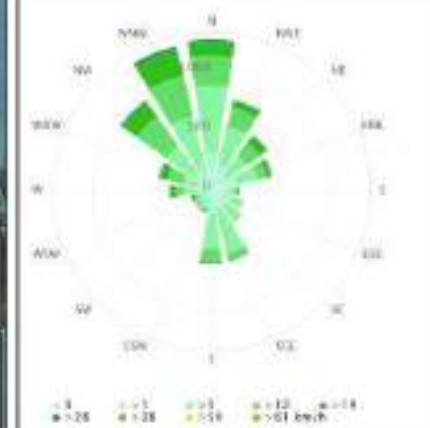


Figure 11.8: Aquatic CBAs and ESAs for the project area based on the NW BSP (2015) (CES, 2020).



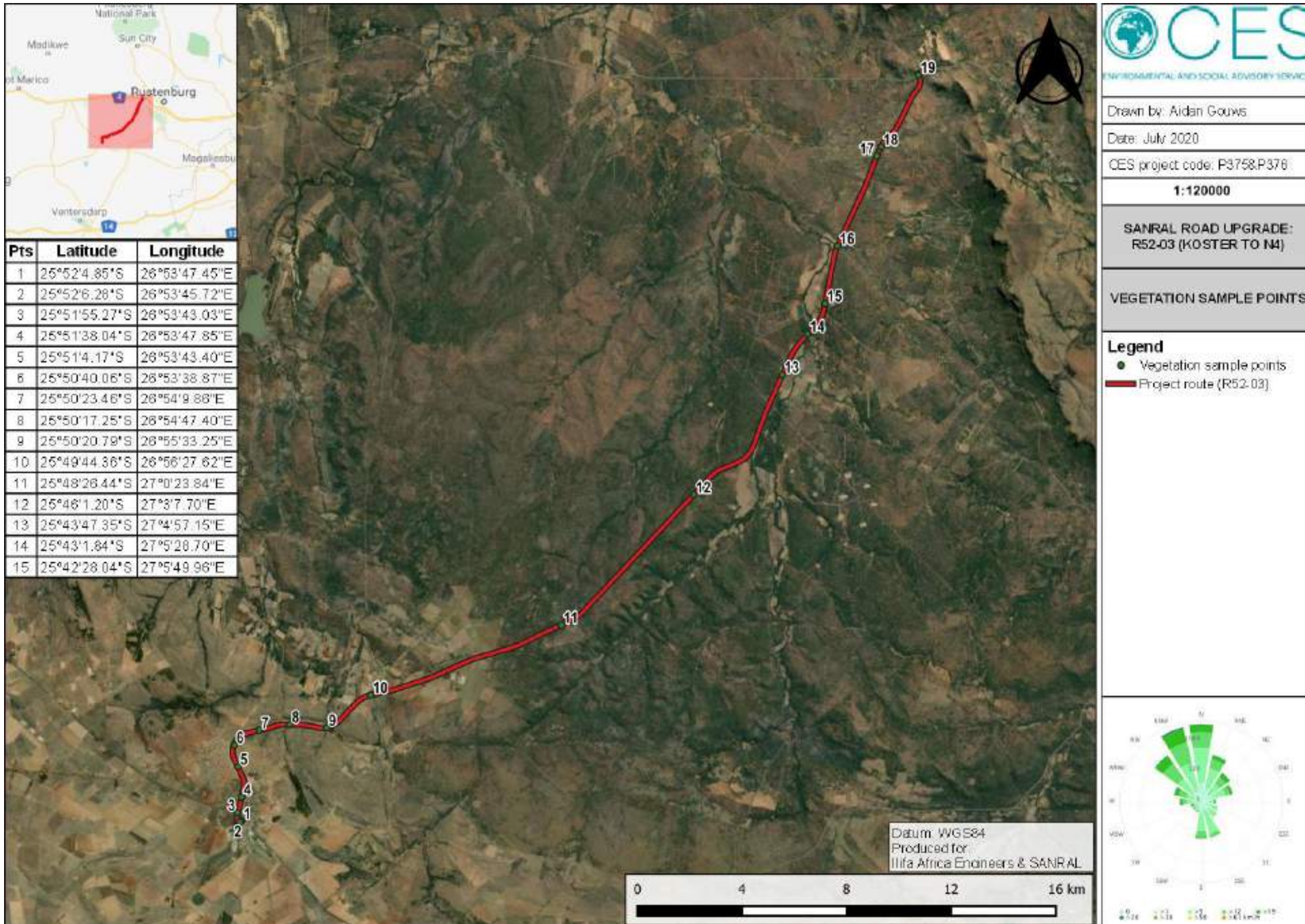


Figure 11.9: Map of the vegetation sample points along the R52-03.





Figure 11.10: Vegetation and general land cover along the R52-03 route (Sample points 1-5).



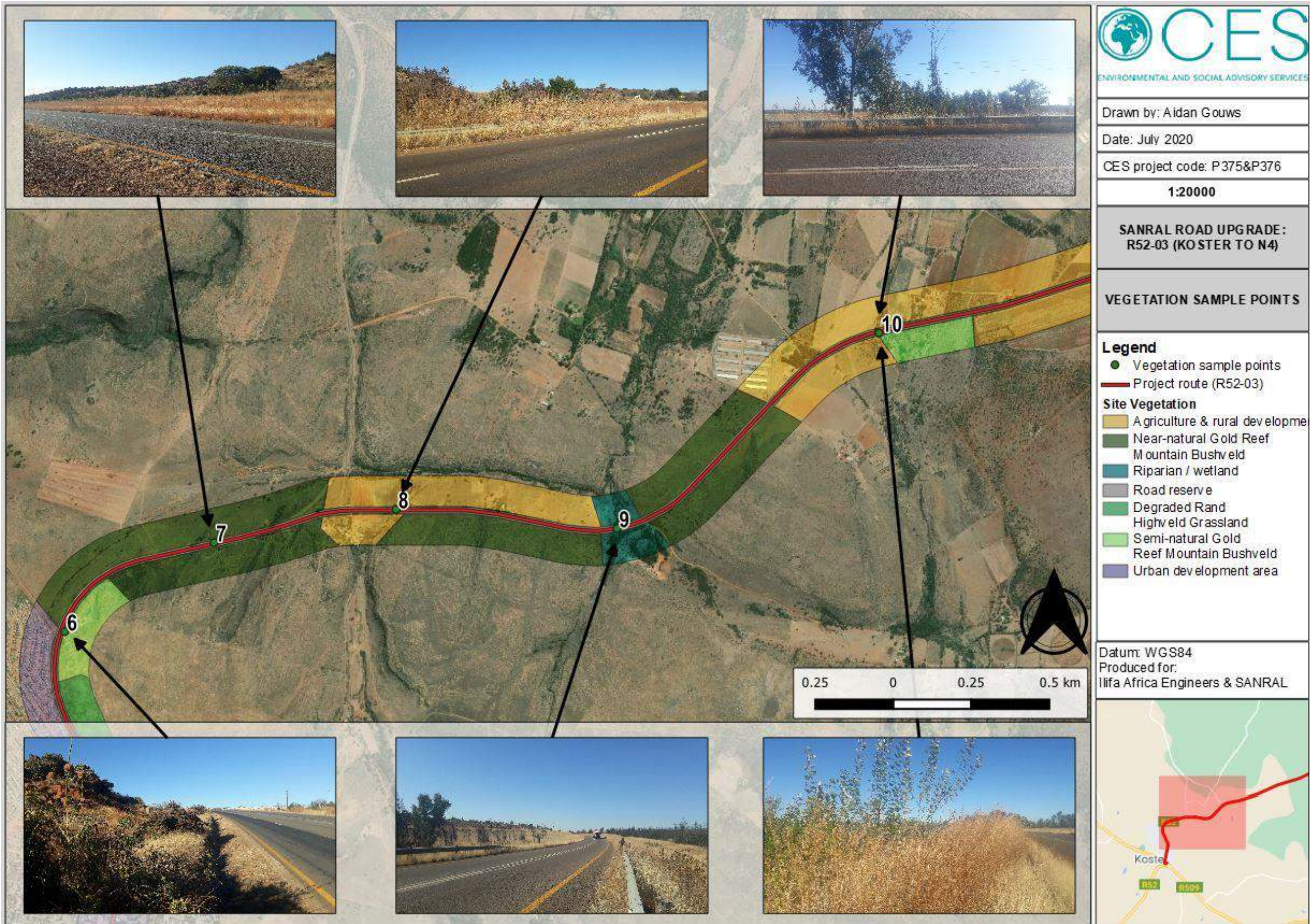


Figure 11.11: Vegetation and general land cover along the R52-03 route (Sample points 6-10).



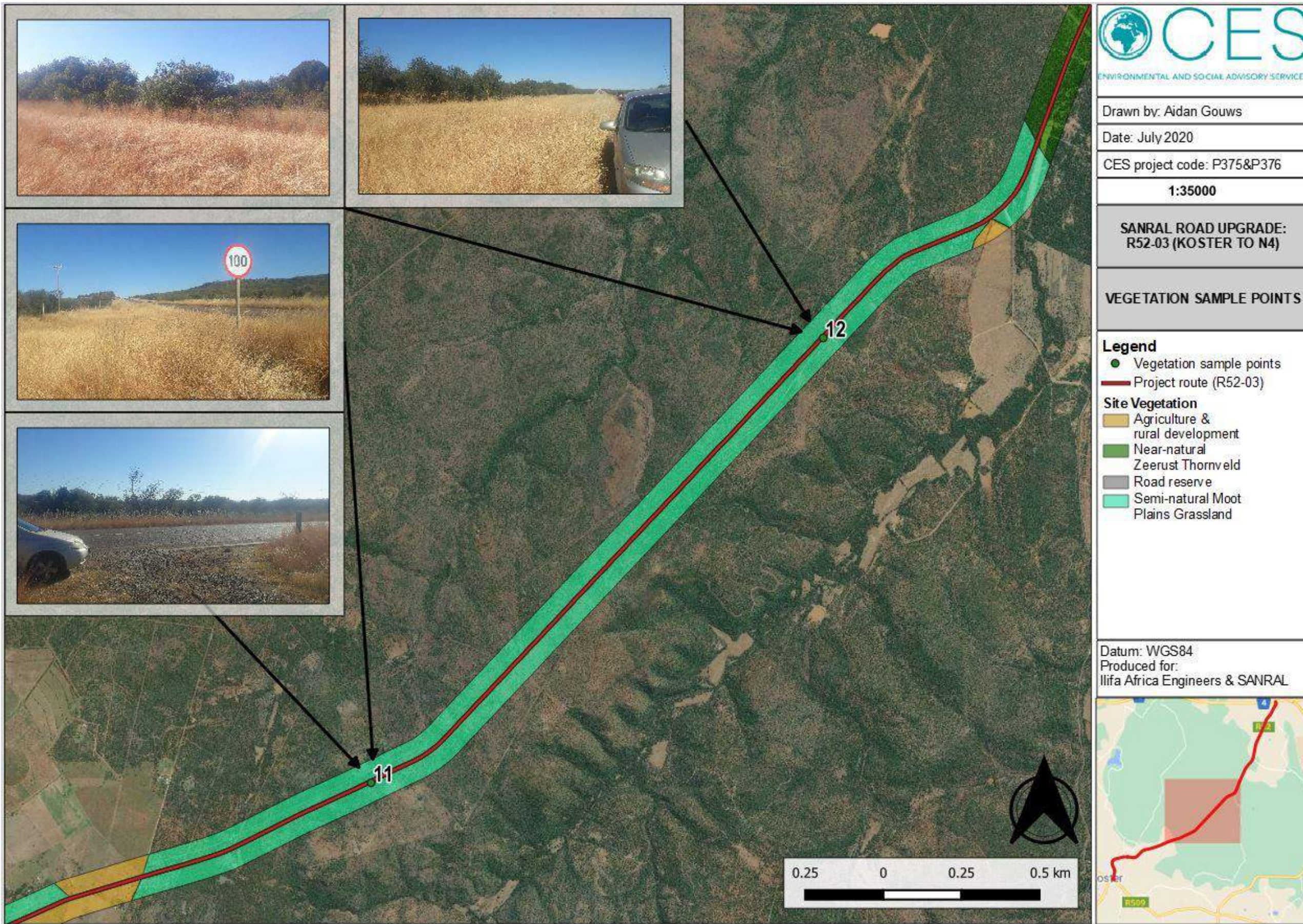


Figure 11.12: Vegetation and general land cover along the R52-03 route (Sample points 11-12).



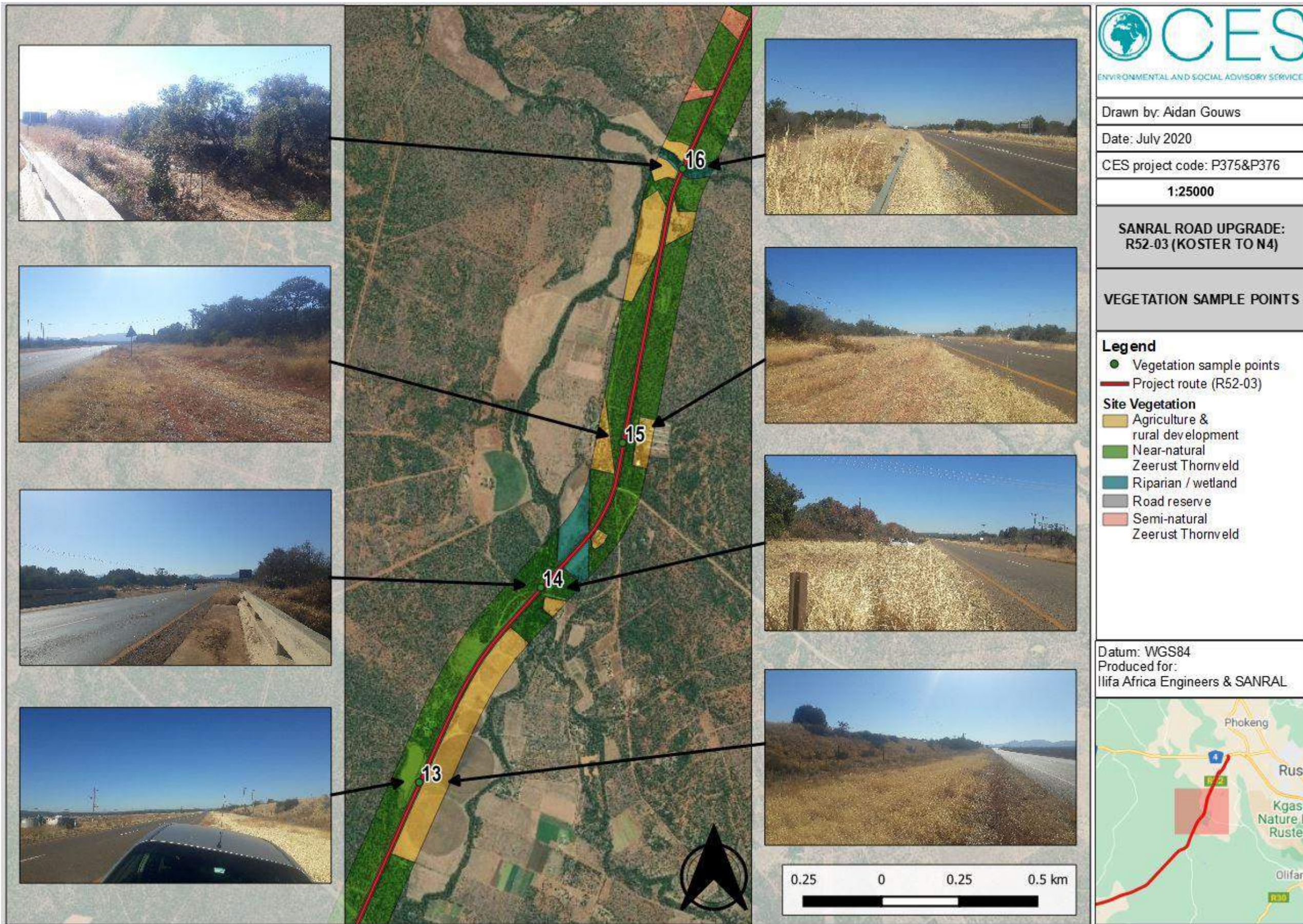


Figure 11.13: Vegetation and general land cover along the R52-03 route (Sample points 13-16).



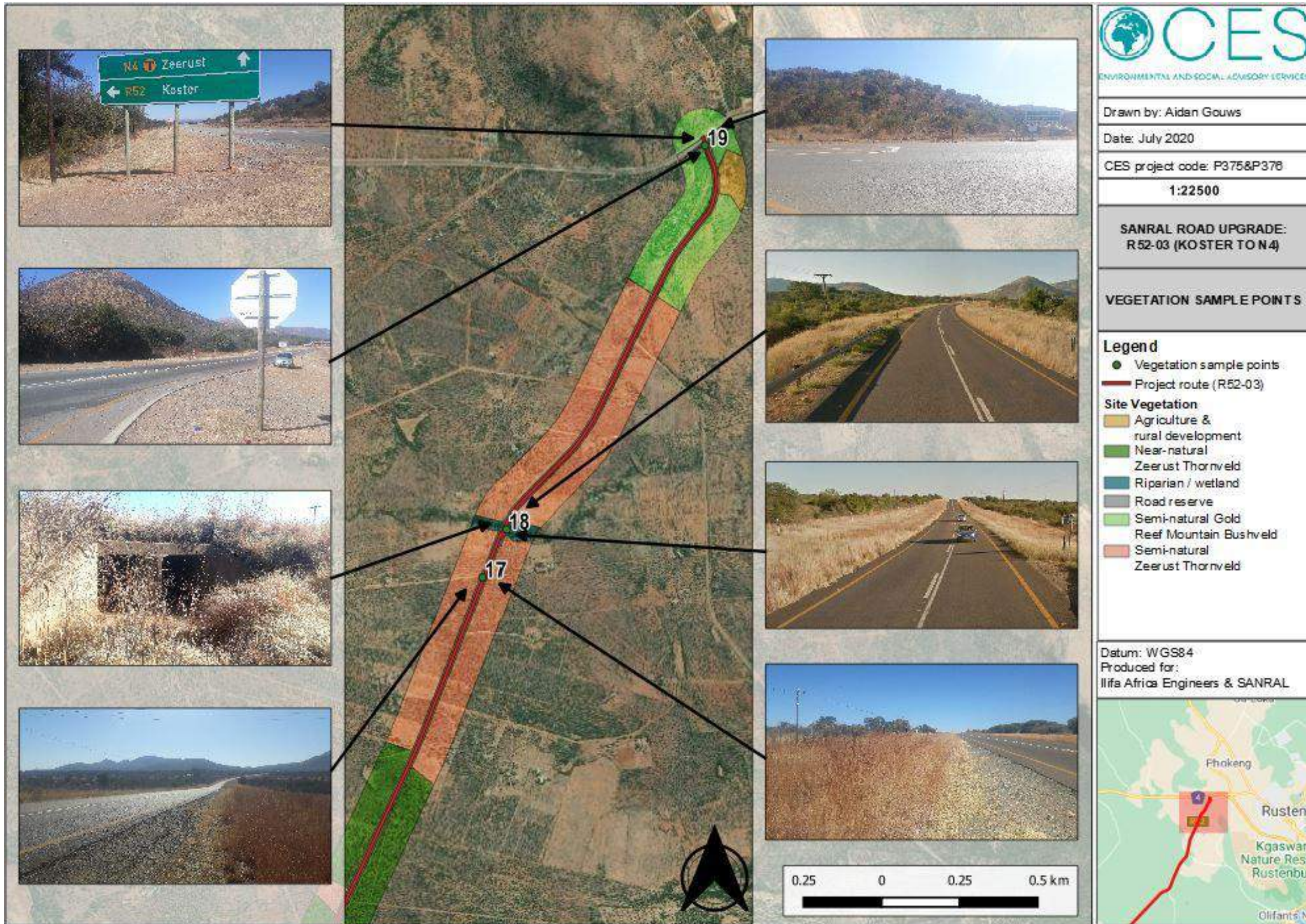


Figure 11.14: Vegetation and general land cover along the R52-03 route (Sample points 17-19).



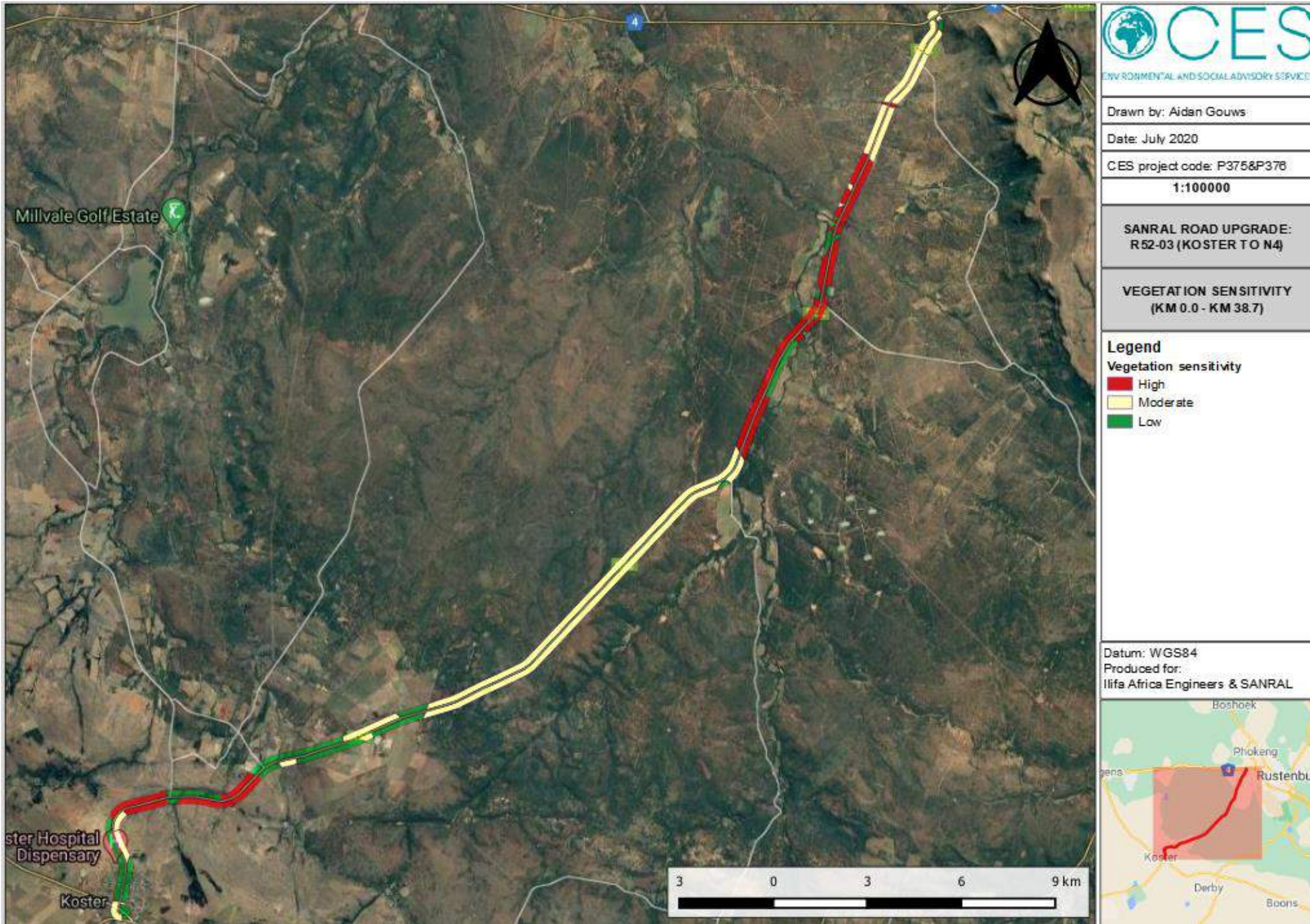


Figure 11.15 Sensitivity map of the entire R52 study area (KM 0.0 – KM 38.7).



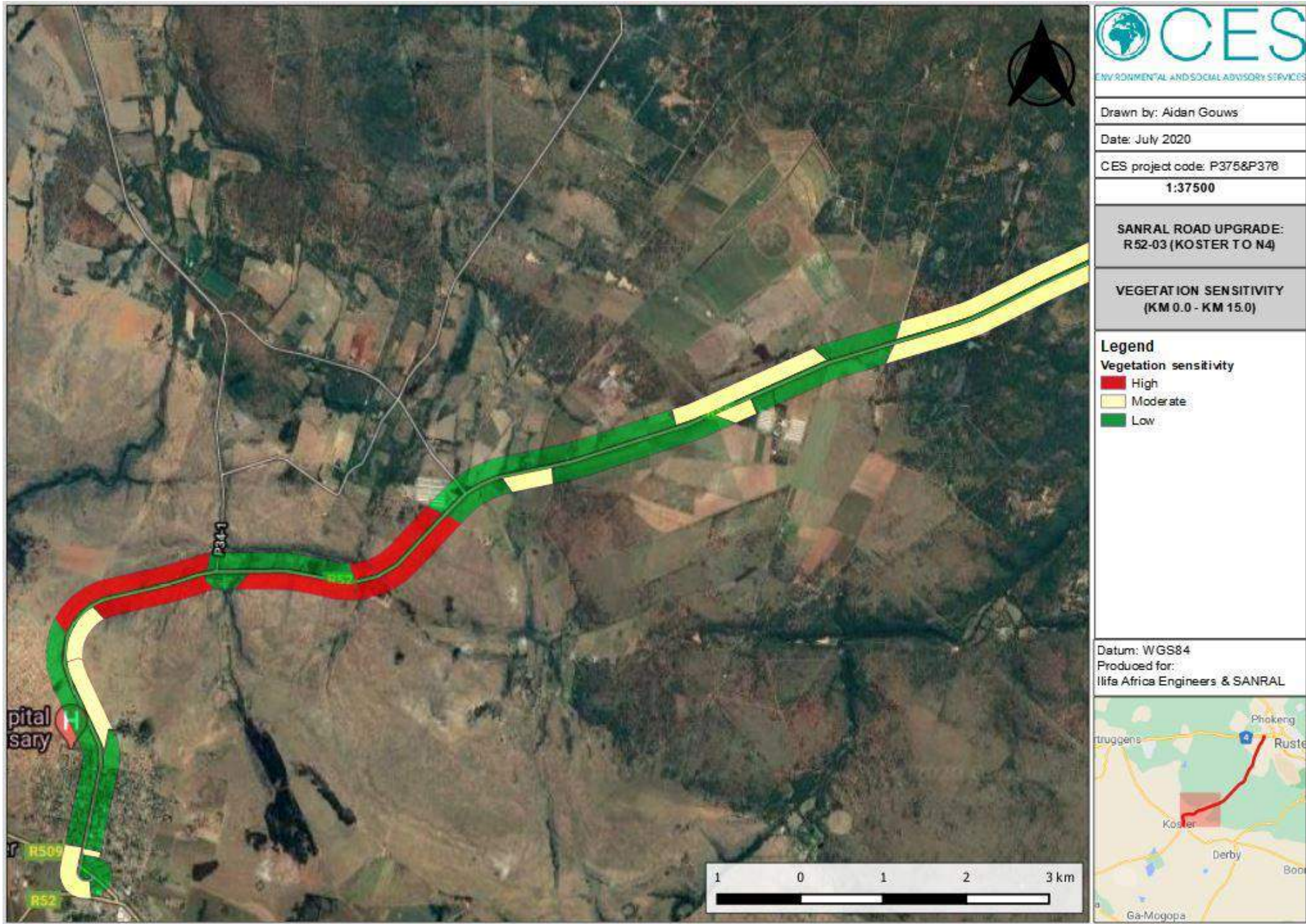


Figure 11.16 Sensitivity map of the R52 study area (KM 0.0 – KM 15.0).



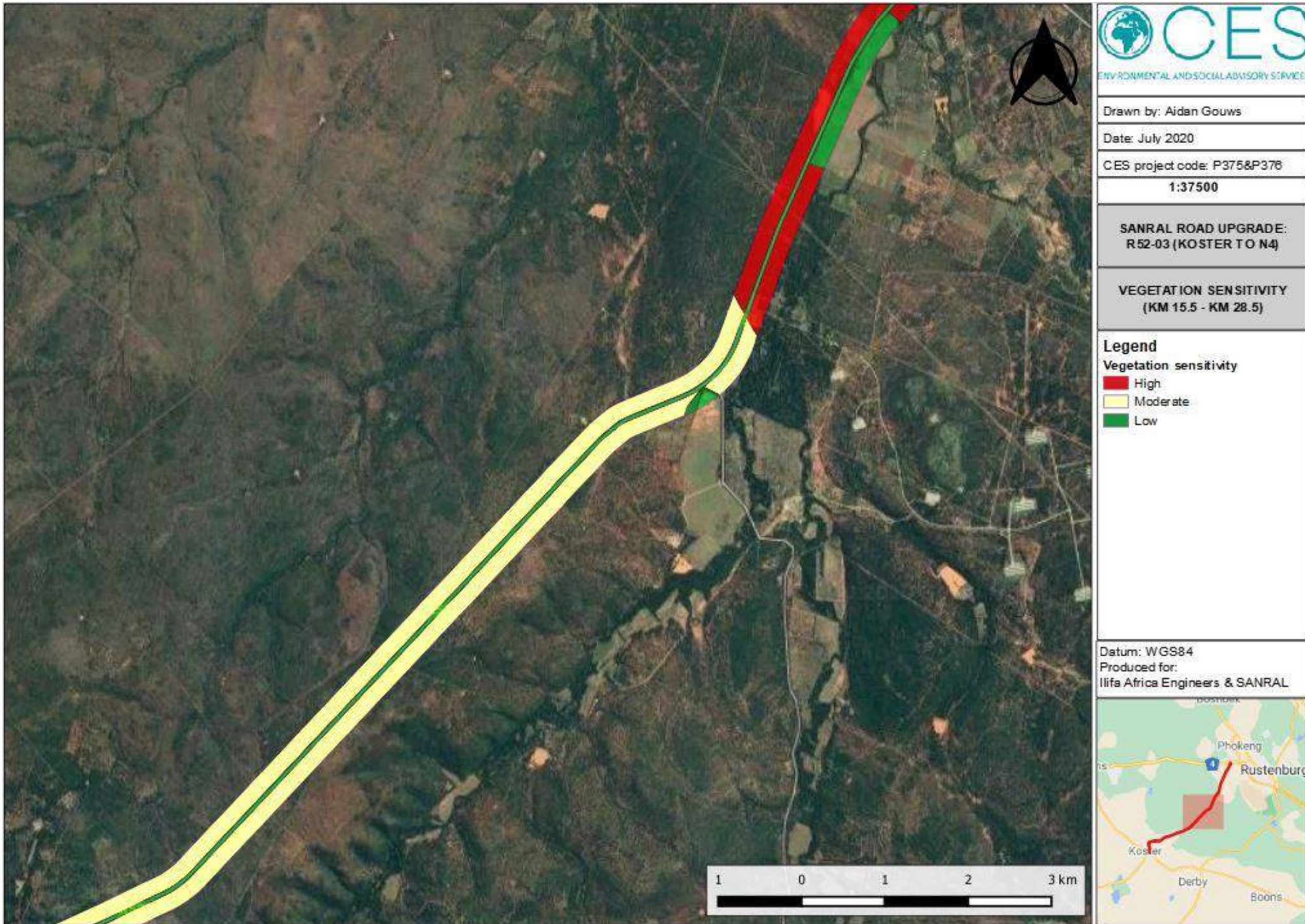


Figure 11.17 Sensitivity map of the R52 study area (KM 15.5 – KM 28.5).



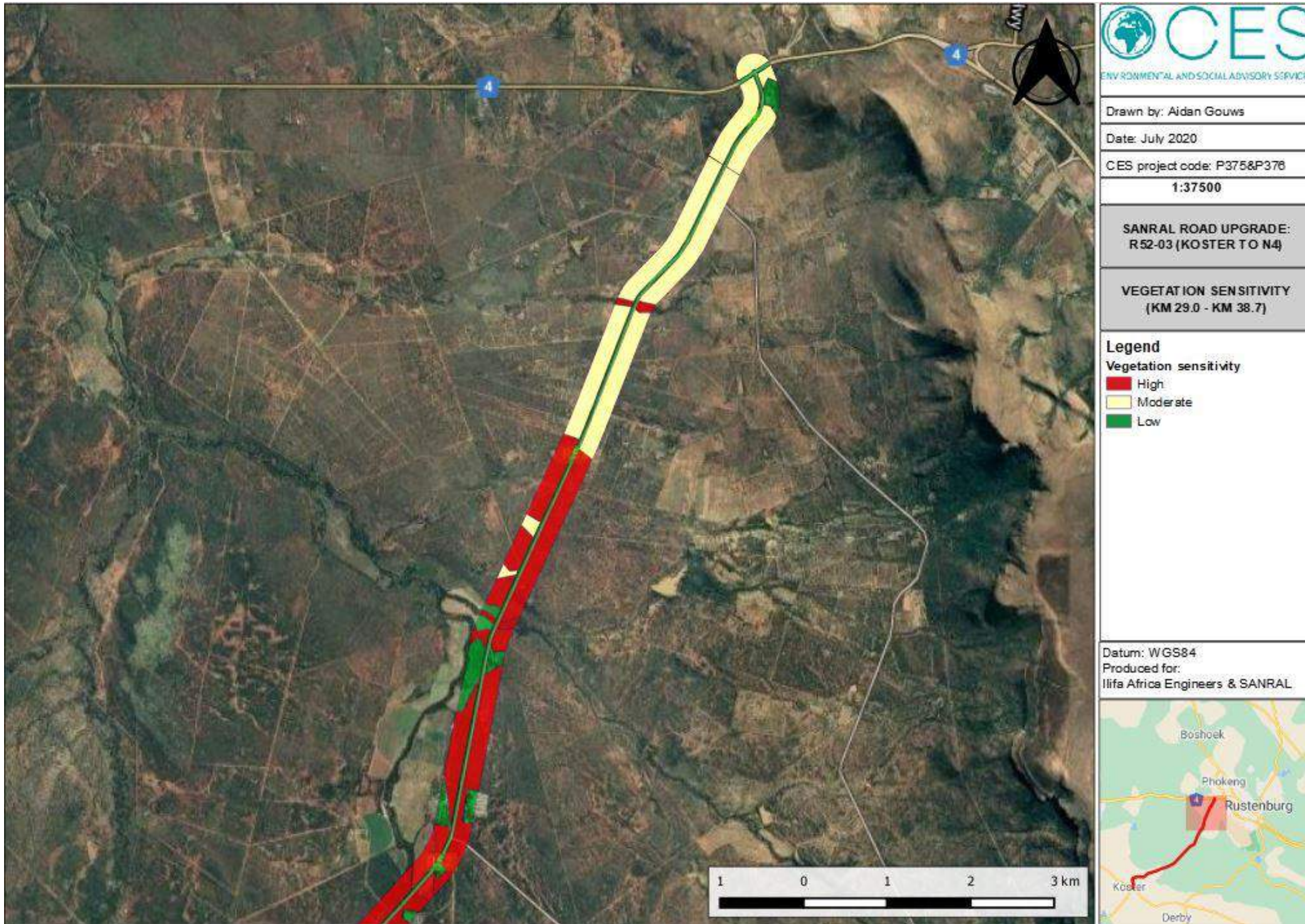


Figure 11.18 Sensitivity map of the R52 study area (KM 29.0 – KM 38.7).





## 12 APPENDIX C: CURRICULUM VITAE

**AIDAN JOHN GOUWS**  
*Curriculum Vitae*



### CONTACT DETAILS

|                               |   |
|-------------------------------|---|
| <b>Name of Company</b>        | CES – Environmental and Social Advisory Services  |
| <b>Designation</b>            | Centurion Branch  |
| <b>Profession</b>             | Environmental Consultant  |
| <b>Years with firm</b>        | 1   |
| <b>E-mail</b>                 | <a href="mailto:a.gouws@cesnet.co.za">a.gouws@cesnet.co.za</a>  |
| <b>Office number</b>          | +27 (0)10 045 1372  |
| <b>Nationality</b>            | South African   |
| <b>Professional body</b>      | SACNASP ( <i>Cand.Nat.Sci</i> )   |
| <b>Key areas of expertise</b> | <ul style="list-style-type: none"> <li>➤ Environmental Authorisation</li> <li>➤ GIS</li> <li>➤ Ecological Studies</li> <li>➤ Database management</li> </ul> |

### PROFILE

#### Mr Aidan Gouws

Aidan obtained his MSc in Environmental Science (*Cum laude*) from Rhodes University, having conducted research on the spatio-temporal dynamics of *Acacia dealbata* invasions and broader land-use and cover changes in the northern Eastern Cape, funded through a study bursary awarded by the Agricultural Research Council (ARC). Prior to this, he obtained his BSc Honours in Geographical and Environmental Sciences (*Cum laude*) from the University of Pretoria, studying plant ecology and EIA methodology amongst others. He is also member of the Golden Key Honours Society. Aidan joined CES in 2018 and has been involved in several projects, including Basic Assessments, Full Scoping and Environmental Impact Assessments, Environmental Audits and Resettlement Action Plan (RAP) Audit. He works from the Johannesburg office and his interests include the general Environmental Impact Assessment (EIA) process, GIS mapping, ecological studies and the Public Participation Process (PPP).





**AIDAN JOHN GOUWS**  
*Curriculum Vitae*



**EMPLOYMENT  
EXPERIENCE**

**Environmental Consultant, CES – Environmental and Social Advisory Services**

*July 2018 – current*

- Responsible for conducting a range of environmental studies in the broad fields of Environmental Impact Assessment and Environmental Management.
- Sourcing small to medium projects by preparing proposals under supervision.
- Taking responsibility for Basic Assessments, and small projects under the guidance and supervision of a more senior staff member.
- Taking responsibility for specialist ecological, database management and GIS tasks when required

**Volunteer, Khulisa Social Solutions**

*May 2018 – July 2018*

- Responsible for refining the organisational participatory research and intervention methodology guidelines.

**Departmental tutor, Department of Environmental Science, Rhodes University**

*January 2016 – December 2017*

- General assistance: helping staff and fellow post-graduate students with GIS- and statistics-related queries.
- Demonstrator: assistance with undergraduate environmental science practical sessions and marking of practical reports.

**Demonstrator, Department of Plant Science, University of Pretoria**

*July 2015 – December 2015*

- Assisting third year students in practical plant identification using dichotomous keys and family recognition by diagnostic reproductive and vegetative characters

**ACADEMIC  
QUALIFICATIONS**

**Rhodes University, Grahamstown, Eastern Cape.**

- M.Sc. Environmental Science (*Cum laude*)  
*January 2016 – January 2018*

**University of Pretoria, Pretoria, Gauteng.**

- B.Sc. Hons. Geographical and Environmental Sciences (*Cum laude*)  
*January 2015 – December 2015*

**University of Pretoria, Pretoria, Gauteng**

- B.Sc. Environmental Sciences (*Cum laude*)  
*January 2012 – December 2014*

**PUBLICATIONS**

- Gouws, A. J., & Shackleton, C. M. (2019). A spatio-temporal, landscape perspective on *Acacia dealbata* invasions and broader land use and cover changes in the northern Eastern Cape, South Africa. *Environmental Monitoring and Assessment*, 191(2), 74.
- Gouws, A. J., & Shackleton, C. M. (2019). Abundance and correlates of the *Acacia dealbata* invasion in the northern Eastern Cape, South Africa. *Forest Ecology and Management*, 432, 455-466.

**MEMBERSHIPS**

- Golden Key International Honour Society – University of Pretoria Chapter.



**AIDAN JOHN GOUWS**  
*Curriculum Vitae*



**CONSULTING  
EXPERIENCE**

**Basic Assessments**

1. Ramotshere Moiloa Local Municipality Residential Extension Projects, Zeerust, North West Province (2 BARs) (2019–)
  - Project manager, Ecological Specialist, PPP, Reporting
2. SANRAL Koster N52 Road Upgrade, Koster, North West Province (2018–)
  - Mapping, PPP, Reporting
3. Transnet Freight Rail Installation of Telecommunications Masts and Associated Infrastructure at Various Locations in South Africa (3 BARs) (2019–)
  - Project manager, PPP, Reporting

**Full Scoping and Environmental Impact Assessments**

4. SANRAL Masekwaspoort N1 Road Upgrade BAR and Quarry S&EIR Authorisation, Musina, Limpopo Province (2018– On hold)
  - Mapping, PPP, Reporting
5. SANRAL Zandkraal-Winburg N1 Road Upgrade Quarry S&EIR Authorisation, Winburg, Free State Province. (2018–)
  - Mapping, PPP, Reporting

**Environmental Auditing**

6. SANRAL Hendrina N11 Road Upgrade ECO Audits, Hendrina, Mpumalanga Province (2018–2019)
  - ECO, Reporting
7. South African National Biodiversity Institute (SANBI) Office Complex Development, Pretoria, Gauteng Province (2018)
  - ECO, Reporting

**Resettlement Action Plan (RAP) Auditing**

8. Millennium Challenge Account Malawi (MCA-M) RAP Audits (2018–2019)
  - Database support, Auditor, Training, Assistant Reporting
9. Malawi Millennium Development (MMD) Trust RAP Audits (2019)
  - Database manager, Auditor, Training

**CERTIFICATION**

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes me, my qualifications, and my experience. I understand that any wilful misstatement described herein may lead to my disqualification or dismissal, if engaged.

  
**AIDAN GOUWS**

Date: January 2020





DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

|                        |                         |
|------------------------|-------------------------|
|                        | (For official use only) |
| File Reference Number: |                         |
| NEAS Reference Number: | DEA/EIA/                |
| Date Received:         |                         |

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

**PROJECT TITLE**

SANRAL SOC Ltd UPGRADE OF NATIONAL ROAD R52 SECTION 3 FROM KOSTER (KM 0.0) TO N4 RUSTENBURG (KM 38.70), NORTH WEST

**Kindly note the following:**

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.environment.gov.za/documents/forms>.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

**Departmental Details**

**Postal address:**

Department of Environmental Affairs  
Attention: Chief Director: Integrated Environmental Authorisations  
Private Bag X447  
Pretoria  
0001

**Physical address:**

Department of Environmental Affairs  
Attention: Chief Director: Integrated Environmental Authorisations  
Environment House  
473 Steve Biko Road  
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:  
Email: [EIAAdmin@environment.gov.za](mailto:EIAAdmin@environment.gov.za)

## 1. SPECIALIST INFORMATION

|  |   |       |                                    |
|--|---|-------|------------------------------------|
| Specialist Company Name:               | CES (t/a Coastal and Environmental Services (Pty) Ltd.)               |       |                                    |
| B-BBEE                                 | Contribution level (indicate 1 to 8 or non-compliant)                 | 1     | Percentage Procurement recognition |
| Specialist name:                       | Aidan Gouws   |       |                                    |
| Specialist Qualifications:             | MSc. Environmental Science  |       |                                    |
| Professional affiliation/registration: | SACNASP Cand.Sci.Nat  |       |                                    |
| Physical address:                      | 70 Regency Drive, Route 21 Business Park, Centurion                   |       |                                    |
| Postal address:                        | Att: Aidan Gouws, 70 Regency Drive, Route 21 Business Park, Centurion |       |                                    |
| Postal code:                           | 0178  | Cell: |                                    |
| Telephone:                             | 010 045 1372  | Fax:  |                                    |
| E-mail:                                | a.gouws@cesnet.co.za  |       |                                    |

## 2. DECLARATION BY THE SPECIALIST

I, Aidan Gouws, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

  
\_\_\_\_\_  
Signature of the Specialist

CES (t/a Coastal and Environmental Services (Pty) Ltd.)  
\_\_\_\_\_  
Name of Company:

31/07/2020  
\_\_\_\_\_  
Date

Details of Specialist, Declaration and Undertaking Under Oath



**3. UNDERTAKING UNDER OATH/ AFFIRMATION**

I, Aidan Gouws, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.



Signature of the Specialist

CES (t/a Coastal and Environmental Services (Pty) Ltd)  
Name of Company

31/7/2020  
Date

Signature of the Commissioner of Oaths

**WILLIAM CLAUDE WEST**  
COMMISSIONER OF OATHS  
PRACTISING ATTORNEY  
237 BRAAM PRETORIUS STREET  
WONDERBOOM, PRETORIA

31/7/2020  
Date