EIA FOR THE PROPOSED BRANDVALLEY WIND ENERGY FACILITY, NORTHERN AND WESTERN CAPE PROVINCES, SOUTH AFRICA.

DEA Reference Number: 14/12/16/3/3/2/900
DENC Ref: NC/NAT/ZFM/KHE/BLA1/2016

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DRAFT

Prepared for:	**Prepared by:**
Brandvalley Wind Farm (Pty) Ltd	**EOH Coastal & Environmental Services**
5th Floor, 125 Buitengracht Street, 8001 Cape Town	The Point, Suite 408, 4th Floor, 76 Regent Road, Sea Point, 8005 Cape Town
South Africa	South Africa

23 May 2016

REVISIONS TRACKING TABLE

This report should be cited as follows: EOH Coastal & Environmental Services, May 2016: *Proposed Brandvalley Wind Energy Facility, Northern and Western Cape Provinces, South Africa, Draft Environmental Impact Assessment Report*. EOH CES, Cape Town.

CES Report Revision and Tracking Schedule

Document Title	Proposed Brandvalley Wind Energy Facility, Northern And Western Cape Provinces, South Africa.		
Client Name & Address	Brandvalley Wind Farm (Pty) (Ltd) 5th Floor 125 Buitengracht Street 8001 Cape Town		
Document Reference	**DEA Ref: 14/12/16/3/3/2/900** **DENC Ref: NC/NAT/ZFM/KHE/BLA1/2016**		
Status	Draft		
Issue Date	16 May 2016		
Lead Author	Ms Belinda Huddy	EOH Coastal & Environmental Services	
Reviewer	Ms Amber Jackson	EOH Coastal & Environmental Services	
Study Leader or Registered Environmental Assessment Practitioner Approval	Mr Marc Hardy	EOH Coastal & Environmental Services	
Report Distribution	***Circulated to:***	***No. of hard copies***	***Electronic copies***
	Department of Environmental Affairs (DEA)	2	2
	Department of Environmental Affairs and Development Planning (Western Cape)	1	1
	Department of Nature Conservation and Environmental Affairs (Northern Cape)	1	1

EOH Coastal& Environmental Services
Cape Town
The Point, Suite 408, 4th Floor
76 Regent Road
Sea Point
Info@cesnet.co.za
www.cesnet.co.za
Also in Grahamstown, Port Elizabeth, East London Johannesburg and Maputo

THE PROJECT TEAM

EOH Coastal & Environmental Services team and responsibilities

Mr Marc Hardy Environmental Assessment Practitioner and Project Leader
Ms Amber Jackson Project Manager
Ms Belinda Huddy Project Manager & Author

Table A: Sub-consultant team members and responsibilities

Specialist Field	Specialist		Peer reviewed
Archaeological Impact Assessment	Ms Celeste Booth	Booth Heritage Consulting	No
Agricultural Impact Assessment	Mr Roy de Kock	EOH CES	Yes
Aquatic Impact Assessment	Dr Brian Colloty	Scherman Colloty & Associates (SC&A)	No
Avifaunal Impact Assessment	Dr Tony Williams	African Insights	No
Bat Impact Assessment	Mr Werner Marais	Animalia Zoological & Ecological Consultation CC	No
Ecological Impact Assessment	Mr Simon Todd	Simon Todd Consulting	No
Heritage Screeners	Mr Nicholas Wiltshire	Cedar Tower Services	No
Heritage Impact Assessment	Ms Celeste Booth	Booth Heritage Consulting	No
Noise Impact Assessment	Dr Brett Williams	Safetech	No
Paleontological Impact Assessment	Dr John Almond	Naturaviva	No
Social Impact Assessment	Mr Tony Barbour	Independent Consultant	No
Visual Assessment Specialist	Mr Thomas King	EOH CES	Yes
Traffic Impact Assessment	Mr Hermanus Steyn	Aurecon South Africa	No

DOCUMENT CHECKLIST

Table B: Overview of the Public Participation Process requirements in terms of Section 41(2), (3), (4), Section 42 and Section 44(1) of the Government Notice (GN) R.982 and where the relevant information can be found in this Report.

Item in GN R.982	Requirement Description	Relevant Section
41 (2)	give notice to all potential interested and affected parties by:	
41 (2) (a)	fixing a notice board at a place conspicuous to and accessibly by the public at the boundary or on the fence or along the corridor of— (i) the site where the activity to which the application or proposed application relates is or is to be undertaken; and (ii) any alternative site; proof of site notice must be included	**Refer to Appendix C-5**
41 (2) (b)	giving written notice, in any of the manners provided for in section 47D of the Act, to (these are considered as key stakeholders)— (i) the occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site where the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken; (ii) owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken; (iii) the municipal councillor of the ward in which the site is situated or alternative site is situated and any organisation of ratepayers that represent the community in the area; (iv) the municipality which has jurisdiction in the area; (v) any organ of state having jurisdiction in respect of any aspect of the activity; and (vi) any other party as required by the competent authority;	**Refer to Appendix C-3 and C-2 for the I&AP database**
41 (2) (c)	placing an advertisement in: (i) one local newspaper; or (ii) any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these regulations; (scans and copy the entire page where the advert appears)	**Refer to Appendix C-4**
41(2) (d)	Placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken.	**Refer to Appendix C-4**
41 (3) (a) (b) 41 (4) (a) (b)	The notice, notice board or advertisement referred to in sub regulation (2) must – give details of the application or proposed application which is subject to public participation; and state - (i) whether basic assessment of S&REIR procedures are being applied to the application; (ii) the nature and location of the activity to which the application relates; (iii) where further information on the application or proposed application can be obtained; and (iv) the manner in which and the person to whom representations in respect of the application or proposed application may be made A notice board referred to in sub regulation (2) must - be of a size at least 60cm by 42cm; and display the required information in lettering and in a format as may be determined by the competent authority.	**Refer to Appendix C-4 and C-5**
42 (a-c)	A proponent or applicant must ensure the opening and maintenance of a register of interested and affected parties and submit such a register to the competent authority, which register must contains the names, contact details and addresses of— (a) all persons who, as a consequence of the public participation process conducted in respect of that application, have submitted written comments or attended meetings with the proponent, applicant or EAP; (b) all persons who, have requested the proponent or applicant, in writing, for their names to be placed on the register; and (c) all organs of state which have jurisdiction in respect of the activity to which the application relates.	**Refer to Appendix C-2**
44 (1)	The applicant must ensure that the comments of interested and affected parties are recorded in reports and plans and that such written comments, including responses to such comments and records of meetings, are attached to the reports and plans that are submitted to the competent authority in terms of these Regulations.	**Refer to Chapter 6, Section 6.5 and Appendix C-6**

Table C: Requirements for the Environmental Impact Report in terms of Appendix 3(3) of GN R. 982.

Section	*NEMA 2014 Regs - Appendix 3 (3) Requirement*	Chapter in report
1	An Environmental Impact Assessment Report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include —	
(a)	details of -	
	(i) the EAP who prepared the report; and	**Refer to Chapter 1, Section 1.5.2**
	(ii) the expertise of the EAP, including the Curriculum Vitae;	**Refer to Appendix D**
(b)	the location of the activity, including:	
	(i) the 21 digit Surveyor General code of each cadastral land parcel;	**Refer to Section 2.1, Table 2-1**
	(ii) where available, the physical address and farm name; and	**Refer to Section 2.1, Table 2-1**
	(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	**Refer to (i) and (ii) above**
(c)	a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-	**Refer to Figure 3-3**
	(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken;	**Refer to Appendix G**
	(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	**Refer to Appendix G**
(d)	a description of the scope of the proposed activity, including-	**-**
	(i) all listed and specified activities triggered and being applied for; and	**Refer to Section 1.3**
	(ii) a description of the associated structure and infrastructure related to the development;	**Refer to Chapter 2**
(e)	a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to legislation and policy context;	**Refer to Chapter 5**
(f)	a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location;	**Refer to Chapter 4**
(g)	a motivation for the preferred development footprint within the approved site;	**Refer to Chapter 3 and Chapter 10**
(h)	a full description of the process followed to reach the proposed development footprint within the approved site; including:	**Refer to Chapter 3**
	(i) details of the development footprint alternatives considered;	**Refer to Chapter 3**
	(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	**Refer to Chapter 6**
	(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	**Refer to Section 6.5 and Appendix C-6 for the CRR**
	(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic and cultural aspects;	**Refer to Section 7**
	(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts: (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	**Refer to Section 9**
	(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	**Refer to Section 8.3**
	(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on geographical, physical, biological, social, economic, heritage and cultural aspects;	**Refer to Chapter 9**
	(viii) the possible mitigation measures that could be applied and level of residual risk;	**Refer to Chapter 9**
	(ix) if no alternative development locations for the activity were investigated, the motivation for not considering alternative sites; and	**Alternative locations were considered**
	(xi) a concluding statement indicating the preferred alternative development location within the approved site;	**Refer to Chapter 10**

Section	*NEMA 2014 Regs - Appendix 3 (3) Requirement*	Chapter in report
(i)	a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including-	**Chapter 8**
	(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and	
	(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	
(j)	an assessment of each identified potentially significant impact and risk, including-	**Chapter 9**
	(i) cumulative impacts;	
	(ii) the nature, significance and consequences of the impact and risk;	
	(iii) the extent and duration of the impact and risk;	
	(iv) the probability of the impact and risk occurring;	
	(v) the degree to which the impact and risk can be reversed;	
	(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and	
	(vii) the degree to which the impact and risk can be mitigated;	
(k)	where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 of these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	**Chapter 7 and Chapter 9**
(l)	an environmental impact statement which contains-	**Chapter 9 and chapter 10**
	(i) a summary of the key findings of the environmental impact assessment; and	
	(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitive of the preferred site indicating any areas that should be avoided, including buffers; and	
	(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	
(m)	based on the assessment and, where applicable, recommendations from specialist reports, the recording of proposed impact management objectives and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	**Chapter 9 and chapter 10 as well as the EMPr**
(n)	the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	**Chapter 10**
(o)	any aspects which are conditional to the findings of the assessment wither by the EAP or specialist which are to be included as conditions of authorisation;	**Chapter 10**
(p)	a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	**Chapter 10**
(q)	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	**Chapter 10**
(r)	where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requriements finalised;	**NA**
(s)	an undertaking under oath or affirmation by the EAP in relation to:	**Appendix E**
	(i) the correctness of the information provided in the reports;	
	(ii) the inclusion of comments and inputs from stakeholders and I&APs ;	
	(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and	
	(iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comment or inputs made by interested and affected parties;	
(t)	where applicable, details of any financial provisions for the rehabilitation, closure and on-going post decommissioning management of the negative environmental impacts;	**N/A**
(u)	an indication of any deviation from the approved scoping report, including the plan of study, including-	**Refer to Section 8.5**
	(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and	**No deviation from the approved methodology**
	(ii) a motivation for the deviation;	**N/A**
(v)	any specific information that may be required by the competent authority; and	
(w)	any other matters required in terms of sections 24(4)(a) and (b) of the Act.	

Table **D: Additional requirements listed in the letter from dea accepting the scoping report**

Item	Comment from DEA	Where to find item in the DEIR
	Please ensure that comments from all relevant stakeholders are submitted to the Department with the final ElAr. This includes but is not limited to the Northern Cape Department of Environment and Nature Conservation, the Department of Environmental Affairs and Development Planning, the Department of Agriculture, Forestry and Fisheries (DAFF), the provincial Departments of Agriculture, the South African Civil Aviation Authority (SACAA), the Department of Transport, the Central Karoo District Municipality, the Laingsburg Local Municipality, the Namakwa District Municipality, the Karoo Hoogland Local Municipality, the Cape Winelands District Municipality, the Witzenberg Local Municipality, the Department of Water and Sanitation (DWS), the South African National Roads Agency Limited (SANRAL), the South African Heritage Resources Agency (SAHRA), the Endangered Wildlife Trust (EWT), BirdLife SA, the Department of Mineral Resources, the Department of Rural Development and Land Reform, the Department of Environmental Affairs: Directorate Biodiversity and Conservation, and the South African Astronomy Observation (SAAO).	**Please see Appendix C-6 for the comments and response table and Appendix C-2 for the I&AP database inclusive of the relevant stakeholder.** **The list of stakeholders in the database includes all those listed in the Scoping Approval.**
	Please be advised that the contact person for renewable projects at the SAAO office is Dr Ramotholo Sefako and he can be contacted on Tel: (011) 447 0025 or E-mail: rrs@saao.ac.za.	**Noted. These details have been added to the I&AP Database as provided in Appendix C-2.5.**
	Proof of correspondence with the various stakeholders must be included in the ElAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.	**Please see all proof of notification of I&APs in Appendix C-3**
	The EAP must, in order to give effect to Regulation 8, give registered l&APs access to, and an opportunity to comment on the report in writing within 30 days before submitting the final EIAr to the Department.	**Noted. The I&APs will be notified of the release of the Draft EIR and of the 30 day comment period. Hard copies of the DEIR will be available at two different libraries as well as electronically online.**
	EIA additional information requirement	
i.	The EIAr must provide an assessment of the impacts and mitigation measures for each of the listed activities applied for.	**Please see Chapter 10 of the DEIR for the Impact Assessment.**
ii.	The listed activities represented in the EIAr and the application form must be the same and correct.	**Noted. Please see Chapter 1, Section 1.3, Table 1-1 which is the same as the listed activities applied for in the amended application form (attached to this report).**
iii.	The EIAr must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions. A sample for the minimum information required is listed under point 2 of the EIA information required for wind energy facilities below.	**Refer to Table F**

iv.	The ElAr must provide the four corner coordinate points for the proposed development site (note that if the site has numerous bend points, at each bend point coordinates must be provided) as well as the start, middle and end point of all linear activities.	**Please see Chaper 2, for all coordinates of all linear activities.**
v.	The ElAr must provide the following: • Clear indication of the envisioned area for the proposed wind energy facility; i.e. placing of wind turbines and all associated infrastructure should be mapped at an appropriate scale. • Clear description of all associated infrastructure. This description must include, but is not limited to the following: ➢ Power lines; ➢ Internal roads infrastructure; and; ➢ All supporting onsite infrastructure such as laydown area, guard house and control room etc. ➢ All necessary details regarding all possible locations and sizes of the proposed satellite substation and the main substation.	**Please see Chapter 2 for a project description of the proposed project.**
vi.	The ElAr must also include a comments and response report in accordance with Appendix 2 h (iii) of the EIA Regulations, 2014.	**Please see Appendix C-6 for the Comments and Response Table.**
vii.	The ElAr must include the detail inclusive of the PPP in accordance with Regulation 41 of the EIA Regulations.	**Please see Chapter 6 and Appendix C.**
viii.	Details of the future plans for the site and infrastructure after decommissioning in 20-30 years and the possibility of upgrading the proposed infrastructure to more advanced technologies.	**Refer to Section 0**
ix	It is imperative that the relevant authorities are continuously involved throughout the ElAr process as the development property possibly falls within geographically designated areas in terms of GN R. 985 Activity 4 (a)(ii)(bb)(cc)(dd)(ee) and 4 (f)(i)(aa), Activity 12 (a)(i)(ii) and 12(d)(i), Activity 14 (x)(xii)(a)(c)(a)(ii)(bb)(ee)(ff) and 14 (f)(i)(bb)(dd)(ee)(ff), Activity 18(a)(ii)(bb)(cc)(dd)(ee)(ii) and 18(f)(i)(aa), Written comments must be obtained and submitted to this Department. <u>In addition, a graphical representation of the proposed development within the respective geographical areas must be provided.</u>	**Noted. The relevant authorities will be continuously consulted throughout the EIA process.**
x.	The EAP must provide a motivation and applicability of Activity 17 of GNR 984 as they state that the Competent Authority for this application will be DMR.	**Please note that Activity 17 was excluded from the revised application form (Revision 2) attached to this report.**
xi.	The terms of reference for the aquatic impact assessment must include, inter elle the following: ➢ Site inspection to assess the site and in particular, the areas that are identified as potential risk areas. The site inspection must also gather the necessary information relating to the status of the drainage features (natural and man-made) and existing water storage facilities on site.	**Please see Appendix G for the Aquatic Impact Assessment**
xii.	The terms of reference for the ecological assessment must also investigate the following: ➢ The property falls within a National Protected Area Expansion Strategy Focus Area (NPAES). The ecological study must assess the impact of the proposed	**Please see Appendix G for the Ecology Impact Assessment**

	development on the integrity of the NPAES in the area. ➢ Must indicate the location of both private and government nature protection areas in the area. ➢ Must indicate and describe the competing land uses in the area.	
xiii	The terms of reference for the visual assessment must also investigate the following: ➢ Assess and rate the cumulative impact of multiple WEFs in the landscape. ➢ The South African Astronomy Observatory must be thoroughly engaged and their comments included as part of the EIAr.	**Please see the Appendix G for the Visual Impact Assessment** **SAAO has been included as an I&AP, and have provided comments. See Appendices C-2 and C-6.**
xiv.	A significant amount of materials and equipment will be delivered to the site during the construction phase of the development and will thus have impacts on the environment. The impacts of this activity must be fully identified and assessed. A traffic impact assessment must form part of the EIAr and the terms of reference must include, inter alia the following: ➢ Evaluate the impacts of the proposed development on existing road network and traffic volumes. The study must determine the specific traffic needs during the different phases of implementation, namely wind turbine construction and installation, operation and decommissioning. ➢ Identify the position and suitability of the preferred access road alternative. ➢ Evaluate the roadway capacity of the road network. ➢ Confirm the associated clearances required for the necessary equipment to be transported from the point of delivery to the various sites. ➢ Confirm freight and transport requirements during construction, operation and maintenance. ➢ Propose origins and destinations of equipment. ➢ Determine (Abnormal) Permit requirements if any.	**Please see the Appendix H in the EMP for the Traffic Impact Assessment**
xv.	Should the property be located on land with high potential and/or pivoted or active agricultural land, the Department of Agriculture must be included in the public participation process for this development.	**Noted. Although the project is not located on high potential agricultural land as confirmed by the agricultural impact assessment (see Appendix G), the Department of Agriculture has been included in the public participation process.**
xvi.	The Bat and Avifaunal specialist assessments must assess and make recommendations for definite measurements for the preferred hub heights and rotor diameter.	**Please see the Bat and Avifauna Impact Assessments in Appendix xx and xxx. Recommendations were made for the preferred hub height of 120m and 140m rotor diameter.**

xvii.	Should in-house specialists be used for any specialist study, then the specialist study must be peer reviewed by external specialists.	**Noted. The Visual Impact Assessment and the Agricultural Impact Assessment, undertaken by internal EOH CES specialists, have been peer reviewed. See Appendix xx and xxx for copies of the peer reviews.**
xiii.	Information on services required on the site, e.g. sewage, refuse removal, water and electricity. Who will supply these services and has an agreement and confirmation of capacity been obtained? Proof of these agreements must be provided.	**Please see Section 0**
xix.	The ElAr must provide a detailed description of the need and desirability, not only providing motivation on the need for clean energy in South Africa of the proposed activity. The need and desirability must also indicate if the proposed development is needed in the region and if the current proposed location is desirable for the proposed activity compared to other sites. The need and desirability must take into account cumulative impacts of the proposed development in the area.	**Please see Chapter 4 for the Need and Desireability of the proposed project.**
xx.	A copy of the final site layout map. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. The layout map must indicate the following: ➢ Wind turbine positions and its associated infrastructure; ➢ Permanent laydown area footprint; ➢ Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible); ➢ Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used; ➢ The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected by the facility and its associated infrastructure; ➢ Substation(s) and/or transformer(s) sites including their entire footprint; ➢ Connection routes (including pylon positions) to the distribution/transmission network; All existing infrastructure on the site, especially roads; ➢ Buffer areas; ➢ Buildings, including accommodation; and ➢ All "no-go" areas.	**Chapter 10**
xxi.	An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.	**Chapter 9**
xxii.	A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.	**Chapter 10**
xxiii.	A shapefile of the preferred development layout/footprint must be submitted to this Department. The shapefile must be created using the Hartebeesthoek 94 Datum and the data should be in Decimal Degree Format using the WGS 84 Spheroid. The shapefile must include at a minimum the following extensions i.e. .shp; .shx;	**This will be included with the Final EIA submission to DEA.**

	.dbf; .prj; and, .xml (Metadata file). If specific symbology was assigned to the file, then the .avl and/or the .lyr file must also be included. Data must be mapped at a scale of 1:10 000 (please specify if an alternative scale was used). The metadata must include a description of the base data used for digitizing.	
	Appendix A: EIA information required for wind energy facilities	
1.	General site information The following general site information is required: Descriptions of all affected farm portions • 21 digit Surveyor General codes of all affected farm portions.	**Please see Table 2-1**
	• Copies of deeds of all affected farm portions	**This will be provided along with the Final EIA Report.**
	• Photos of areas that give a visual perspective of all parts of the site	**Please see the images included on page xvi**
	• Photographs from sensitive visual receptors (tourism routes, tourism facilities, etc.)	**Please see Appendix xx for the Visual Impact Assessment**
	• Facility design specifications including: > Type of technology, Structure height, Surface area to be covered (including associated infrastructure such as roads), Structure orientation, Laydown area dimensions (construction period and thereafter), Generation capacity. Generation capacity of the facility as a whole at delivery points. • This information must be indicated on the first page ofthe EIAr. It is also advised that it be double checked as there are too many mistakes in the applications that have been received that take too much time from authorities to correct.	**Please see Table E, Table F and Chapter 362.**
2.	Technical details for the proposed facility	**Please see Chapter 2 and Table F.**
3.	Site maps and GIS information	**All GIS information will be provided electronically to the DEA for decision making**
	Regional map and GIS information	**All GIS information will be provided electronically to the DEA for decision making**
	Important stakeholders	**Please note that Ms Mashudu Marubini (Delegate of the Minister), Ms Thoko Buthelezi (AgriLand Liaison office) and Mr John Geeringh (Eskom Transmission) were notified of the EIA process as per the I&AP database included in Appendix C-2.**
B.	Agriculture study requirements	**Please note that the Agricultural Impact Assessment was undertaken in line with**

		these requirements.
C.	Astronomy Geographic Advantage Act. 2007 (Act No. 21 of 2007) The purpose of the Act is to preserve the geographic advantage areas that attract investment in astronomy. The entire Northern Cape Province excluding the Sol Plaatjie Municipality had been declared an astronomy advantage area. The Northern Cape optical and radio telescope sites were declared core astronomy advantage areas. The Act allowed forthe declaration ofthe Southern Africa Large Telescope (SALT), MeerKAT and Square Kilometre Array (SKA) as astronomy and related scientific endeavours that had to be protected. You are requested to indicate the applicability ofthe Astronomy Geographic Advantage Act, Act No. 21 of 2007 on the application in the BAR/EIR. You must obtain comments from the Southern African Large Telescope (SALT) if the proposed development is situated within a declared astronomy advantage area.	**Refer to Chapter 5** **SAAO and SKA have been included as I&APs, and have provided comments. See Appendices C-2 and C-6.**

GENERAL SITE INFORMATION

Table E: Farm Portions on which the Proposed Development is Located.

Farm Name and Number	21 digit SG Code	Municipality/ Province	Farm size (ha)
The Remainder of Barendskraal 76	C04300000000007600000	Laingsburg LM/ Central Karoo DM/ Western Cape	1,523.7
Portion 1 of Barendskraal 76	C04300000000007600001	Laingsburg LM / Central Karoo DM / Western Cape	2,828.6
The Remainder of Brandvalley 75	C04300000000007500000	Laingsburg LM / Central Karoo DM / Western Cape	1,981.9
Portion 1 of Brandvalley 75	C04300000000007500001	Laingsburg LM / Central Karoo DM / Western Cape	56.3
The Remainder of Fortuin 74	C04300000000007400000	Laingsburg LM / Central Karoo DM / Western Cape	2,454.98
Portion 3 Fortuin 74	C04300000000007400003	Laingsburg LM / Central Karoo DM / Western Cape	1,868.4
The Remainder of Kabeltouw 160	C01900000000016000000	Witzenberg (Ceres) LM/ Cape Winelands DM/ Western Cape	1,082.8
The Remainder of Muishond Rivier 161	C01900000000016100000	Witzenberg (Ceres) LM/ Cape Winelands DM/ Western Cape	4,051.8
Portion 1 of Muishond Rivier 161	C01900000000016100001	Witzenberg (Ceres) LM/ Cape Winelands DM/ Western Cape	3391
Portion 1 of Fortuin 74 (Ou Mure)	C04300000000007400001	Laingsburg LM / Central Karoo DM / Western Cape	408.9
The Farm Rietfontein 197	C07200000000019700000	Karoo Hoogland LM/ Namakwa DM/ Northern Cape	5,873.6
		Total hectares	**25,521.98**

Table F: Technical Details of the Proposed Wind Energy Facility.

Permanent (20 years) Infrastructure	
Facility area	9,299 ha
Site access	The project area can be accessed via the R354 that connects to the N1 between Matjiesfontein and Laingsburg. The R354 is the main arterial road providing access to the project area. There are a number of existing gravel roads providing access from the R354.
Export capacity	Up to 147MW (5% of the feed in capacity).
Proposed technology	Power generation through wind energy generation turbines
Turbine hub height	Up to 120 m
Rotor Diameter	Up to 140 m
Generation capacity (at point of grid feed-in)	Maximum 140MW
Number of turbines	Approximately 70, between 1.5MW and 4MW in capacity each
Turbine foundation	25m in diameter and 4m in depth
Proximity to grid connection	Between 3km and 4km depending on whether the facility will ultimately connect to Bon Espirange Substation or Komsberg Substation. Please note that the 132kV powerlines for grid connection are assessed in two separate Basic Assessment processes (DEA Ref Numbers not yet received).
Area occupied by buildings: 1. Substations 2. Offices, control rooms etc.	Potential 33/132kV onsite substation location(s) were assessed. The footprint will be up to 200m x 200m and will include the other buildings.
Area occupied by both permanent and construction laydown areas	A laydown area of 70m x 50m will be required per turbine (total 24.5ha). The laydown areas will be permanent as it will likely be required during the operational phase for maintenance purposes and for the replacement/ refurbishment of turbine components. The laydown areas will however be kept to a minimum as far as possible.
Electrical turbine transformers	690V/33kV, footprint from 2m x 2m up to 10m x 10m.
Cabling	Underground 33kV cabling between turbines
Width and length of internal roads	Roads will be up to 12m wide, including structures for storm-water control and turning circles would be required to access each turbine location. Where possible, existing roads will be upgraded.
Overhead power lines	33kV overhead power lines linking groups of wind turbines to onsite 33/132kV substation(s) will be required.
Type and height of fencing	Limited mesh fencing around the construction camp and onsite substation will be required. It will be up to 4m in height and will be secured through electrified fences or barbed wire.
Wind measuring lattice masts	4 x 120m, strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase. The footprint of these masts will be up to 40m^2 each.
Temporary Infrastructure	
Construction camp	~10ha
On-site concrete batching plant	~1ha

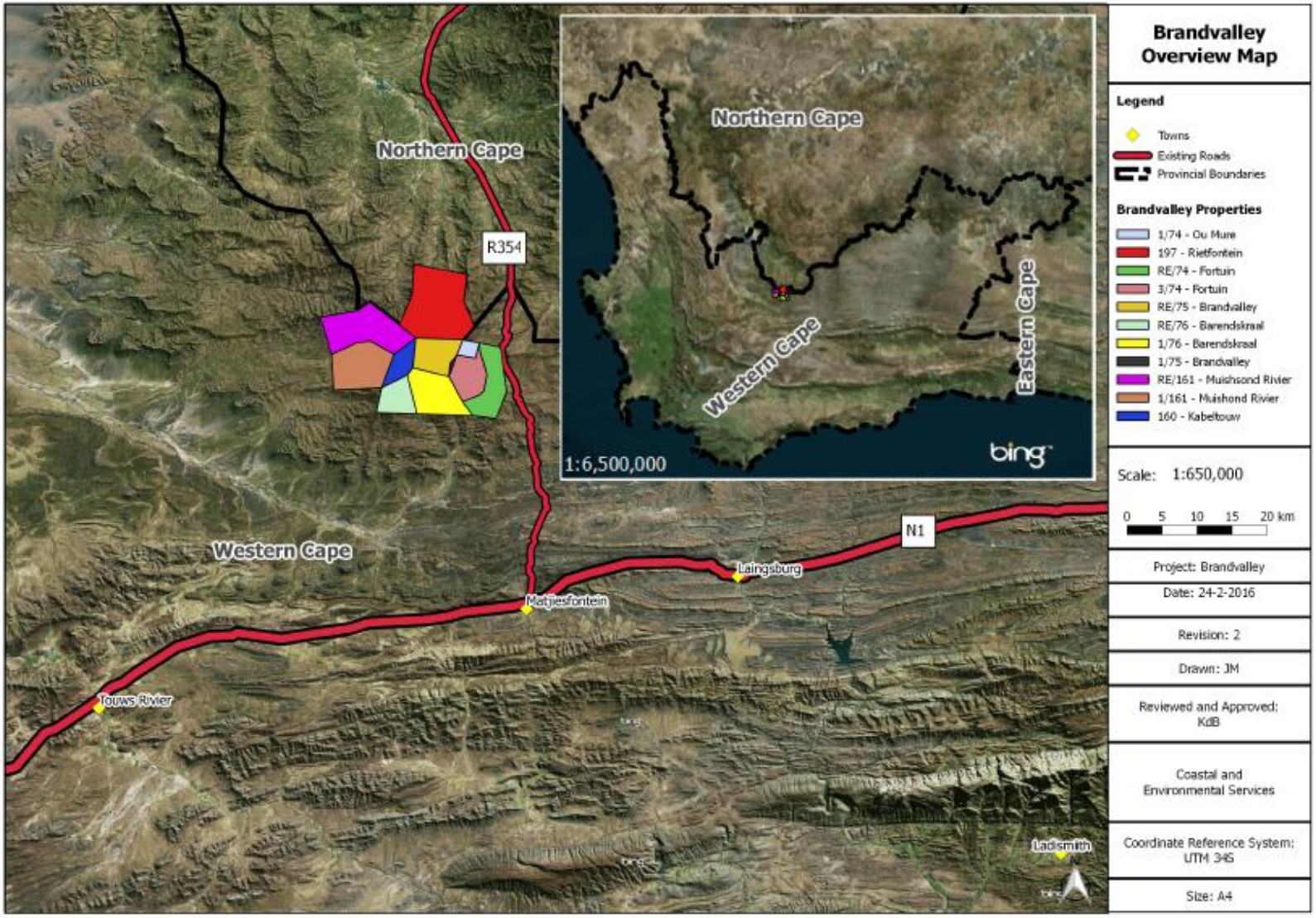

Figure A: Locality Map indicating the position of the proposed project area relative to surrounding towns.

Site photographs of the Project Area.

Vegetation found in the project area.

General topography of the project area.

The R354 situated on the east of the project area, connects the N1 to the R356.

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LIST OF ABBREVIATIONS

ATNS	Air Traffic and Navigation Services
AU	Animal Unit
BA	Basic Assessment
BID	Background Information Document
CAPE	Cape Action for People and the Environment
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
CES	Coastal and Environmental Services
CFR	Cape Floristic Region
CSIR	Council for Scientific and Industrial Research
CVs	Curriculum Vitae
DAFF	Department of Agriculture
DBSA	Development Bank of South Africa
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DENC	Department of Environmental and Nature Conservation
DM	District Municipality
DME	Department of Minerals and Energy
DoE	Department of Energy
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EBA	Endemic Bird Area
ECA	Environmental Conservation Act
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMFs	Environmental Management Framework
EMPr	Environmental Management Programme
ESA	Ecological Support Area
EWT	Endangered Wildlife Trust
FEPA	Freshwater Ecosystem Priority Areas
GHG	Greenhouse gases
GIS	Geographical Information System
GNR	Government Notice Regulation
ha	Hectare
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IBA	Important Bird Area
IDP	Integrated Development Plan
IEP	Integrated Energy Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IUCN	International Union for Conservation of Nature
JV	Joint Venture
kV	Kilovolt
LM	Local Municipality
LSU	Large Stock Unit

Ltd	Limited
LTMS	Long Term Mitigation Scenarios
m/s	Meters per second
MAP	Mean Annual Precipitation
MAT	Mean Annual Temperature
MPRDA	Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)
MSA	Municipal Systems Act
MW	Megawatts
NBI	National Biodiversity Index
NDP	National Development Plan
NEM: AQA	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
NEM: BA	National Environment Management: Biodiversity Act (Act No. 10 of 2004)
NEM: PAA	National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
NEM: WMA	National Environmental Management: Waste Management Act (Act No. 59 of 2008)
NEMA	National Environmental Management Act (Act No. 107 of 1998) (as amended)
NERSA	National Energy Regulator of South Africa
NFEPA	National Freshwater Ecosystem Priority Areas
NPAES	National Protected Areas Expansion Strategy
NRTA	National Road Traffic Act
NSA	Noise Sensitive Areas
NT	National Treasury
NWA	National Water Act (Act No.36 of 1998)
NWI	National Wetlands Inventory
PoS	Plan of Study
PPA	Power Purchase Agreement
PPP	Public Participation Process
PS	Performance Standards
REFIT	Renewable Feed In Tariff
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SA	Secondary Area
SAAO	South African Astronomical Observatory
SACCA	South African Civil Aviation Authority
SACNASP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resources Agency
SALT	Southern African Large Telescope
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SANRAL	South African National Roads Agency
SAWS	South African Weather Services
SDF	Spatial Development Framework
SDP	Spatial Development Plan/ Site Development Plan
SGM	Shale Gas Mining
SIA	Social Impact Assessment
SIPS	Strategic Infrastructure Projects
SKA	Square Kilometre Array
SKEP	Succulent Karoo Ecosystem Programme
SSC	Species of Special Concern
STEP	Subtropical Thicket Ecosystem Project
TCP	Technical Cooperation Permit
ToR	Terms of Reference

UNFCCC	United Nations Framework Convention on Climate Change
WASA	Wind Atlas for South Africa
WEF	Wind Energy Facility
WESSA	Wildlife and Environmental Society of Southern Africa
WRC	Water Research Commission
WWF	Worldwide Fund for Nature

1. INTRODUCTION

According to Appendix 3(3) of the EIA Regulations (GN R. 982 of 2014), an Environmental Impact Report must contain all the information necessary for the competent authority to consider and come to a decision on the application, and must include—

(a) Details of –
(i) the EAP who prepared the report; and
(ii) the expertise of the EAP, including a Curriculum Vitae (CV)
(d) a description of the scope of the proposed activity, including –
(i) all listed and specified activities triggered and being applied for;
(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;

1.1 Background to the Study

Brandvalley Wind Farm (Pty) Ltd (the applicant), a subsidiary of G7 Renewable Energies (Pty) Ltd (G7), proposes to develop a 140 megawatt (MW) WEF near Laingsburg, on the border of the Northern Cape Province and the Western Cape Province in South Africa. The proposed WEF is located in the Karoo Hoogland, the Witzenberg (Ceres) and the Laingsburg Local Municipalities, which fall within the Namakwa, the Cape Winelands and the Central Karoo District Municipalities, respectively. The Brandvalley WEF will comprise of up to 70 turbines, with a generating capacity of between 1.5MW and 4MW each and a foundation of 25m in diameter and 4m in depth. The turbine structures will have a maximum hub height of up to 120m per turbine and a rotor diameter of up to 140m. The total maximum generating capacity (at point of grid feed-in) will be 140MW, in accordance with the maximum generation capacity per WEF as stipulated under the Department of Energy's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP).

Brandvalley WEF is being developed in parallel to a second 140MW WEF (Rietkloof WEF)[1], proposed by Rietkloof Wind Farm (Pty) Ltd, another subsidiary of G7. Three farm portions currently overlap with both Brandvalley with Rietkloof as indicated in the locality Figure 1-1 below. The Rietkloof WEF is proposed on adjacent properties to the Brandvalley WEF, some of which overlap in this application for Environmental Authorisation (EA). Two separate Environmental Impact Assessment (EIA) processes will be undertaken for each WEF, with the intention of running in parallel. Two separate Basic Assessments (BAs) will also be undertaken to assess the grid connection alternatives and overhead power lines. The EIA process will be further discussed in Section 1.2 below.

1.2 The Environmental Impact Assessment Process

The protection and management of the environment within South Africa is governed by various items of legislation, within the regulatory framework of the Constitution of the Republic of South Africa (Act 108 of 1996).

The primary legislation regulating EIAs within South Africa is the National Environmental Management Act (Act No. 107 of 1998) (as amended) (NEMA), which makes provision for the Minister of Environmental Affairs to identify activities, which may not commence prior to the authorisation granted by either the Minister or the provincial Member of the Executive Council (MEC). In addition, NEMA provides for the formulation of regulations in respect of such authorisations. The EIA process is guided by Regulations made in terms of Chapter 5 of NEMA, which came into effect on 4th December 2014. The Regulations set out the procedures and criteria for the submission, processing and consideration of, and decisions on, applications for the environmental authorisation of activities.

[1] DEA reference number: 14/12/16/3/3/2/899

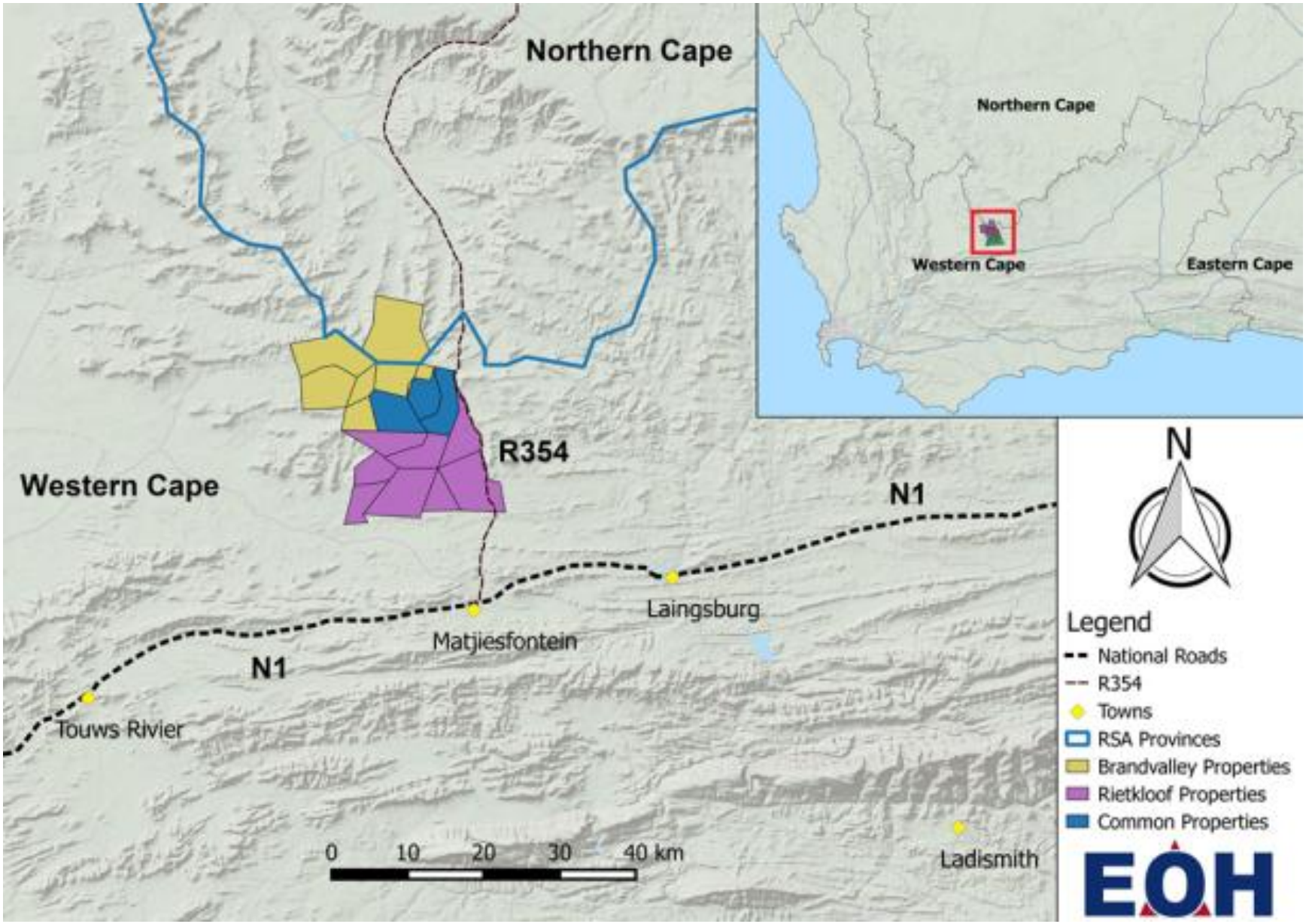


Figure 1-1: Overlapping properties for the proposed Brandvalley and Rietkloof projects.

1.3 Listed Activities Applied For

Three lists of activities, provided in the Regulations published on 4 December 2014, as Government Notice Numbers R.983, R.984, and R.985, define whether the impacts of the development should be subjected to a Basic Assessment (BA) process, which applies to activities with limited environmental impacts (GN R.983 and R.985), or whether a more rigorous, two-tiered approach comprising of a Scoping and Environmental Impact Assessment (EIA) will be required (GN R. 984).

As the proposed Brandvalley WEF trigger activities from GN R. 983, 984 and 985, a Scoping and EIA process is required to assess activities with potentially more significant environmental impacts, both in extent and duration. The listed activities triggered by the proposed Brandvalley WEF are listed in Table 1-1 below.

Table 1-1: Listed activities triggered by the proposed Brandvalley WEF.

Listed activity as described in GN R 983, 984 and 985	Description of project activity that triggers listed activity
GN 983, 11(i): Listing Notice 1 of R.983 EIA Regulations dated 4 December 2014. Activity No. 11: The development of facilities or infrastructure for the transmission and distribution of electricity from a renewable resource where – (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.	*The project will entail construction of substations and power line/s with a capacity of 33kV or more but less than 275kV (outside an urban area).*
GN 983, 12(x), (xii), (a) and (c): Listing Notice 1 of R.983 EIA Regulations dated 4 December 2014. Activity No. 12: The development of – (x) buildings exceeding 100 square metres in size; or (xii) infrastructure or structures with a physical footprint of 100 square metres or more; Where such development occurs – (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.	*Associated infrastructure and structures with a physical footprint of 100 square metres or more, such as turbines, substations, access roads, or buildings and other associated infrastructure exceeding 100 square metres will be constructed within a watercourse or within 32 metres of a watercourse.*
GN 983, 19(i): Listing Notice 1 of R.983 EIA Regulations dated 4 December 2014. Activity No. 19: The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from – (i) a watercourse.	*The construction of access roads, cabling, turbines and other associated infrastructure will require the infilling or depositing of material of more than 5 cubic metres into a watercourse or the dredging, excavation, removal of more than 5 cubic metres from a watercourse.*
GN 983, 24(ii): Listing Notice 1 of R.983 EIA Regulations dated 4 December 2014. Activity No. 24: The development of –	*The WEF will require access roads with parts wider than 8m in width (up to 12m in width), to be constructed outside urban areas, with no reserve.*

Listed activity as described in GN R 983, 984 and 985	Description of project activity that triggers listed activity
(ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres.	
GN 983, 28(ii): Listing Notice 1 of R.983 EIA Regulations dated 4 December 2014. Activity No. 28: Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.	*The development footprint for the proposed WEF (infrastructure and associated areas) will cover an area greater than 1 hectare on land currently used for agriculture outside of an urban area.*
GN 984, 1: Listing Notice 2 of R984 EIA Regulations dated 4 December 2014. Activity No. 1: The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more.	*The WEF will generate an electricity output of more than 20MW. Brandvalley WEF will apply to have contracted capacity of up to 140 MW.*
GN 984, 15: Listing Notice 2 of R984 EIA Regulations dated 4 December 2014. Activity No. 15: The clearance of an area of 20 hectares or more of indigenous vegetation.	*Land clearance of an area of 20 hectares or more of indigenous vegetation will occur during the construction phase of the WEF and associated infrastructure.*
GN 985, 4: 4(a) (ii) (bb), (cc), (dd) and (ee) and 4(f) (i) (aa) Listing Notice 3 of R985 EIA Regulations dated 4 December 2014. Activity No. 4: The development of a road wider than 4 metres with a reserve less than 13,5 metres. (a) Northern Cape (ii) Outside urban areas, in: (bb) National Protected Area Expansion Strategy Focus Area; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an International Convention; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. f) In Western Cape: i. Areas outside urban areas; (aa) Areas containing indigenous vegetation;	*The access roads proposed within the Northern Cape will be wider than 4 meters with a reserve less than 13.5 metres, outside of urban areas within areas earmarked for expansion of protected areas, sensitive areas in terms of the National Wetlands Inventory and the National Freshwater Ecosystem Priority Areas (NFEPA) (as there are important wetlands and wetlands and rivers of NFEPA status) and within areas identified as Critical Biodiversity Areas (CBAs) and Ecological Support Area (ESA).* *The access roads proposed within the Western Cape will be wider than 4 meters with a reserve less than 13.5 metres, outside of urban areas within areas containing indigenous vegetation.*
R985, 12: 12(a) (i) and (ii) and 12(d) (i) Listing Notice 3 of R985 EIA Regulations dated 4 December 2014. Activity No. 12: The clearance of an area of 300 square metres or more of indigenous	*Land clearance of an area of 300 square meters or more of indigenous vegetation will take place during the construction phase of the proposed project.* *According to the desktop study, there are*

Listed activity as described in GN R 983, 984 and 985	Description of project activity that triggers listed activity
vegetation. a) Western Cape province: (i) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; (ii) Within critical biodiversity areas identified in bioregional plans; or (d) In Northern Cape: (i) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004	*no threatened terrestrial ecosystems identified within the project area. There are wetlands and rivers of NFEPA status found within the project area.* *The project does, however, fall within a CBA and an ESA in terms of the Cape Winelands District Municipality, a T2 CBA in terms of the Namakwa Municipality and a CBA and an ESA in terms of the Central Karoo District Municipality.* *Note: the systematic biodiversity plans adopted by the competent authority or in bioregional plans have not been formally adopted by the competent authority for the Western Cape.*
GN 985, 14 (x) (xii) 14(a) and (c), (a) (ii) (bb) (ee) and (ff) and 14(f) (i) (bb) (dd) (ee) and (ff); Listing Notice 3 of R.985 EIA Regulations dated 4 December 2014. Activity No. 14: The development of – (x) buildings exceeding 10 square metres in size; (xii) infrastructure or structures with a physical footprint of 10 square metres or more; Where such development occurs – (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres if a watercourse, measured from the edge of a watercourse. (a) In Northern Cape: (ii) Outside urban areas, in: (bb) National Protected Area Expansion Strategy Focus areas; (ee) Sites or areas identified in terms of an International Convention. (ff) Critical biodiversity areas or ecosystems service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. (f) In Western Cape: i. Outside urban areas, in: (bb) National Protected Area Expansion Strategy Focus areas; (dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority. (ee) Sites or areas identified in terms of an International Convention. (ff) Critical biodiversity areas or ecosystems service areas as identified in	*Infrastructure exceeding these footprints will occur within 32 metres of a watercourse, in the Northern and Western Cape outside of urban areas within areas earmarked for expansion of protected areas, sensitive areas in terms of the National Wetlands Inventory and the National Freshwater Ecosystem Priority Areas (NFEPA) (as there are important wetlands and wetlands and rivers of NFEPA status) and within areas identified as CBAs and ESAs.* *Note: the Environmental Management Framework for the Cape Winelands District Municipality has not been formally adopted by the competent authority.* *Note: the systematic biodiversity plans adopted by the competent authority or in bioregional plans have not been formally adopted by the competent authority for the Western Cape.*

Listed activity as described in GN R 983, 984 and 985	Description of project activity that triggers listed activity
systematic biodiversity plans adopted by the competent authority or in bioregional plans.	
R985, 18(a) (ii) (bb) (cc) (dd) and (ee) (ii) and 18(f) (i) (aa); Listing Notice 3 of R.985 EIA Regulations dated 4 December 2014. Activity No. 18: The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. (a) In Northern Cape province: ii. Outside urban areas, in: (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority. (dd) Sites or areas identified in terms of an International Convention; (ee) Critical biodiversity areas or ecosystems service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. (ii) Areas on the watercourse side of the development setback line or within 100 metres from the edge of a watercourse where no such setback line has been determined; or (f) Western Cape: i. All areas outside urban areas: (aa) Areas containing indigenous vegetation.	*The upgrading of the roads for the project will involve widening and/or lengthening of existing access roads.* *The undertaking of this activity will take place in the Northern Cape Province, outside urban areas within areas earmarked for expansion of protected areas, sensitive areas in terms of the National Wetlands Inventory and the National Freshwater Ecosystem Priority Areas (NFEPA) (as there are important wetlands and wetlands and rivers of NFEPA status) and within areas identified as CBAs and ESAs as well as in the Western Cape, in areas outside of urban areas containing indigenous vegetation.*

The proposed development activities trigger at least one listed activity from GN R984 and therefore require a full Scoping and EIA. The Scoping and EIA process is regulated by Chapter 4, Part 3 and Appendices 2,3,4,6 and 7 of the 2014 EIA Regulations.

It is important to note that in addition to the requirements for an authorisation in terms of the NEMA, there may be additional legislative requirements, which need to be considered prior to commencing with the activity.

1.4 Phases of the EIA Process

An EIA process consists of four phases, namely the Pre-Assessment Public Participation Process (PPP) Phase, the Scoping Phase (the current phase), the Specialist Phase and the EIA Phase. These phases are depicted in the flow-diagram provided in Figure 1-2.

The EIA process is initiated through a Pre-Assessment PPP. The pre-assessment process is not a mandatory requirement in terms of the EIA Regulations (2014) but a beneficial option for the client and EAP in order to identify key stakeholders and Interested and Affected Parties (I&APs) as well as to identify any fatal flaws at the onset of a project.

This phase is followed by the Scoping Phase (inclusive of a notice of intent to the authorities), as

shown in Figure 1-2. During the Scoping Phase, the Terms of Reference for the full EIA is formulated, and requirements from the authorities clarified. The Scoping Process serves to further inform the I&APs of the proposed activities and to consult with relevant government departments, allowing for the identification of potential issues and concerns.

After completion of the Scoping Phase, detailed specialist studies will be undertaken in order to address issues identified during the Scoping Phase. Specialists are expected not only to provide baseline information in their particular field of expertise for the study area, but also to take this study further and identify which project actions will result in significant impacts. Consultants are also expected to suggest ways in which these negative impacts could be mitigated, to reduce their severity.

The specialist investigations will inform the EIA Phase. A comprehensive EIA report will be compiled, documenting the outcome of the specialist impact assessments. All Draft Reports are submitted for public review, during which time the Environmental Assessment Practitioner (EAP) presents the key findings to all I&APs at the provincial and local levels. All comments made by I&APs are captured in a Comments and Response Table, and in this table responses to all issues and concerns raised during the public review period are provided.

All recommendations cited in the EIA Report must be detailed in an Environmental Management Programme report (EMPr), which defines the actions to be implemented. EMPr's are recognised as very important tools for the sound environmental management of projects.

The Scoping and EIA Reports, along with all comments received during the PPP, will be submitted to the Department of Environmental Affairs (DEA) for decision-making.

The structure of this report is based on Chapter 4 and Appendix 3 of the EIA regulations (GNR 982), which clearly specifies the required content of an Environmental Impact Assessment Report.
The DEA, formerly the Department of Environmental Affairs and Tourism (DEAT), is the competent authority that must consider and decide on the application for authorisation in respect of the activities listed in Table 1-1. All electricity-related projects, including generation, transmission and distribution, are to be submitted to DEA, irrespective of the nature of the application. This decision has been made in terms of Section 24(C)(3) of NEMA. I&APs will be notified of DEA's decision and informed of their right to appeal this decision.

The environmental process will be undertaken in accordance with the requirements of NEMA and the 2014 EIA Regulations promulgated in terms of this Act (Government Notice (GN) No R.982, R.983, R.984 and R.985)

EOH Coastal & Environmental Services (CES) is the environmental consultancy appointed by Brandvalley Wind Farm (Pty) Ltd to undertake the EIA process, with Marc Hardy designated as the Environmental Assessment Practitioner (EAP) that will manage this process.

PRE-ASSESSMENT PUBLIC PARTICIPATION PROCESS (PPP)
• Identification of key stakeholders and Interested and Affected Parties (I&APs) • Distribution of PPP Documents (Background Information Document, Notification letters, placement of posters and site notices)

SCOPING PHASE (44 DAYS)	
ACTIVITY	TIMEFRAME
Submission of Application	-
Authority Acknowledgement	10 days after receipt of Application
Public Review of Draft Scoping Report (DSR)	30 days
Submission of Final Scoping Report (FSR)	44 days from receipt of acknowledgment of Application
Consideration by Authorities	43 days from receipt of FSR

SPECIALIST PHASE

EIA PHASE (106 DAYS)	
ACTIVITY	TIMEFRAME
Public Review of Draft Environmental Impact Report (DEIR) and Environmental Management Programme (EMPr)	30 day
Submission of Final Environmental Impact Report (FEIR) and Environmental Management Programme (EMPr)	106 days from Acceptance of Scoping Report
Notification of extension of additional 50 days	Must be lodged within 106 days of Acceptance of Scoping Report. Extension period allows for a further 50 days to submit the EIR (i.e. within 156 days).
Environmental Authorisation Decision	107 days from receipt of FEIR
EA Notification	Authority to notify Applicant within 5 days 14 days to notify I&APs
Environmental Authorisation Appeal Finalised 90 days from Environmental Authorisation Decision	90 days from Environmental Authorisation Decision

Figure 1-2: The EIA process.

1.5 Details and Expertise of the Environmental Consulting Company and EAP

According to Regulation 13 of the EIA Regulations (GN R. 982 of 2014), *An EAP must* **–**
(a) be independent; and
(b) have expertise in conducting Environmental Impact Assessments, including knowledge of the Act, these Regulations and any guidelines that have relevance to the proposed activity.

In fulfilment of the above-mentioned legislative requirement, the details of the EAP that prepared this Environmental Impact Report as well as the expertise of the individual members of the study team are provided below.

1.5.1 Details of the Environmental Consulting Company

Coastal and Environmental Services (CES), trading as EOH Coastal & Environmental Services
Physical Address (Head Office): 67 African Street, Grahamstown 6139
Physical Address (Branch): The Point, Suite 408, 4th Floor, 76 Regent Road, Sea Point 8005
Postal Address: P.O. Box 934, Grahamstown 6140
Telephone: +27 46 622 2364 (Head Office); +27 21 045 0900 (Branch)
Fax: +27 46 622 6564
Website: www.cesnet.co.za
Email: info@cesnet.co.za

1.5.2 Expertise of EOH CES, the EAP and the Project Team

EOH Coastal & Environmental Services is a South African based company, established in 1990, to service the field of Environmental Management and Impact Assessment. Our principal area of expertise is in assessing the impacts of development on the natural, social and economic environments through, among other instruments, the EIA process, and in so doing contribute towards sustainable development. Provided below are summarised qualifications for each of the team members involved in the EIA process. A full *Curriculum Vitae (CV)* for the EAP, Marc Hardy, is provided in Appendix D of this report.

Mr Marc Hardy
(Role: Environmental Assessment Practitioner, Project Leader and Reviewer)
Marc holds a M.Phil in Environmental Management from Stellenbosch University's School of Public Management and Planning. His professional interests include environmental impact reporting for linear, energy and bulk infrastructure projects, strategic environmental policy development and reporting – mostly relating to Environmental Management Framework's (EMF's) - compliance monitoring and environmental auditing. Marc has, amongst others, been project manager for the Dinokeng EMF (Gauteng), the Milnerton Refinery to Ankerlig Power Station Liquid Fuels Transportation Infrastructure Project, numerous Eskom Transmission and Distribution power line and substation EIA's countrywide, mining EMPR compliance audits, compliance audits for Camden, Grootvlei and Komati Power Stations and the hazardous waste management facility for the Coega Development Corporation (Coega IDZ). Before entering the consulting field he gained extensive experience in the EIA regulatory field whilst in the employ of the Gauteng Department of Agriculture, Conservation and Environment - being responsible for the review of infrastructure projects like the Gautrain Rapid Rail system and representing the Department on various EMF project steering committees. He is currently managing numerous EIA processes for wind energy developments countrywide, as well as renewable energy and mining projects throughout Africa.

Ms Amber Jackson
(Role: Project Manager and Report Production)
Amber, Senior Environmental Consultant at CES, holds an MPhil in Environmental Management and has a background in both Social and Ecological work. Her undergraduate degrees focused on Ecology, Conservation and Environment with particular reference to landscape effects on Herpetofauna, while her masters focused on the environmental management of social and

ecological systems. With a dissertation in food security that investigated the complex food system of informal and formal distribution markets. She has been involved in managing the Environmental and Social Impact Assessment for two large forestry plantation projects in Mozambique (Green Resources) and numerous wind farm applications in South Africa. During her time at CES she has co-ordinated specialist studies, put together the Impact Reports, prepared the Issues and Response trails and managed the compilation of the Social and Environmental Management Programmes and Monitoring Programmes. She has been involved in ecological studies in Mozambique and South Africa. Interests include, ecological studies dealing with indigenous fauna and flora, as well as land use and natural resource management. She is registered as a candidate Professional Natural Scientist in the field of Environmental Science through the South African Council for Natural Scientific Professions (SACNASP).

Ms Belinda Huddy
(Role: Report Production and Public Participation)
Belinda, Environmental Consultant at CES, holds an MPhil in Environment, Society and Sustainability and a Bachelor of Business Science (Hons) in Economics both obtained from the University of Cape Town. Her master's dissertation explored alternative values, focusing on the social values, attached to the Cape Town Talent Exchange. Her honours thesis investigated the determinants of the success and failures of the bio-diesel industry, focusing on a jatrohpa plantation in Zambia. Courses in her master's degree include Theory and Practice of Environment Management, Managing Complex Human-Ecological Systems, Environmental Law and Cultural Geography. The relevant courses in her honours degree included Environmental Economics and Natural Resource Economics.

1.6 Assumptions, Limitations and Gaps in Knowledge

This report is based on information that is currently available and, as a result, the following limitations and assumptions under which this report was compiled are implicit:

- The report is based on a project description taken from preliminary design specifications and site layouts for the proposed WEF that have not yet been fully optimised and are likely to undergo a number of iterations and refinements (based on environmental and technical inputs) before they can be regarded as definitive. All potential turbine position alternatives will, however, be contained within the property boundaries of the project area.
- The preliminary turbine site layout and associated infrastructure will be subject to the necessary specialist assessments provided in this report.
- Descriptions of the surrounding environment are based on limited fieldwork and available literature.
- The field assessments were limited to a summer dry season observation due to time constraints.
- The information provided in the reports have reference only to the study area and cannot be applied to other areas without detailed investigation.
- It is assumed that the existing roads and tracks within the facility to be used for the project will be upgraded while the new roads and associated transmission lines will avoid or span the observed water courses as far as possible.
- It is assumed that water will be sourced from a licensed resource and not illegally abstracted from any surrounding water courses, particularly if dust suppression is required.
- Any satellite imagery used may be outdated due to any land changes occurring since the imagery was taken.
- The worst case scenario impacts were determined throughout the study.

The assumptions and limitations specific to the specialist studies can be found in the respective specialist reports, found in Appendix H.

Due to the complex and dynamic nature of the environment, uncertainty and gaps in our knowledge are inevitable. The Precautionary Principle has been adopted to account for this uncertainty throughout the Scoping Phase of the proposed project, and will similarly be implemented in the EIA Phase. The Precautionary Principle ensures that:-

- Uncertainty surrounding impacts are identified and addressed appropriately;
- Preventative measures are taken into account throughout the project;
- Various alternatives are thoroughly explored;
- Adequate and transparent public participation is conducted;
- A holistic approach is adopted to ensure social, economic and ecological impacts are explored, and mitigation measures are determined, through an integrated and balanced approach; and
- An adaptive approach is adopted to account for the complexities and dynamism inherent in environmental processes.

The Precautionary Principle ensures that potential impacts are predicted, avoided and mitigated to avoid threats of a serious or irreversible nature (IUCN, 2007).

2. PROJECT DESCRIPTION

According to Appendix 3(3) of the EIA Regulations (GN R. 982 of 2014), *an Environmental Impact Report must contain all the information necessary for the competent authority to consider and come to a decision on the application, and must include—*

(b) the location of the activity, including -
(i) the 21 digit Surveyor General code of each cadastral land parcel;
(ii) where available, the physical address and farm name;
(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;
(c) a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-
(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken;
(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;
(d) a description of the scope of the proposed activity, including-
(ii) a description of the associated structure and infrastructure related to the development;

In line with the above-mentioned legislative requirement, this Chapter describes how wind energy technology works, identifies the site location of the proposed Brandvalley WEF and provides a description of its various components and arrangements on the site.

2.1 Broad-level Description of Electricity Production from Wind

Wind energy is a form of solar energy. Winds are caused by the uneven heating of the atmosphere by the sun, the irregularities of the earth's surface, and rotation of the earth. Wind flow patterns are modified by the earth's terrain, bodies of water, and vegetation. This wind flow or motion energy (kinetic energy) can be used for generating electricity. The term “wind energy” describes the process by which wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy in the wind into mechanical power and a generator can then be used to convert this mechanical power into electricity. A typical wind turbine consists of the following components, which are shown in Figure 2-1:

- A *rotor*, with 3 blades, which collects energy from the wind and converts the wind energy into rotational shaft motion/energy to turn the generator;
- A *nacelle* which houses the equipment at the top of the tower includes a gearbox, if required, breaks to prevent damage by switching off the turbine during very high winds and a generator that converts the turning motion/mechanical energy of the blades into electricity) and determines the speed of the rotation of the blades;
- A *tower*, to support the nacelle and rotor and to allow the blades to be distanced safely off the ground and so as to reach the stronger winds found at higher elevations. The tower must be strong enough to support the rotor and nacelle, to sustain vibrations, wind loading and to endure the overall weather elements throughout the life of the project;
- *Electronic equipment* i.e. controls, transformers, electrical cables and switchgear, ground support equipment, and interconnection equipment; and
- *Turbine step-up transformer* which can be indoor or outdoor, depending on the turbine model whose function is to increase the voltage capacity of the electricity generated by the turbine to a higher, grid-equivalent voltage.

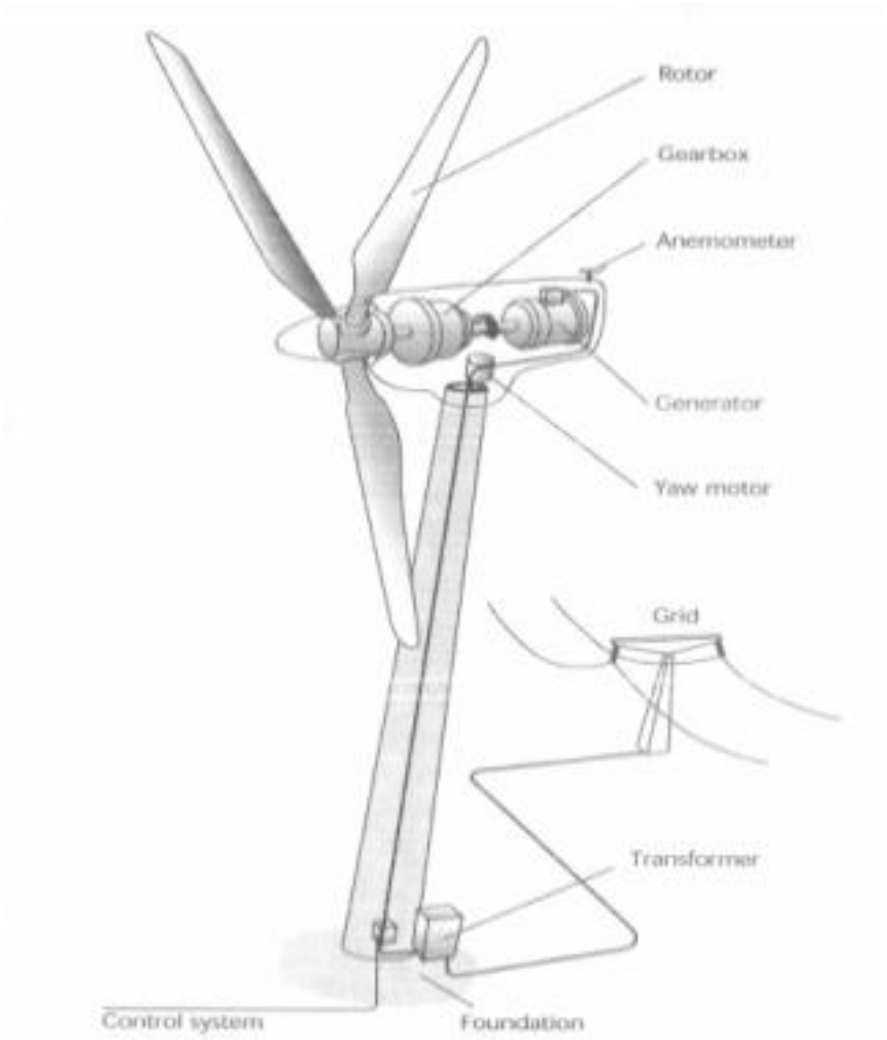


Figure 2-1: Component of a Wind Turbine.

The amount of energy the wind transfers to the rotor depends on the density of the air (the heavier the air, the more energy received by the turbine), the rotor area (the bigger the rotor diameter, the more energy received by the turbine), and the wind speed (the faster the wind, the more energy received by the turbine). The sections that follow provide a detailed explanation of the various components of a wind energy project. The electricity generated by each turbine is passed through a step-up transformer and then transmitted via 33kV to underground and/or overhead cables into a central substation, which connects the project to a high voltage network.

2.2 Location and Site Description of the Proposed Development

Brandvalley Wind Farm (Pty) Ltd proposes to develop a WEF within the Northern Cape and Western Cape Provinces of South Africa. The WEF straddles the border where in the Northern Cape, the proposed project falls within the Karoo Hoogland Local Municipality and within the Namakwa District Municipality. In the Western Cape, the WEF falls within the Witzenburg Local Municipality and the Laingsburg Local Municipality and within the Cape Winelands and the Central Karoo District Municipalities, respectively.

Sutherland is the closest town within the Northern Cape Province and is situated approximately 60km north of the project area. The closest town within the Western Cape Province is Matjiesfontein, situated 30km south of the project area. Laingsburg is a further 30km east of Matjiesfontein, along the N1 national road in the Western Cape Province.

The project area can be accessed via the R354 that connects to the N1 between Matjiesfontein and Laingsburg. The R354 is the main arterial road providing access to the project area, where there are a number of existing local, untarred roads providing access within the project area.

The proposed Brandvalley WEF falls across eleven (11) farm portions, provided in Table 2-1 below. These land portions, collectively referred to as the project area for the Brandvalley WEF, are currently used for animal husbandry, game farming and agriculture, including grazing of sheep.

Table 2-1: Farm Portions on which the Proposed Development is Located[2].

Farm Name and Number	21 digit SG Code	Municipality/ Province	Farm size (ha)
The Remainder of Barendskraal 76	C04300000000007600000	Laingsburg LM/ Central Karoo DM/ Western Cape	1,523.7
Portion 1 of Barendskraal 76	C04300000000007600001	Laingsburg LM / Central Karoo DM / Western Cape	2,828.6
The Remainder of Brandvalley 75	C04300000000007500000	Laingsburg LM / Central Karoo DM / Western Cape	1,981.9
Portion 1 of Brandvalley 75	C04300000000007500001	Laingsburg LM / Central Karoo DM / Western Cape	56.3
The Remainder of Fortuin 74	C04300000000007400000	Laingsburg LM / Central Karoo DM / Western Cape	2,454.98
Portion 3 Fortuin 74	C04300000000007400003	Laingsburg LM / Central Karoo DM / Western Cape	1,868.4
The Remainder of Kabeltouw 160	C01900000000016000000	Witzenberg (Ceres) LM/ Cape Winelands DM/ Western Cape	1,082.8
The Remainder of Muishond Rivier 161	C01900000000016100000	Witzenberg (Ceres) LM/ Cape Winelands DM/ Western Cape	4,051.8
Portion 1 of Muishond Rivier 161	C01900000000016100001	Witzenberg (Ceres) LM/ Cape Winelands DM/ Western Cape	3391
Portion 1 of Fortuin 74 (Ou Mure)	C04300000000007400001	Laingsburg LM / Central Karoo DM / Western Cape	408.9
The Farm Rietfontein 197	C07200000000019700000	Karoo Hoogland LM/ Namakwa DM/ Northern Cape	5,873.6
		Total hectares	**25,521.98**

The location of the proposed land properties is provided in Figure 2-2 below.

[2]These farm entrance gates can be accessed via the R354 and existing access roads.

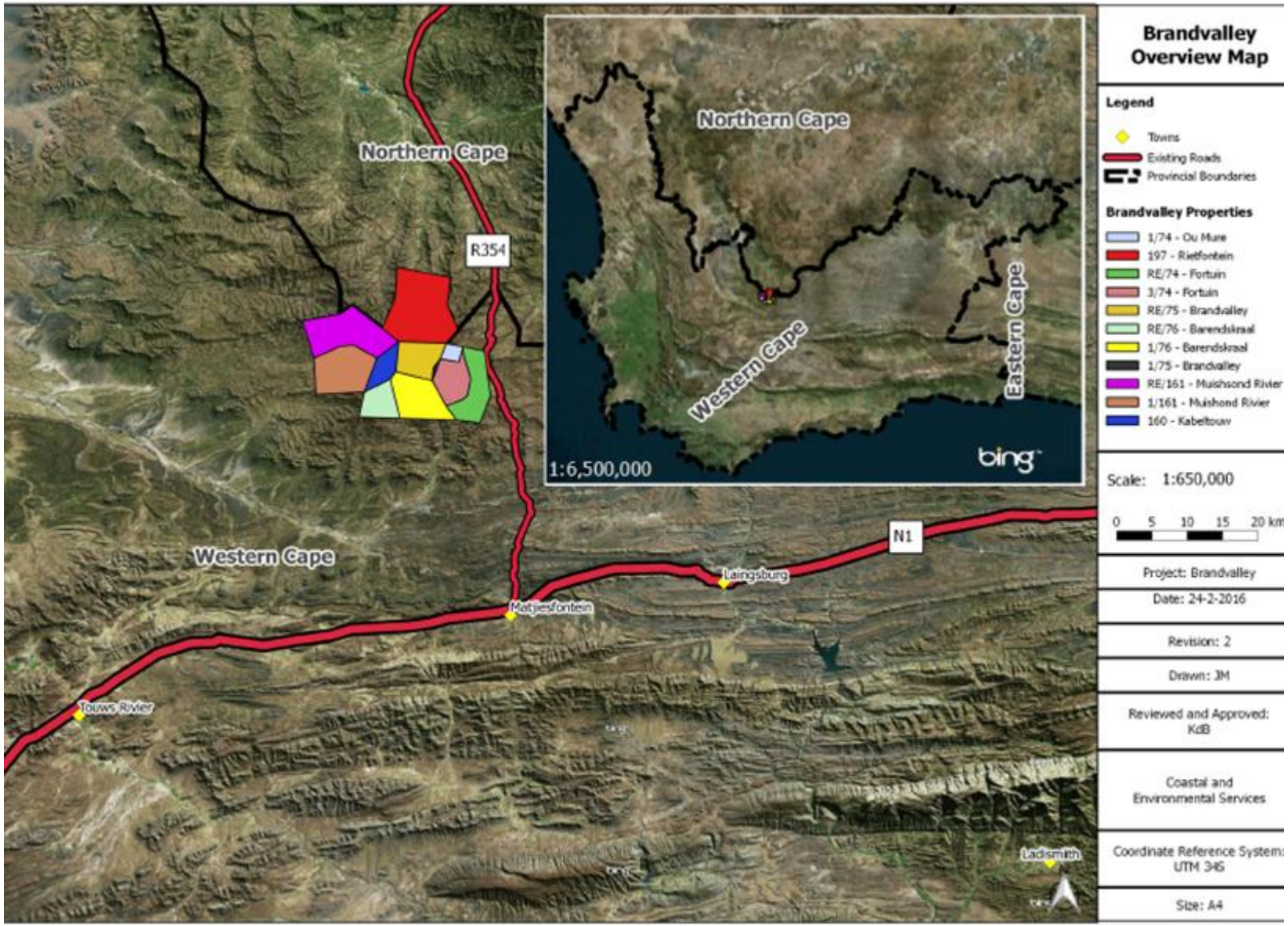


Figure 2-2: Proposed Location for the Brandvalley Wind Energy Facility.

2.3 Detailed Description of the Brandvalley WEF

Brandvalley WEF will have an energy generation capacity (at point of grid feed-in) of up to 140 megawatt (MW), and will include the following:

- Up to 70 potential wind turbine positions (between 1.5MW and 4MW in capacity each), each with a foundation of 25m in diameter and 4m in depth.
- The hub height of each turbine will be up to 120m, and the rotor diameter up to 140m.
- Permanent compacted hard-standing laydown areas for each wind turbine (70mx50m, total 24.5ha) will be required during construction and for on-going maintenance purposes.
- Electrical turbine transformers (690V/33kV) adjacent to each turbine (typical footprint of 2m x 2m, but can be up to 10m x 10m at certain locations) would be required to increase the voltage to 33kV.
- Internal access roads up to 12m wide, including structures for storm-water control would be required to access each turbine location and turning circles. Where possible, existing roads will be upgraded.
- 33kV overhead power lines linking groups of wind turbines to onsite 33/132kV substation(s). A number of potential electrical 33kV powerlines will be required in order to connect wind turbines or strings of turbines to the preferred onsite substation. The layout of the 33kV powerlines will be informed by sensitive features identified. The facility will consist of both above and below ground 33kV electrical infrastructure depending on what will require the shortest distance and result in the least amount of impacts to the environment.
- Underground 33kV cabling between turbines buried along access roads, where feasible.
- A number of potential 33/132kV onsite substation location(s) will be assessed. The footprint of these 33/132kV substation(s) will need to be assessed in both this EIA and the Basic Assessment process for electrical infrastructure as the applicant will remain in control of the low voltage components of the 33/132kV onsite substation (including isolators, control room, cabling, transformers etc.) (assessed in this EIA), whereas the high voltage components of this substation (assessed in BA) will likely be ceded to Eskom. The total footprint of this onsite substation will be approximately 200m x 200m. The exact coordinates of the low voltage components footprint (assessed in this EIA) and high voltage components footprint (to be assessed in the basic assessment process) will be informed by detailed designs.
- Up to 4 x 120m tall wind measuring lattice masts strategically placed within the wind farm development footprint to collect data on wind conditions during the operational phase.
- Temporary infrastructure including a construction camp (~10ha) and an on-site concrete batching plant (~1ha) for use during the construction phase.
- Borrow pits and quarries for locally sourcing aggregates required for construction (~4.5ha), in addition to onsite turbine excavations where required. All materials excavated will eventually be used on the compacting of the roads and hard-standing areas and no material will be sold to any third parties. The number and size of the borrow pits depends on suitability of the subsurface soils and the requirement for granular material for access road construction and other earthworks. Alternative borrow pit locations will be assessed in a separate BA process. Application for approval will also be submitted in terms of the Mineral and Petroleum Resources Development Act (Act 107 of 2002) (MPRDA) once the suitability of the material has been determined.
- Fencing will be limited around the construction camp and the entire facility would not necessarily need to be fenced off. The height of fences around the construction camp are anticipated to be up to 4m.

It is important to note that the number of turbines and grid connection options detailed above will be subject to an iterative process based on the findings of the specialist reports and technical feasibility. It is important to note that this layout is preliminary and was amended in light of environmental sensitive areas identified during the EIA process. The amended project description and final layout are provided in Chapter 10.

2.4 Grid Connection Infrastructure

The following infrastructure will likely be ceded to Eskom at a later stage and will therefore be assessed in a separate Basic Assessment process:

- High voltage components of the 33/132kV onsite substation including transformers, isolators, cabling, light mast and other as required by Eskom. The onsite substation will have a footprint of up to 200m x 200m that will also house site offices, storage areas, ablution facilities and the maintenance building which will be shared or devided between Brandvalley Wind Farm (Pty) Ltd and Eskom.
- 132kV above-ground distribution line to connect the onsite 33/132kV substation to the grid. The pylons for this line will have an average spacing of 250m to 300m.
- Extension of the Eskom high voltage infrastructure in order to connect the wind farm. There are three grid connection options being considered and the preferred option will be informed by environmental, technical considerations and Eskom's preference:
    - Connection to the existing 400kV Komsberg substation;
    - Connection to the Bon Espirange satellite 132kV substation. The Bon Espirange satellite substation will be established by Eskom and other IPPs as an alternative to connecting all wind farms west of Komsberg directly to the Eskom Komsberg Substation; or
    - Construction of a central switching station (up to 200m x 200m) to be shared by both Brandvalley and Rietkloof if both are awarded preferred bidder status by the Department of Energy. If the central hub or switching station option is ultimately selected by Eskom, each project will build their own 33/132kV substation and connect to the central substation. From there one 132kV line for both projects will lead to either the Komsberg or Bon Espirange substation.

2.5 Potentially Shared infrastructure

Access roads, laydown areas, borrow pit locations and buildings and other infrastructure will be shared as far as feasibly possible.

2.6 Access Roads

Although a 200m corridor is proposed for the access roads, Figure 2-3 below indicates the center line of this corridor for the proposed access roads for the proposed project. The access roads are considered a linear activity and are further explored in Section 3.2.1. Existing access roads are indicated in Figure 2-4.

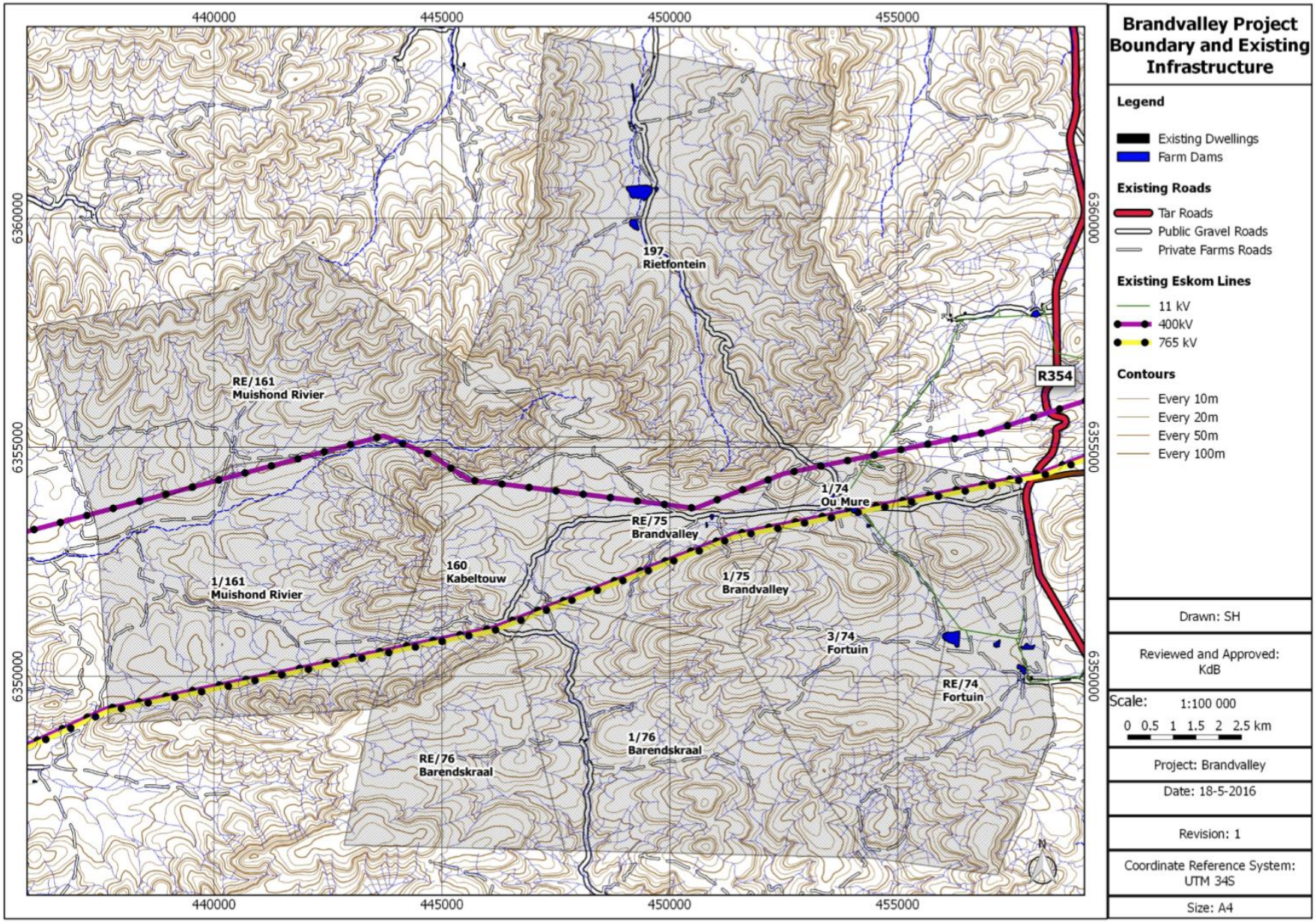


Figure 2-3: Exisiting infrastructure and access roads (Map by G7).

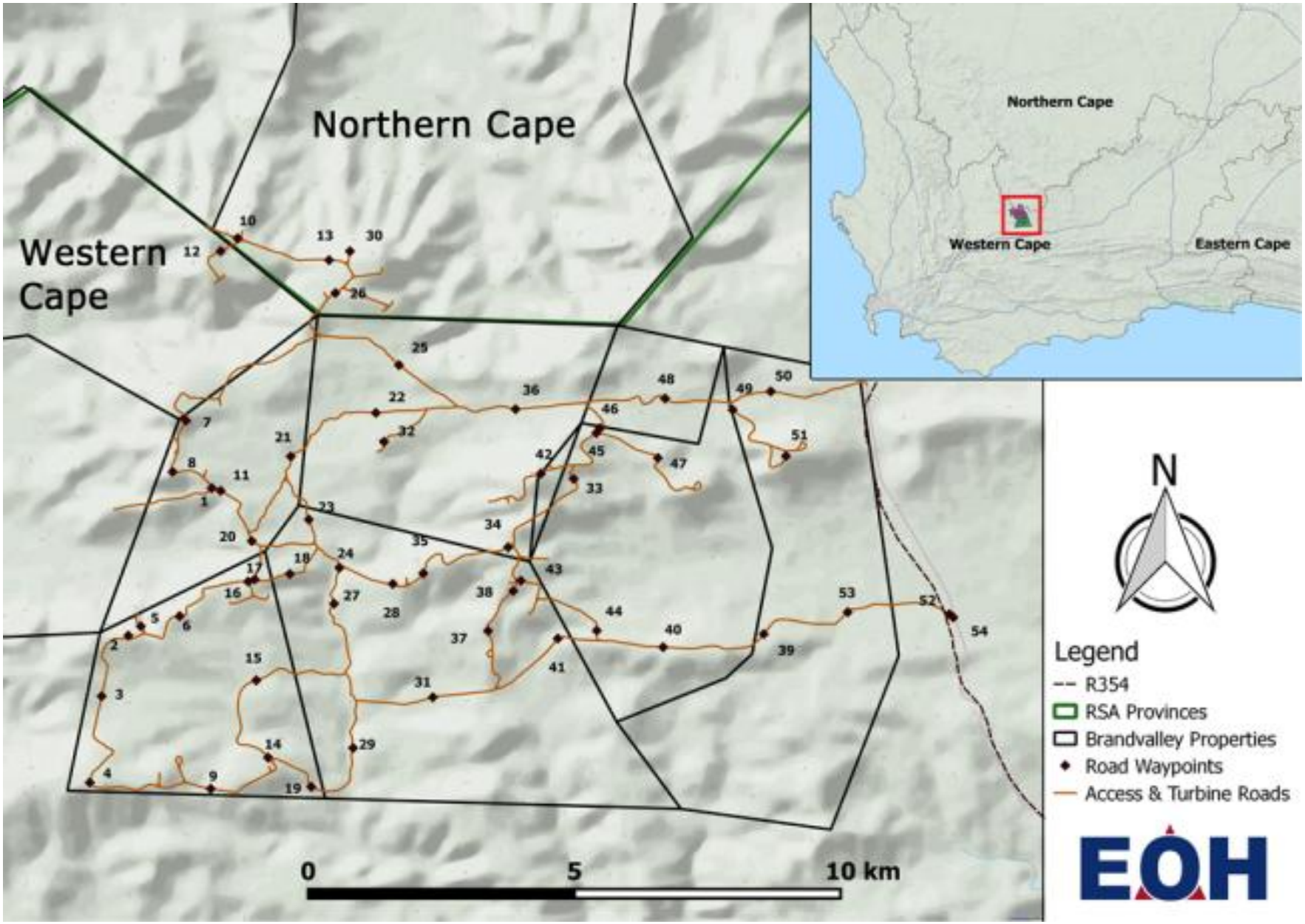


Figure 2-4: Proposed and existing access roads for the proposed project (the numbers refer to 2km intervals).

The coordinates of the access roads are provided in Table 2-2 below. The numbers shown in Figure 2-4 correspond to the numbers in Table 2-2.

Table 2-2: Coordinates of proposed and existing access roads (2km intervals).

No.	Interval	Latitude	Longitude	No.	Interval	Latitude	Longitude
1	0	445532.16	6351991.73	28	54000	448943.45	6350219.51
2	2000	443978.97	6349226.01	29	56000	448212.84	6347147.97
3	4000	443483.84	6348089.26	30	58000	448104.91	6356436.96
4	6000	443269.92	6346473.66	31	60000	449706.56	6348103.41
5	8000	444213.1	6349401.71	32	62000	448763.16	6352878.18
6	10000	444941.29	6349594.5	33	64000	452332.17	6352199.6
7	12000	445040.5	6353249.98	34	66000	451107.3	6350915.4
8	14000	444794.38	6352292.82	35	68000	449514.82	6350419.32
9	16000	445543.52	6346370.42	36	70000	451233.9	6353497.84
10	18000	445989.5	6356668.17	37	72000	450736.49	6349350.02
11	20000	445699.55	6351942.37	38	74000	451206.18	6350097.86
12	22000	445674.73	6356426.5	39	76000	455917.39	6349315.9
13	24000	447712.59	6356269.38	40	78000	454027.98	6349061.11
14	26000	446616.37	6346960.14	41	80000	452048.25	6349212.68
15	28000	446388.05	6348403.02	42	82000	451716.48	6352295.35
16	30000	446223.68	6350248.74	43	84000	451348.14	6350291.61
17	32000	446346.91	6350288.33	44	86000	452780.27	6349364.87
18	34000	447006.62	6350393.62	45	88000	452752.76	6353060.22
19	36000	447429.59	6346418.61	46	90000	452821.33	6353150.97
20	38000	446288.56	6351006.85	47	92000	453913.1	6352598.53
21	40000	447012.54	6352591.84	48	94000	454042.94	6353711.35
22	42000	448607.99	6353416.36	49	96000	455313.68	6353506.35
23	44000	447357.76	6351413.38	50	98000	456030.28	6353853.65
24	46000	447938.33	6350516.08	51	100000	456320.62	6352644.6
25	48000	449038.23	6354312.38	52	102000	459404.93	6349701.94
26	50000	447835.19	6355653.97	53	104000	457492.7	6349730.66
27	52000	447839.98	6349843.51	54	104525	459474.45	6349642.74

2.7 Life-cycle of the wind energy facility

Phases of a Wind Farm Development

Typically, the development of wind farm is divided into four phases, namely:

- Pre-feasibility and Feasibility
- Construction
- Operation
- Decommissioning

Each of the above-mentioned phases is described in detail in sections that follow. Some of these tasks occured in parallel to the EIA process.

2.7.1 Pre-feasibilty and feasibility phase

During the pre-feasibility phase, several early-stage assessments and surveys were undertaken to determine if there are any evident issues surrounding the proposed project and location. The early stage activities undertaken by the applicant to evaluate feasibility of the site are described in Section 3.2.1 and 4.3.

Once it was confirmed that there are no fatal flaws, the applicant proceeded to the feasibility phase. This EIA process forms part of the current feasibility phase as well as continuing with wind resource data collection. It was necessary to erect wind measurement masts to gather wind speed data in order to correlate these measurements with other meteorological data in order to produce a final wind model of the proposed project area. A measurement campaign of at least 12 months is necessary to ensure verifiable data is obtained. This data will advise on the economic feasibility of

the project and informed the final layout of the wind turbine positions. The masts are a typically guyed lattice towers (or other forms), designed specifically for wind resource measurements (see Plate 2-1 for example). The masts are 'marked' as per the requirements of the Civil Aviation Authority.

Plate 2-1: An example of a meteorological mast.

2.7.2 Construction phase

The Brandvalley WEF will only proceed to this phase if the project is selected as a Preferred Bidder in term of the REIPPPP (see Section 4.2.2for more information on this process).

The construction phase will last approximately 18-24 months. Approximately 250 employees would be required during this phase of which approximately 55% (136) will be available to low skilled workers (construction labourers, security staff etc.), 30% (76) to semi-skilled workers (drivers, equipment operators etc.) and 15% (38) for skilled personnel (engineers, land surveyors, project managers etc.). It is anticipated that the majority of the low and semi-skilled employment opportunities will be available to local residents in the area, specifically residents from Sutherland and Laingsburg (Barbour, 2016).

The project is outside of the normal service areas and therefore no services will be required from the local municipality. Contractors will be appointed to provide the required services for sewage and refuse removal. No effluent other than normal sewage are anticipated. A contractor will be appointed to manage it according to the management measures included in the EMPr. It is expected that portable ablution facilities will be used during the construction phase, which will be managed by the appointed contractor. Although low quantities of waste are anticipated, a contractor will be appointed to manage recycling activities and final disposal of waste that cannot be recycled. Electricty will be provided via a 11kV line servicing at least the construction camp and batching plant. Where required, and no electricity is available onsite, temporary generators will be used instead.

It is anticipated that between 30000m^3/year and 35000m^3/yearwater will be abstracted from existing boreholes during the construction phase. New ones may be drilled, depending on the availability of water from the existing sources. Seperate applications will be submitted to the Department of Water and Sanitation to obtain necessary authorisation as needed.

The construction phase will include the following activities in no particular order:

a) Preliminary civil works

Prior to the commencement of the main construction works, the Contractor would undertake vegetation clearance and site establishment works. The site establishment works would typically include the establishment of the construction camps and laydown areas and the connection of services such as power and water. A construction camp of up to 10ha would be established to accommodate site offices, contractor yards, storage areas etc. Construction of new roads up to 12m wide and/or upgrading of existing roads would be undertaken to provide sufficient access to the project area.

b) Transporation of equipment

Once the construction camp and access roads are constructed, the various turbine components, materials and equipment will be transported from the nearest or most practical South African Port, identified as the Saldanha Port, or manufacturing centres to site. The preferred freight route from Saldanha Port, via Moorreesburg (a distance of 342km), comprises of surface roads for most of the distance and gravel roads for the final road section. The route is predominantly on National and/or Provincial Roads with suitable conditions for the transportation of normal freight or abnormal loads with permits. No toll fees are required on this route, however, abnormal loads permits will be required for transport of transformers and turbine components. The largest potential load (weight) will be transformer(s) with a payload of approximately 85t and nacelle for each turbine which are up to approximately 100t. Building materials will most likely be transported from Worcester, while certain elements will be transported from various manufacturing centres in South Africa, such as Cape Town for tower sections and Johannesburg for transformers. The transport of elements from these manufacturing centres will be predominantly on National and Provincial roads, which presents no limitations for normal freight. Permits will be required for abnormal loads and will be applied for during the feasibility phase (Steyn, 2016).

c) Establishment of substation and ancillary infrastructure

The establishment of these facilities/buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. A laydown area for building materials and equipment associated with these buildings will also be required.

d) Foundation works

Once foundations are excavated, it will then be filled with steel-reinforced concrete, as indicated in the Plate 2.2 example). Foundation design will vary according to the type and quality of the soil (Figure 2.5), but for the Brandvalley WEF the foundations will be up to 25m x 4m, most of which will be below ground.

e) Turbine construction

Weather permitting; the erection of the turbines can be completed swiftly and erection rates generally average 1-2 turbines per week. See Plate 2.3 for the erection of a steel tower. In other cases, concrete towers are assembled and erected from pre-cast pieces (also known as key stones). This phase is the most complex and costly. Cranes are used to erect the various turbine components and therefore a permanent crane pad will be established next to each turbine.

Plate 2-2: Concrete pouring of a turbine foundation – note the tower base collar in the foreground.

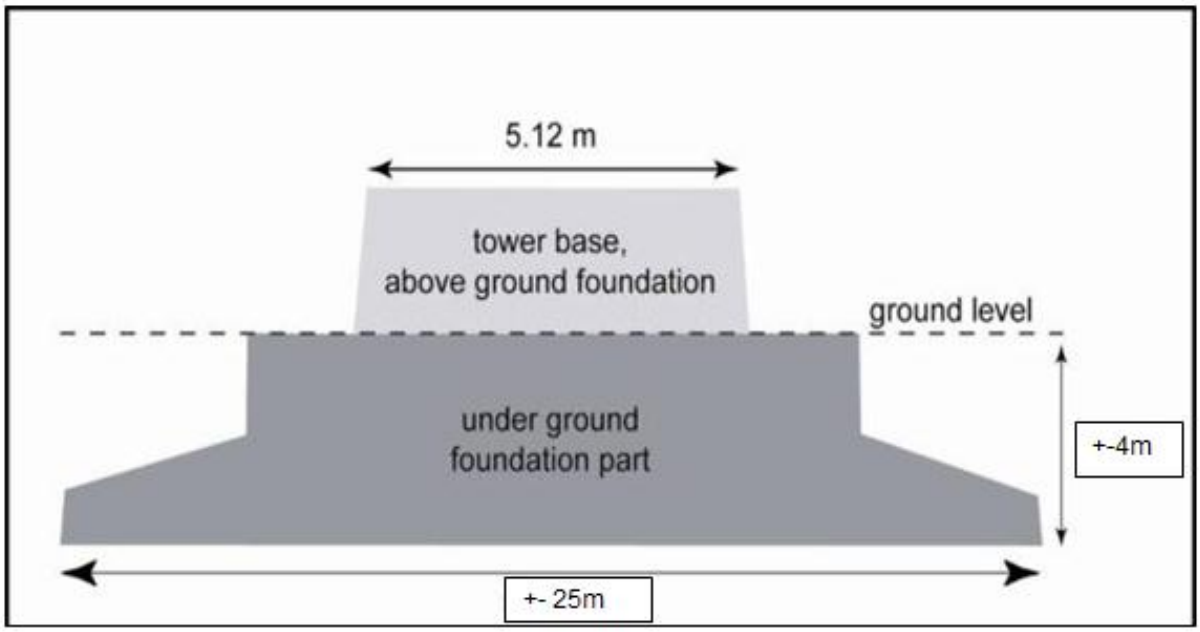


Figure 2-5: Indicative dimensions for the foundation of a 3MW/100m high wind turbine.

Plate 2-3: Assembly and erection of steel tower sections using cranes.

f) Electrical components

Each turbine is fitted with its own transformer that steps up the voltage from 690V to 33kV. The entire WEF is then connected by means of 33kV overhead powerlines or 33kV underground cabling to a 33/132kV onsite substation. Electrical and communication cables are laid in trenches which are usually run alongside the access roads as much as possible. All previous farming activities can continue unhindered on the ground above the cables during the operational phase. At the onsite substation the voltage will be stepped up to 132kV before distributing it to the national grid. The final grid connection setup is arranged and finalised by the project owner and Eskom as part of the implementation agreement after obtaining preferred bidder status in the REIPPPP. Depending on the agreement, the high voltage and grid components are likely to be ceded for ownership by Eskom prior or after being constructed. Throughout this process, there will be various verrification tests undertaken to confirm compliance with grid code and expected standard of functioningorder.

g) Site closure and site remediation

Once construction is completed and all construction equipment is removed, the site will be rehabilitated where practical and reasonable. On full commissioning of the facility, any area which is not required during the operational phase will be rehabilitated.

2.7.3 Operational phase

During the operational phase of approximately 20 years in line with a typical power purchase agreement with Eskom, on-site human activity drops to a minimum, and typically includes routine maintenance requiring only light vehicles to access the site. Only major breakdowns or refurbishment would necessitate the use of cranes and trucks.

Approximately 20 employees would be required during the operational phase. On-going environmental monitoring in line with the EMPr will be undertaken.
The limited services required will continue to be provided by contractors.

2.7.4 Decommissioning phase, refurbishment and rehabilitation

The Power Purchase Agreements (PPAs) obtained in terms of the REIPPPP are valid for a period of 20 years. Thereafter, Eskom or any other electricity offtaker could wish to continue purchasing power generated by the Brandvalley WEF. If economically feasible and appropriate permitting obtained, the disassembly and replacement of the individual components with more appropriate technology/infrastructure available at the time may take place.

Should there be no need for the power generated by Brandvalley WEF after the 20 year operational phase, the infrastructure would be decommissioned. It would include the following decommissioning activities.

a) Decommissioning plan

A decommissioning plan will be compiled in accordance with best practice to ensure the implementation of rehabilitation of disturbed areas and decommissioning activities in the closure of the project.

b) Site preparation

Activities would include confirming the integrity of the access to the site to accommodate the required equipment and the mobilisation of decommissioning equipment.

c) Disassemble all individual components

The components would be disassembled and reused and recycled or disposed of in accordance with regulatory requirements.

3. ALTERNATIVES

According to Appendix 3(3) of the EIA Regulations (GN R. 982 of 2014), *an Environmental Impact Report must contain all the information necessary for the competent authority to consider and come to a decision on the application, and must include—*

(g) a motivation for the preferred development footprint within the approved site;
(h) a full description of the process followed to reach the proposed development footprint within the approved site; including:
(i) details of the development footprint alternatives considered;
(ix) if no alternative development locations for the activity were investigated, the motivation for not considering alternative sites; and

3.1 Reasonable and feasible alternatives

Alternatives should include consideration of all possible means by which the purpose and need of the proposed activity could be accomplished. The no-go alternative must, in all cases, be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed.

The determination of whether the preferred activity, site or site location is appropriate is informed by the specific circumstances of the proposed development and its environment.

"Alternatives", in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to -
(a) the property on which or location where it is proposed to undertake the activity;
(b) the type of activity to be undertaken;
(c) the design or layout of the activity;
(d) the technology to be used in the activity;
(e) the operational aspects of the activity; and
(f) the option of not implementing the activity.

There are two types of alternatives: Fundamental Alternatives and Incremental Alternatives (these were considered for the project).

3.2 Fundamental Alternatives

Fundamental alternatives are developments that are entirely different from the proposed project and usually involve a different type of development on the proposed site, or a different location for the proposed development.

3.2.1 Location alternative supplementary information

The applicant has undertaken various extensive processes in order to determine and select the current site location namely Brandvalley wind farm (see Figure 2-2 for the project properties). The process involved integrated feasibility assessments (including spatial, environmental and technical) using a combination of internal tools and external input from third party stakeholders such as consultants, landowners and authorities. The project area selection process has been considered from the following perspectives:

- National – consideration of the potential development sites from various locations within the borders of South Africa, using predetermined criteria, including environmental, legislative and technical.
- Regional – determination of the suitability of positioning of the site within a chosen locality using evaluative spatial, technical and legal parameters.
- Local – detailed evaluation of factors that influence project feasibility and the optimal

location of the project infrastructure within the site boundaries.

A detailed overview of the site selection process is provided below.

National Alternatives

The wind resource is the main determining factor of project success due to the highly competitive nature of the REIPPPP, however environmental and social considerations are also crucial to ensure sustainable development. The applicant therefore identified fourteen areas in South Africa that could potentially have significant wind resources. These areas were subjected to an environmental and social pre-feasibility assessment that was undertaken by CES during 2009[3]. The high level assessment determined the significance of the environmental and socio-economic issues, potential fatal flaws and to rank the sites.

The pre-feasibility assessment considered the following key factors:

- Visual impact including proximity to scenic areas, sense of place, prevailing land use, areas of conservation or recreational use, topography, proximity to dense settlements and shadow flicker;
- Noise/ acoustic considerations including proximity to existing ambient noise sources and settlements;
- Impacts to avifauna (birds) and bats based on proximity to important bird areas, migratory routes and local bird and bat data;
- Terrestrial ecology (fauna and flora) assessed in terms of local species and biomes;
- Hydrology impacts in terms of the presence of wetlands and surface water features, potential alterations to watercourses and the associated permit requirements;
- Heritage impacts to local heritage features;
- Road access and power line servitudes;
- Potential safety impact considerations; and
- Proximity to airfields in terms of the restrictions imposed by Civil Aviation Authority (CAA) Regulations.

The pre-feasibility assessment determined that two sites namely Swellendam 2 and Uitvlugt are potentially fatally flawed as indicated in Table 3-1. Although the other sites had various areas of concern/ risk[4] they were not deemed fatally flawed from an environmental and social perspective.

[3] Source: CES, 2009

[4] Extreme risk: Significant mitigatory actions required to reduce these risks and in some cases it may not be possible to mitigate. Major risk: These risks are of a serious nature, and without effective mitigation measures would be major hindrances to the project proceeding. Medium risk: These risks are of a less serious nature but still important, and need to be reduced to as low as reasonably possible for the benefit of the environment or social network affected. Minor risk: These risks are generally acceptable to the project and environment, and mitigation is desirable but not essential.

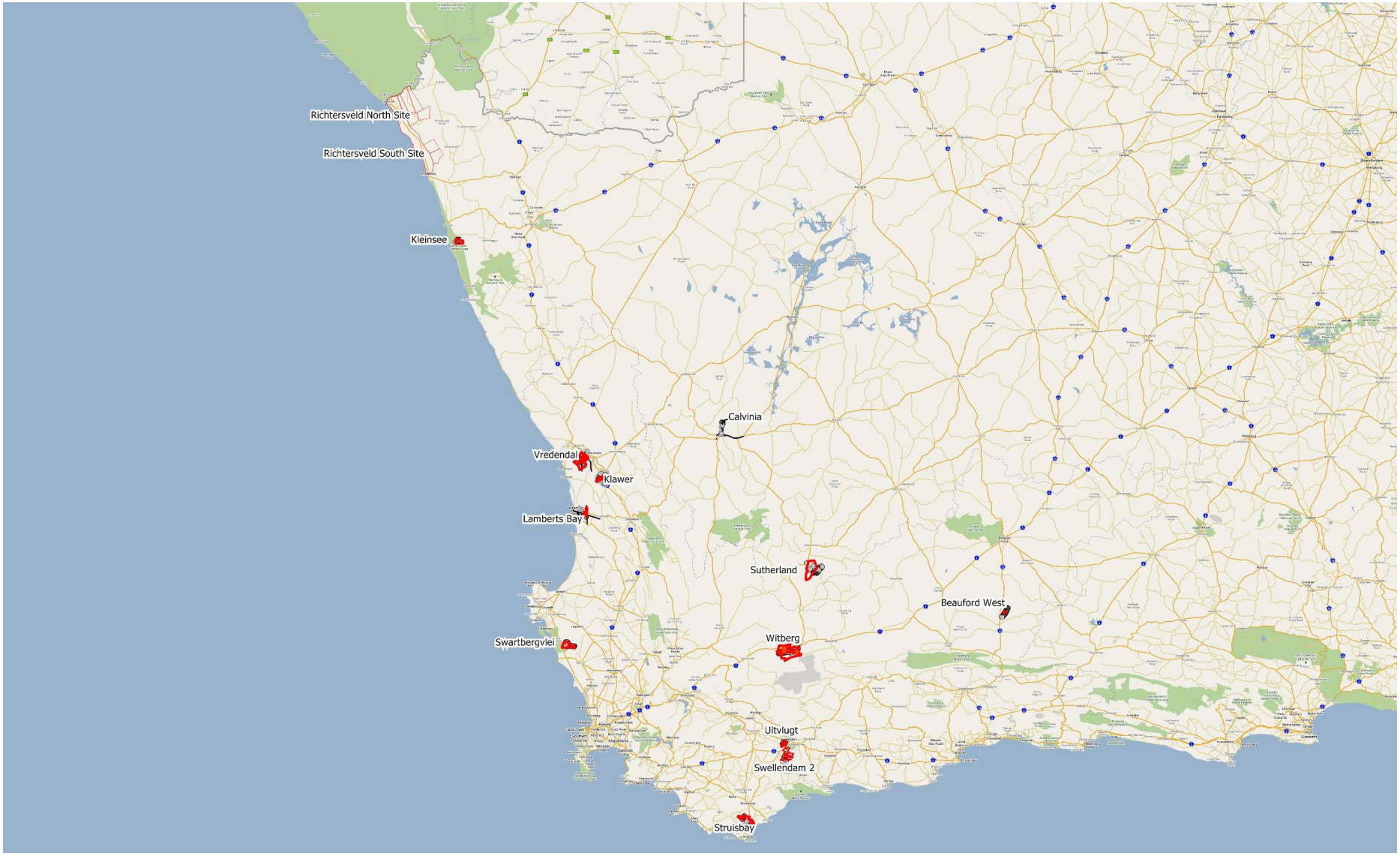


Figure 3-1: Overview map of the areas investigated in the pre-feasibility assessment and site selection process.

Table 3-1: Outcome of the environmental and social pre-feasibility assessment.

Overall Risk Categorisation											
Site	**Visual**	**Acoustic**	**Birds**	**Bats**	**Fauna**	**Flora**	**Hydrology**	**Heritage**	**Access**	**Safety**	**Fatally Flawed**
Kleinsee	Minor Risk	Minor Risk	Minor Risk	Major Risk	Minor Risk	Minor Risk	Minor Risk	Minor Risk	Minor Risk	Minor Risk	**No**
Richtersveld South	Medium Risk	Minor Risk	Medium Risk	Medium Risk	Minor Risk	Minor Risk	Minor Risk	Medium Risk	Minor Risk	Minor Risk	**No**
Richtersveld North	Medium Risk	Minor Risk	Medium Risk	Medium Risk	Minor Risk	Minor Risk	Minor Risk	Medium Risk	Minor Risk	Minor Risk	**No**
Lamberts Bay	Extreme Risk	Minor Risk	Medium Risk	Major Risk	Minor Risk	Minor Risk	Minor Risk	Minor Risk	Minor Risk	Minor Risk	**No**
Witberg	Medium Risk	Minor Risk	Major Risk	Major Risk	Minor Risk	Minor Risk	Minor Risk	Minor Risk	Medium Risk	Minor Risk	**No**
Beaufort West	Medium Risk	Minor Risk	Major Risk	Medium Risk	Minor Risk	Minor Risk	Medium Risk	Minor Risk	Minor Risk	Minor Risk	**No**
Sutherland	Minor Risk	Minor Risk	Major Risk	Major Risk	Minor Risk	Minor Risk	Minor Risk	Medium Risk	Medium Risk	Minor Risk	**No**
Vredendal	Extreme Risk	Minor Risk	Medium Risk	Major Risk	Minor Risk	Minor Risk	Minor Risk	Medium Risk	Minor Risk	Minor Risk	**No**
Calvinia	Medium Risk	Minor Risk	Minor Risk	Major Risk	Medium Risk	Medium Risk	Minor Risk	Minor Risk	Minor Risk	Minor Risk	**No**
Klawer	Extreme Risk	Minor Risk	Medium Risk	Major Risk	Minor Risk	Minor Risk	Medium Risk	Minor Risk	Minor Risk	Minor Risk	**No**
Struisbay	Major Risk	Minor Risk	Extreme Risk	Extreme Risk	Minor Risk	Minor Risk	Minor Risk	Minor Risk	Minor Risk	Major Risk	**No**
Swartbergvlei	Extreme Risk	Major Risk	Extreme Risk	Extreme Risk	Minor Risk	Medium Risk	Minor Risk	Minor Risk	Minor Risk	Major Risk	**No**
Uitvlugt	Extreme Risk	Minor Risk	Extreme Risk	Extreme Risk	Minor Risk	Medium Risk	Minor Risk	Minor Risk	Minor Risk	Minor Risk	**Potentially**
Swellendam 2	Extreme Risk	Extreme Risk	Extreme Risk	Major Risk	Minor Risk	Medium Risk	Minor Risk	Minor Risk	Minor Risk	Medium Risk	**Potentially**

The applicant proceeded to assess the remaining twelve sites to determine technical feasibility, including:

- Wind resource: Analysis of publicly available information, proprietary information and specialist on-site analysis of weather data to determine the wind resource.
- Site extent to ensure that sufficient land can be secured under long-term lease agreements to allow for a minimum number of wind turbines to make the project feasible.
- Grid access: Grid access and the distance to a viable connection point were key considerations in terms of prioritising appropriate sites. Ease of access into the Eskom electricity grid is vital to the viability of a wind facility. Projects which are in close proximity to a connection point and/or demand centre are favourable, and reduce the losses associated with power transmission.
- Land suitability: The current land use of the site properties was an important consideration for site selection in terms of limiting disruption to existing land use practices. Agricultural land was preferred as the majority of farming practices can continue in tandem to the operation of the wind farm once the construction and commissioning of the project is complete. Sites that facilitate easy construction conditions (relatively flat, limited watercourse crossings, lack of major rock outcrops) were also favoured during site selection.
- Proximity to aerodromes: The proximity to aerodromes and possible interactions with these facilities was considered as part of site selection.
- Landowner support: The selection of sites where the landowners are supportive of the development of renewable energy is essential for ensuring the success of the project.

Table 3-2: Technical considerations of the sites assessed to be environmentally feasible sites.

Overall Risk Categorisation		
Site	**Go / No-go** (not necessarily the *status quo*)	**Motivation**
Kleinsee	This project was considered a no-go.	The Kleinzee mining area where this site is located was subjected to a tender for land rights with conditions seen technically and financially unfeasible to the applicant.
Richtersveld South	This project was considered a no-go.	Unfavourable wind conditions.
Richtersveld North	The applicant proceeded with the development of this site.	All technical and environmental pre-screenings seemed to be favourable.
Lamberts Bay	The applicant proceeded with the development of this site.	All technical and environmental pre-screenings seemed to be favourable. Further wind resource evaluation showed that the site had low wind resources.
Witberg	The applicant proceeded with the development of this site.	All technical and environmental pre-screenings seemed to be favourable.
Beaufort West	This project was considered a no-go.	Unfavourable wind conditions
Sutherland	This project was considered a no-go.	Unfavourable wind conditions
Vredendal	This project was considered a no-go.	High environmental risk and less favourable wind conditions
Calvinia	This project was considered a no-go.	Limited space and grid connection options for a feasible wind farm.
Klawer	The applicant proceeded with the development of this site.	All technical and environmental pre-screenings seemed to be favourable.
Struisbay	This project was considered a no-go.	High environmental risks in terms of birds and

		bats.
Swartbergvlei	This project was considered a no-go.	High environmental risks in terms of birds and bats.

These initial pre-feasibility assessments assisted the applicant with forthcoming decisions as to which site alternatives to be prioritised for the development of wind energy facilities. Even though the Roggeveld area per se was not included in this national assessment, the Sutherland site was taken as a proxy regarding environmental risks before environmental impact assessment (EIA) processes commenced in mid-2010. The final EIA report and resulting environmental authorisation in 2014 confirmed that the area had comparatively low environmental sensitivities and that bird and bat risks were actually lower than originally thought for Sutherland.

In addition, the DEA's strategic environmental assessment (SEA) for wind and solar farms identified an area of about 160x60km, centred on Eskom's Komsberg substation, as one of only a few priority areas for wind farm development in South Africa. The SEA itself is based on a large number of environmental and technical criteria and therefore supports the applicant's findings.

Regional Alternatives

Apart from the sites described in Table 3-2, the applicant also proceeded with researching the greater Roggeveld area. An EIA process commenced in mid-2010 for a 750MW WEF. Before completing the process, DEA requested that separate EIA processes be undertaken for each 140MW WEF in accordance with the maximum generation capacity per WEF as stipulated under the Department of Energy's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). The original 750MW project was therefore divided into various phases, each with a potential to generate 140MW.

The detailed EIAs undertaken as part of the earlier 750MW project Roggeveld, lead the applicant to believe that there is an acceptable risk of environmental impacts by wind farms in this area. Based on high quality wind measurements conducted since 2010, the wind resource in this area also proved to be exceptionally high, further evidenced by the first phase's ability to bid the lowest tariff (R0.56/kWh) of all wind farm projects in round 4 of the REIPPPP in August 2014. Advanced wind modelling conducted for an area about 25km around the first phase showed that the surrounding terrain (which includes the Brandvalley site) held very similar, if not better wind potential and therefore was considered to be feasible for further wind farm development.

A number of possible 140MW phases were investigated further. Phase 2, now the Karreebosch wind farm, lies north of the Roggeveld wind farm (phase 1) and obtained environmental authorisation in January 2015. Another two phases, 3 and 4, now referred to as the Brandvalley and Rietkloof wind farms respectively, are currently undergoing their environmental impact assessment process.

As an alternative, a fifth phase located immediately southwest of the current Brandvalley project site was considered for potential project development, but was considered no-go for wind farm development for reasons described below.

Phase 5 alternative

Phase 5 consisted of the properties immediately southwest of Brandvalley, up to about 13km away where the terrain falls off into the southern tips of the comparatively flat Tankwa Karoo. According to the applicant's wind map this region exhibits even better wind resources than phase 1 (Roggeveld Wind Farm) due to the presence of many elongated mountain ridges which are ideally exposed to the prevailing wind directions. The area was also expected to have similar ecological sensitivities to Roggeveld due to the comparable biophysical environment.

However, this alternative proved infeasible due to the fact that none of the affected landowners were open to the idea of wind energy development on their properties. All further assessments and investigations therefore did not progress any further.

Local alternatives

The main project components are the wind turbines themselves which inform the layout of associated infrastructure such as roads, crane pads, substation positions or power lines. Within the Brandvalley area, detailed consideration was given to selecting areas that would be suitable for turbine placement or project infrastructure. In the selection process some alternative areas were eliminated for the following reasons:

Wind resources
An extensive wind measurement campaign has been undertaken for the greater Roggeveld area for over five years which, together with short duration wind data from 80m masts on site, was used to compute a high resolution wind map for the Brandvalley study area to inform the turbine placement within. An overview of the wind resources (red= high, yellow = average, green/blue = low) measured and modelled for Brandvalley site (red dotted line), the demarcation of the buildable areas (black polygons mainly around the ridge tops) and the 70 selected most feasible turbine positions are indicated in the in the Figure 3-2 below.

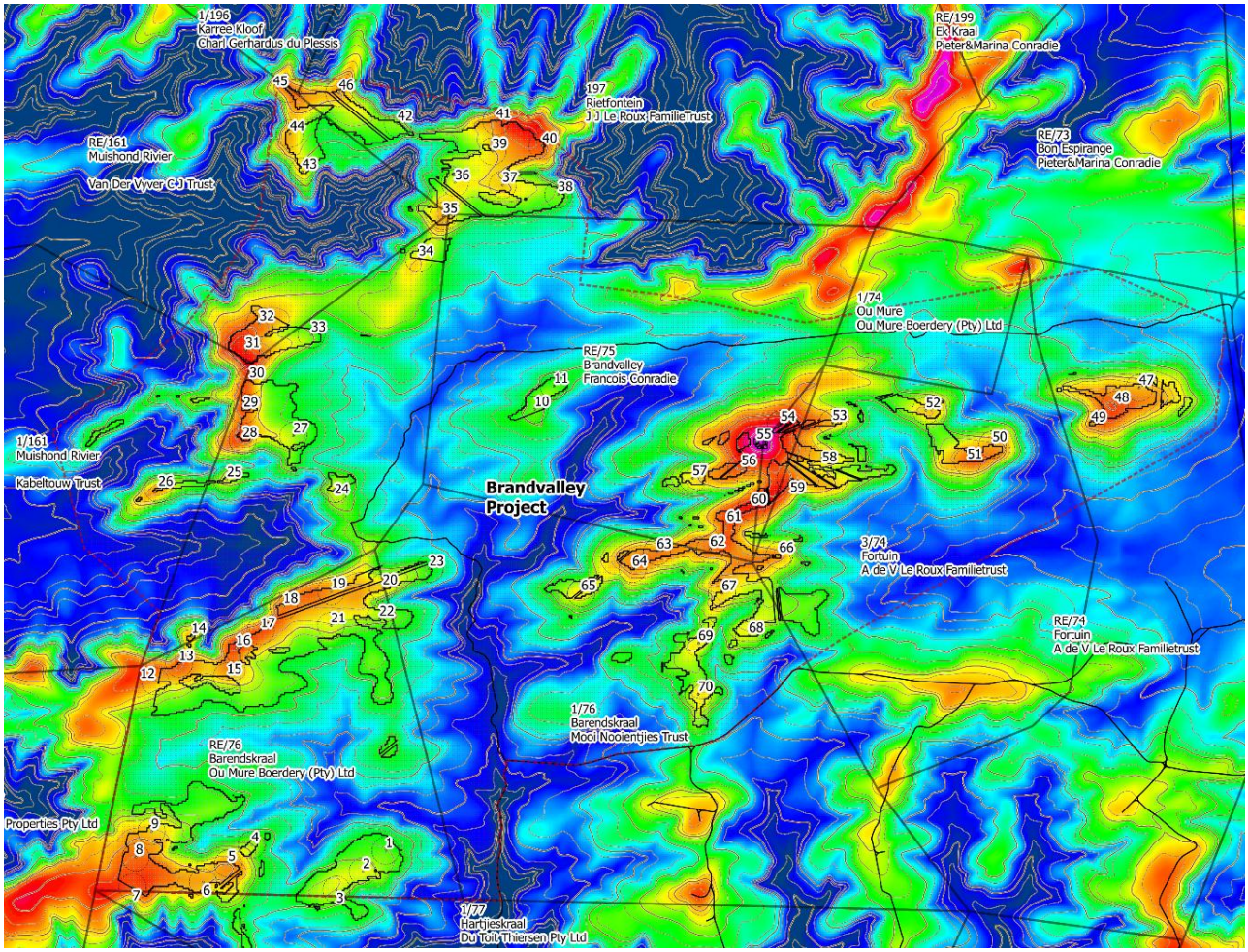


Figure 3-2: Overview of wind resources measured and modelling for the Brandvalley WEF.

In order to ensure that a project has a good chance of being constructed in the highly competitive REIPPPP market, wind turbines must be placed in the areas with the highest wind resources. Typically, ridgelines prove most suitable in this respect due to flow acceleration effects which occur in such exposed spots and no wind shading from surrounding hills. Average wind speeds in the valleys between tend to be very low for the opposite reasons.

However, within the ridge systems present on site, some of them do not show the expected high wind resources due to lower exposure (shorter and/or smaller slopes upwind) at these locations. This can also be caused by wind shading caused by neighbouring ridgelines or unfavourable predominant wind direction compared to the topographical layout of a location, although their wind potential is still higher than any position in the valleys.

As indicated in Figure 3-2, the southeast corner and the northern section, certain ridges to the have medium or high wind resources, but were disqualified as potential alternatives for turbine placement either because they were not within a "buildable area" or as a result of landowner input as explained below.

Buildable Areas
Buildable Areas are custom defined areas based on all preliminary technical and environmental parameters (before EIA and in-depth technical studies) which demarcate where turbine placement is feasible and exclude areas where not. They are based on maximum allowable slopes, setbacks from farmsteads, setbacks from neighbouring farms required by provincial land use regulations and finally required buffers from Eskom power lines. In addition, the process of identifying buildable areas takes into account certain no-go zones to avoid potential electromagnetic interference on existing telecommunication infrastructure.

The buildable areas for the Brandvalley Wind Farm exclude high slopes of more than 8 degrees for civil and electrical engineering design and environmental reasons (due to sensitive vegetation on slopes), erosion control and slope stability. Setbacks of 3 times tip height from existing Eskom transmission lines (400kV and 765kV) were applied. All direct point to point links of telecommunication providers available at the time of the application were buffered adequately to avoid potential risk of interference. These included the providers Eskom, Telkom, Sentech, Transnet, Cell C, MTN, Vodacom and Breede Net who have facilities in the area. The providers are part of the I&AP list and are therefore not only informed of the development, but also have the chance to comment in case there are any issues.

In terms of the applicable Zoning Scheme regulations in the Western Cape, renewable energy projects may be granted a Consent Use on an Agriculture Zone when an application has been submitted to the relevant municipality. One of the key parameters for wind turbine placement is that the structure must be positioned at a distance of 1.5 times tip height (from foundation to tip of the blade) from the various features specified in LUPA. This parameter was applied to positioning all the turbines from the outer boundaries of the project properties.

Landowner input
The applicant and the landowners entered into negotiation for a long-term lease agreement for the land to be used for project development. During these discussions, the landowners had the opportunity to state preference for certain areas of their properties to be excluded from the development. The applicant also consulted with the landowners during the conceptualisation phase to discuss the site development plans. The landowners, in turn, expressed a preference for certain infrastructure to be placed at different locations within their properties. This meant that some areas of potential development would be excluded due to landowner preferences. In case of this Brandvalley project, alternative positions for siting of infrastructure had to be considered in light of landowner input.

3.2.2 Access road alternatives

Two access road alternatives were identified during the preliminary design of the wind farm namely:

- Access road alternative 1 is proposed to start from the R354 and follow the existing gravel road to a western direction. Various side roads branch from this main access road in all directions order to connect the various ridges where turbines are proposed to the main access road.

- Access road alternative 2 is south of alternative 1 and is also proposed to start from the R354 and follow an existing farm access road in a western direction. From this alternative main access road various roads will branch to north, west and east directions.

Please note that the main access road sections i.e. the point of access from the R354 and a short road section are the main difference between the two alternatives as the turbine roads branching to connect the ridges will be assessed in both access road alternatives. Please see Figure 3-3 for the layout of access road alternative 1 and access road alternative 2.

Each road section will be buffered by 200m in order to allow for incremental alternatives i.e. reroute within the buffer in order to avoid any sensitive features that could be identified during the detailed specialist assessments.

Please see Chapter 9 for the impact assessment of the three alternatives and Chapter 10 for the preferred alternative.

3.2.3 Construction camps

Potential areas for the establishment of a construction camp were identified through considering large areas with a slope less than 2 degrees and a site extent of up to 10ha. Areas steeper than that, might require blasting or levelling to establish a suitable area and areas smaller than that might be too small. Input from landowners were obtained to further guide the identification of suitable construction camp locations.

Three construction camp alternatives layouts were assessed during the EIA phase namely:

- Construction camp alternative 1 located adjacent and to the south of the point where access road alternative 1 connects to the R354.
- Construction camp alternative 2 is located adjacent to a proposed secondary access road immediate north of the centre of the facility.
- Construction camp alternative 3 is located immediate west of the centre of the facility adjacent to a secondary access road.

Please see Chapter 9 for the impact assessment of the three alternatives and Chapter 10 for the preferred alternative.

3.2.4 Substation location alternatives

Four identified onsite 33/132kV substation positions were based on a technical study to limit overall line length of internal park cabling and losses based on different turbine layouts (40-70 turbines depending on generator size), economic and environmental optimisation with cutting down number of electrical strings and cable trenches, slope analysis of suitable positions for earthworks and levelling and optimised 132kV line routing. Four substation location alternatives were identified during preliminary designs for assessment during the EIA phase:

- Substation alternative 1 is proposed adjacent and to the south of the main access road alternative 1 approximately 2.7km from the R354.
- Substation alternative 2 is proposed adjacent and to the south of a secondary road extending from the main access road alternative 1.
- Substation alternative 3 is proposed adjacent to a secondary road north-east from the centre of the facility.
- Substation alternative 4 is proposed adjacent to a secondary road in close proximity to construction camp alternative 3.

Please see Figure 3-3 for the proposed substation locations. Please see Chapter 9 for the impact assessment of the three alternatives and Chapter 10 for the preferred alternative.

3.2.5 Technology Alternatives

Various technology alternatives to wind energy were deemed inappropriate for the site based on the following in addition to the motivation provided in Chapter 4:

- solar energy developments require areas with high solar radiation and large, flat terrain. However, the site is very hilly with prominent ridgelines with slopes that are unsuitable for large photovoltaic or solar concentrator arrays. In addition, areas much further north in the Northern Cape have much higher solar irradiation values than the Karoo as the latter suffers from frequent winter and summer cloud cover;
- the site is very dry with slow growing, sparse vegetation unsuitable for a biomass or biogas project;
- there is no coal deposits in the region suitable for a coal fired power station;
- there is not enough water available for the cooling requirements of a nuclear power station; and
- the exact quantity, location and economic recoverability of shale gas resources are still very uncertain in the Karoo, apart from the risks of contaminating underground aquifers through hydraulic fracturing activities. A gas fired power plant is therefore also not feasible in this area.

Therefore, no technology alternatives are feasible for assessment at this stage of the project other than a wind energy facility.

Please also see Chapter 4 for the project need and desirability supporting the technology alternative.

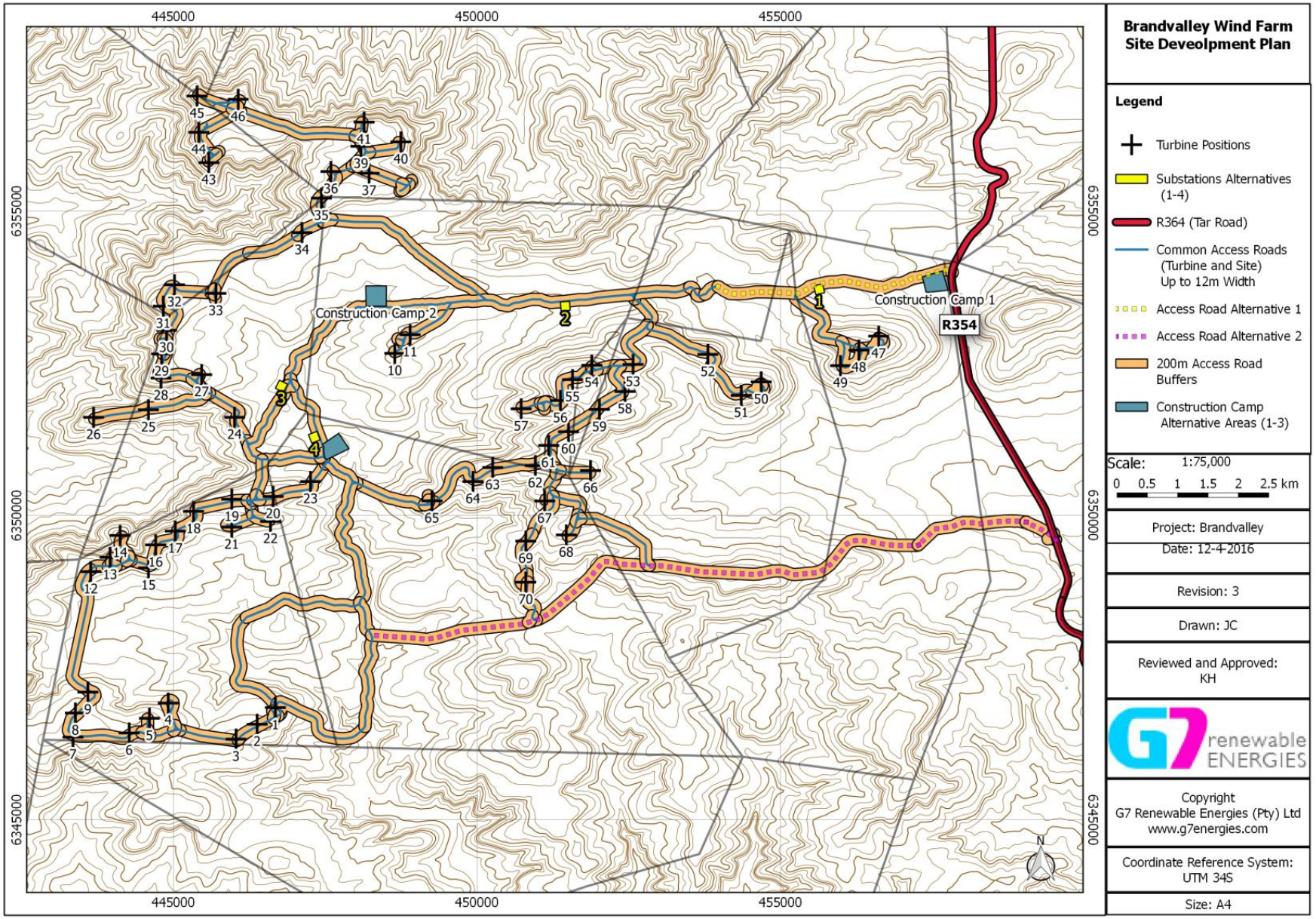


Figure 3-3: Conceptual Layout inclusive of construction camp, access road, substation alternative and turbine positions.

3.3 Incremental Alternatives

Incremental alternatives are modifications or variations to the design of a project that provide different options to reduce or minimise environmental impacts. Turbine layout is considered to be an incremental alternative.

3.3.1 Turbine Layout Alternatives

The detailed specialist assessments, completed bird and bat monitoring campaigns and comments from interested and affected parties identified no-go development zones, recommended to be excluded from the Brandvalley layout site areas. Therefore, incremental alternatives were considered in the EIA Phase as described in Chapter 9 and 10.

3.4 No-Go Development

It is mandatory to consider the “no-go” option in the EIA process. The no development alternative option assumes the siteremains in its current state, i.e. there is no construction of a WEF and associated infrastructure in the proposed project area. The status quo is described in Section 0. The no-go alternative was assessed by all specialists as described in Chapter 9.

3.5 Summary of Alternatives

The following alternatives were assessed in the EIA Phase:

1. Fundamental alternatives:
   - 1.1 Project area location alternative: One project location alternative namely Brandvalley Wind Farm.
   - 1.2 Access road location alternatives: two access road alternatives namely access road alternative 1 and access road alternative 2.
   - 1.3 Three construction camp alternatives.
   - 1.4 Four onsite substation location alternatives.
   - 1.5 Technology alternative: One technology alternative namely a WEF.
2. Incremental alternatives:
   - 2.1 Turbine layout alternatives.
   - 2.2 200m buffer on access roads for sensitivity alternatives (assessed with the access road alternatives).
3. No-go alternative.

4. PROJECT NEED & DESIRABILITY

According to Appendix 3(3) of the EIA Regulations (GN R. 982 of 2014), *an Environmental Impact Report must contain all the information necessary for the competent authority to consider and come to a decision on the application, and must include—*

(f) a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location.

4.1 Introduction

Increasing pressure is being placed on countries internationally to reduce their reliance on fossil fuels, such as oil and coal, which contribute towards greenhouse gases being emitted into the atmosphere and thus to climate change. Most of South Africa's energy comes from non-renewable sources like coal, petroleum, natural gas, propane, and uranium. Currently, fossil fuels supply 90% of South Africa's energy needs with demands on energy supply increasing by 3.5% in the next 20 years. By the end of June 2015, 37 independent power producers commenced with commercial operation, adding 1,860MW capacity to the power system with equates to 4% of the total installed capacity in South Africa (Department of Energy, 2015). The South African Government recognises the need to diversify the mix of energy generation technologies within the country and to reduce the country's reliance on fossil fuels which contribute towards climate change. Therefore, the purpose is to move towards an energy mix that gradually shift away from generation technologies that are not environmentally friendly. To address the need for generation capacity from renewable energy technologies, the various planning and policy documents were developed in line with international conventions as described below.

International conventions, national plans and programmes as well as the relevant Integrated Development Plans (IDP), Spatial Development Frameworks (SDF), Environmental Management Frameworks (EMF) and Strategic Environmental Assessments (SEA) were taken into account in assessing the development in a spatial context.

4.2 Need

4.2.1 International

In accordance with the prescriptions of the **United Nations Convention on Climate Change, 1994 (UNFCCC)** and its associated **Kyoto protocol of 1997** South Africa has put in place a long term mitigation scenario (LTMS) by which the country aims to develop a plan of action which is economically viable and internationally aligned to the world effort on climate change. During this period (2003-2050) South Africa will aim to take action to mitigate greenhouse gas emissions by 30% - 40% by the year 2050. This is a reduction of between 9000 and 17 500 tons of CO_2 by 2050. Consequently, the South African Government has set a target of 17GW renewable energy contribution to new power generation capacity by 2030 (IRP, 2011). This is to be produced from wind, solar, biomass, landfill gas and small-scale hydro facilities.

4.2.2 National

The **National Development Plan (NDP)** is aimed at reducing and eliminating poverty in South Africa by 2030. It promotes sustainable and inclusive development in South Africa, in favour of a decent standard of living for all. The proposed WEF fulfils 3 of the 12 key focus areas namely contributing to an economy that will create more jobs; improving infrastructure and transition to a low carbon economy. The NDP outlines the need for South Africa to increase production of electricity by 40,000 MW by 2030, 20,000 MW of this capacity has been proposed for production from renewable sources. The proposed project aims to be a contributor towards such target.

The proposed WEF, is in line with the **Integrated Energy Plan for the Republic of South Africa (2003)** commissioned by then Department of Minerals and Energy (now the Department of Energy)

in response to the requirements of the National Energy Policy. The framework is intended to create a balance between energy demand and resource availability so as to provide low cost electricity for social and economic development, while taking into account health, safety and environmental parameters. This WEF would contribute to diversification of energy supply and the promotion of universal access to clean energy.

The **Integrated Resource Plan (IRP2010)** for South Africa illustrates a clear need for renewable energy projection. The IRP was initiated by the Department of Energy (DoE) and lays the foundation for the country's energy combination up until 2030, and seeks to find an appropriate balance between the expectations of different stakeholders considering a number of key constraints and risks, including the reduction of carbon emissions; security of supply; Southern African regional development and integration and localisation and job creation. The Policy-Adjusted IRP includes recent development prices and issues allocations of 17.8GW for renewable energies, of the total 42.6GW new-build up to 2030 distributed to wind (8.4GW), concentrated solar power (1.0GW) and photovoltaic (8.4GW).

Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) aims to promote and procure electricity generated by the private-sector from renewable energy sources. The limited supply of power in South Africa has given rise to Independent Power Producer Procurement Programme (IPPP), a platform established by the Department of Energy (DoE), together with the National Treasury (NT) and the Development Bank of Southern Africa (DBSA) aimed to generate electrical power from the private-sector for renewable and non-renewable energy sources. The programme focuses on power generation from onshore wind, concentrated solar thermal, solar photovoltaic, biomass solid, biogas, landfill gas, small hydro-electric schemes and cogeneration (IPP Procurement Programme, 2012).

Should this project receive an environmental authorisation, Brandvalley Wind Farm intends to bid this wind farm under the REIPPP programme in order to supply the electricity generated to Eskom. The REIPPPP, implemented since 2011 by the DoE, is a national programme driving the procurement of renewable generation capacity from independent, private developers to secure energy for power generation. South Africa has significant potential for renewable energy projects and thus the DoE has placed a target of 10 000 Gigawatt hours (GWh) of renewable energy power generation for the country by 2016. It was determined that 3 725 Megawatts (MW) of power generation would be required from renewable energies to provide the country with uninterrupted power supply, which is in accordance with the capacity allocated to Renewable Energy generation in Integrated Resource Plan (IRP) for electricity in 2010-2030 (IPP Procurement Programme, 2012). It was initially aimed to procure 3 725MW renewable energy by 2016, however in 2012 it was announced that an additional 3 200MW of renewable energy will be procured (Creamer, 2012). In August 2015, this allocation further increased to a renewable energy generation capacity of 6 300 MW gazetted in a Ministerial determination (DoE, 2015).

The REIPPPP comprises of a competitive bidding system initiated by a Request for Proposal (RFP) issued by the DoE for solar photovoltaic (PV), concentrated solar thermal, onshore wind, biomass solid, biogas, landfill gas, small hydro and other smaller scale renewable technologies (DoE, 2011). The Bidders are required to place bids on economic development targets and electricity tariffs, on which maximum limits are imposed for each qualifying technology. If the Bidder/ Project Company is selected as a Preferred Bidder, the tariff will be payable by the Buyer in accordance with the Power Purchase Agreement (PPA) entered into between the Buyer (that purchases the electricity) and the Bidder/ Project Company (that generates electricity). It is essential that the renewable energy facility procured in terms of the REIPPPP reach commercial operation by the dates set out in the RFP, referred to as the Commercial Operation Date (COD). To date, there have been four (4) volumes or bidding windows under the REIPPPP. In April 2015, the DoE announced additional preferred bidders for the REIPPPP Bid Window 4 feeding 1 121MW to the national grid and contributing to a total of 5 243MW procured since the implementation of the programme to date (DoE, 2015). As demonstrated above there is a need for renewable energy in South Africa and the proposed Brandvalley Wind Farm aims, in part, to fulfil this need. If this

project is deemed feasible, Brandvalley Wind Farm intends to bid this wind farm under the REIPPP programme in order to supply the electricity generated to Eskom.

4.2.3 Local

Integrated Development Plans (IDPs)

IDPs for the Cape Winelands, the Namakwa and Central Karoo District Municipalities (2012 – 2016) are in accordance with the objectives of the National Development Plan (NDP), which encourage the generation of electricity through renewable energy and to reduce carbon-intensive electricity production. The proposed Brandvalley WEF is thus in line with the objectives of the IDPs for the municipalities in which it falls, as described in Table 4-1 below.

Table 4-1: District and Local Municipality Integrated Development Plans (IDPs) and relevance of the proposed project

Local Planning Guide	Relevance
Cape Winelands District Municipality (CWDM) IDP (2012/13-2016/17)	*The overarching vision and mission statement of the CWDM IDP promotes both sustainable development and job creation. The key stakeholder priorities highlighted in the strategic objectives includes the promotion of renewable energy projects. The IDP furthermore calls for an increase in employment opportunities through the green economy, and more specifically, through green energy initiatives.*
Central Karoo District Municipality (CKDM) IDP (2012-2017)	*The CKDM IDP promotes sustainability through the integration of social, economic and ecological components. The planning document highlights the increasingly importance of sustainable energy, emphasising the national vision to focus on renewable energy as a movement towards less carbon-intensive electricity production. The CKDM IDP and SDF make provision for wind farms within the Central Karoo as an alternative energy source.*
Namawka District Municipality (NDM) IDP (2012-2016)	*The NDM commits to sustainable development and the transition to a low-carbon economy through the expansion of renewable energy. The IDP calls for the development and implementation of a Renewable Energy Strategy to achieve their infrastructure objectives.* *Although such a strategy is not in place, the establishment of a 140MW WEF are in line with the commitment to move towards a low-carbon economy by increasing renewable energy generation capacity.*
Witzenberg Local Municipality IDP (2012/2017)	*The Witzenberg LM IDP promotes renewable energy and the management and use of natural resources as an opportunity to stimulate growth and achieve sustainable development. The environmental policy of the LM calls for environmental projects that ensure environmental sustainability and contribute to job creation.* *The Brandvalley WEF aims to be environmentally sustainable and to contribute to local job opportunities.*
Laingsburg Local Municipality (LLM) IDP (2012/2017)	*The key strategies proposed by the LLM IDP within the Strategic Infrastructure and the Environmental and Spatial Development approaches include the support and promotion of wind, solar and bio-gas developments as a source of alternative energy.*
Karoo Hoogland Local Municipality IDP (2015-2016)	*The mission statement of the Karoo Hoogland LM IDP is to provide leadership on environmental sustainability and climate change response. The Environmental and Spatial Analysis includes the promotion and diversification of renewable energy projects in accordance with the Integrated Resource Plan (IRP) for Electricity 2010-2030 in addition to the creation of job opportunities through the Green Economy.*

4.3 Desirability

4.3.1 Renewable energies

The conventional sources of energy generation, such as coal, oil and fuel, produce greenhouse gas (GHS) emissions associated with climate change. Globally, oil is the highest source of energy, followed by coal, which is the first source for power generation. South Africa is highly dependent on coal-fired power plants for electricity generation and supply. In response to the large percentage of household, industrial and commercial usage of fossil fuels, the NDP described in section 4.2 above highlight the need to reduce reliance on carbon-intensive energy provisions and transition to a low carbon intensive economy. Renewable energy sources play an important role in this transition through the diversification of energy source, the provision of energy services in a sustainable manner, thus contributing to sustainable development, and the mitigation of climate change (DoE, 2015).

Wind is a renewable resource as it is abundant and inexhaustible. Wind energy generates electricity without the production of toxic pollution or carbon dioxide emissions and thus contributes to the transition to a low carbon-intensive economy.

There are, however, environmental impacts associated with the construction and operation of the wind energy facility. These impacts are assessed in Chapter 9 of this report and informed by various specialists.

4.3.2 Sustainable development

Sustainable energy is defined as "*energy which provides affordable, accessible and reliable energy services that meet economic, social and environmental needs within overall developmental context of society, while recognising equitable distribution in meeting those needs"* (DEA, 2015). Sustainable energy is an element of sustainable development, defined as development that meets the needs of the people today without compromising the ability of future generations to meet their needs, which incorporates economic development, social development and environmental development.

Renewable energy developments are considered to contribute towards sustainable development, increasing access to electricity for both the current generation and for future generations, while additionally providing energy sources to commercial and industrial sectors to promote their economic competitiveness and future prosperity. Wind energy is a naturally generated and stable source of energy, contributing to the energy security and sustainable development and is thus in accordance with the country's development goals.

4.3.3 Project location

The vast plains, the mountainous topography, the grid proximity and expected capacity as well as the predicted and confirmed wind resources contribute to the suitability of the Karoo, and the proposed location, for the development of WEFs for the generation of power to meet the renewable energy requirements for South Africa.

The Strategic Environmental Assessment (SEA) for wind and solar PV energy in South Africa (CSIR, 2013) supports of the Strategic Integration Project (SIP) 8 which focuses on the implementation of sustainable green energy initiatives. The SEA integrates environmental, economic and social factors to identify eight (8) Renewable Development Zones (REDZs). The identified REDZs included areas where large scale wind energy facilities can be developed in in a manner that limits significant negative impacts on the environment while yielding the highest possible socio-economic benefits to the country. The SEA process and the determination of the REDZs provided an opportunity for government authorities, the private sector and the public to provide input and agree on appropriate development areas.

The SEA additionally identified priority areas for investment opportunities into the electricity grid, providing a solution to the current limitations of existing grid infrastructure and the challenges faces in expanding the grid.

The proposed Brandvalley WEF falls within the Komsberg Wind REDZ (Figure 4-1 and 4-2). The REDZs are considered areas of the highest development potential on land that is technically suitable for wind and solar developments. Proposed projects that fall within these areas are thus incentivised and streamlined.

Cabinet approved the gazetting of REDZs on 17 February 2016[5].

[5] South African Government, 2016. http://www.gov.za/speeches/statement-cabinet-meeting-17-february-2016-18-feb-2016-0000.

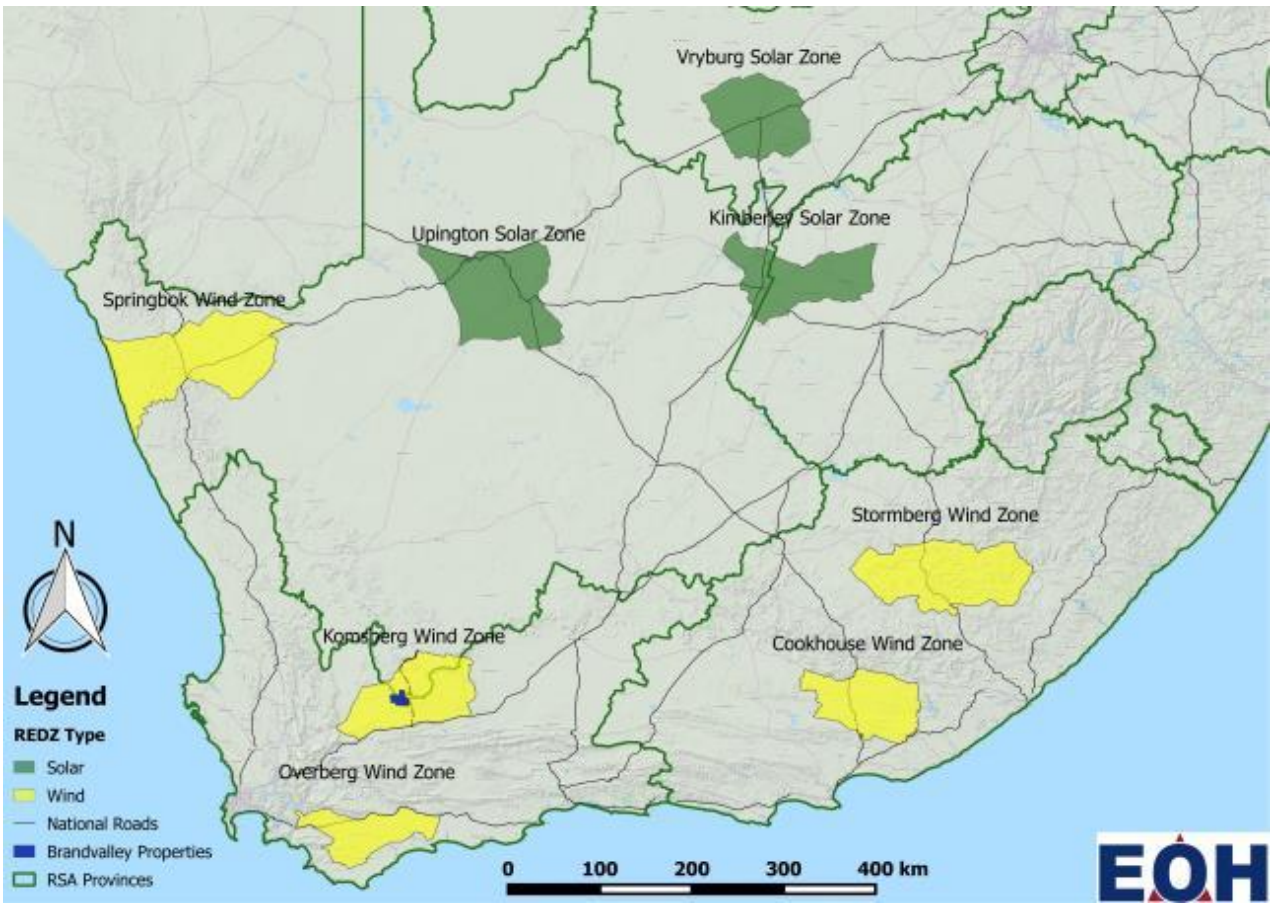


Figure 4-1: The proposed Brandvalley WEF project site in relation to the REDZs.

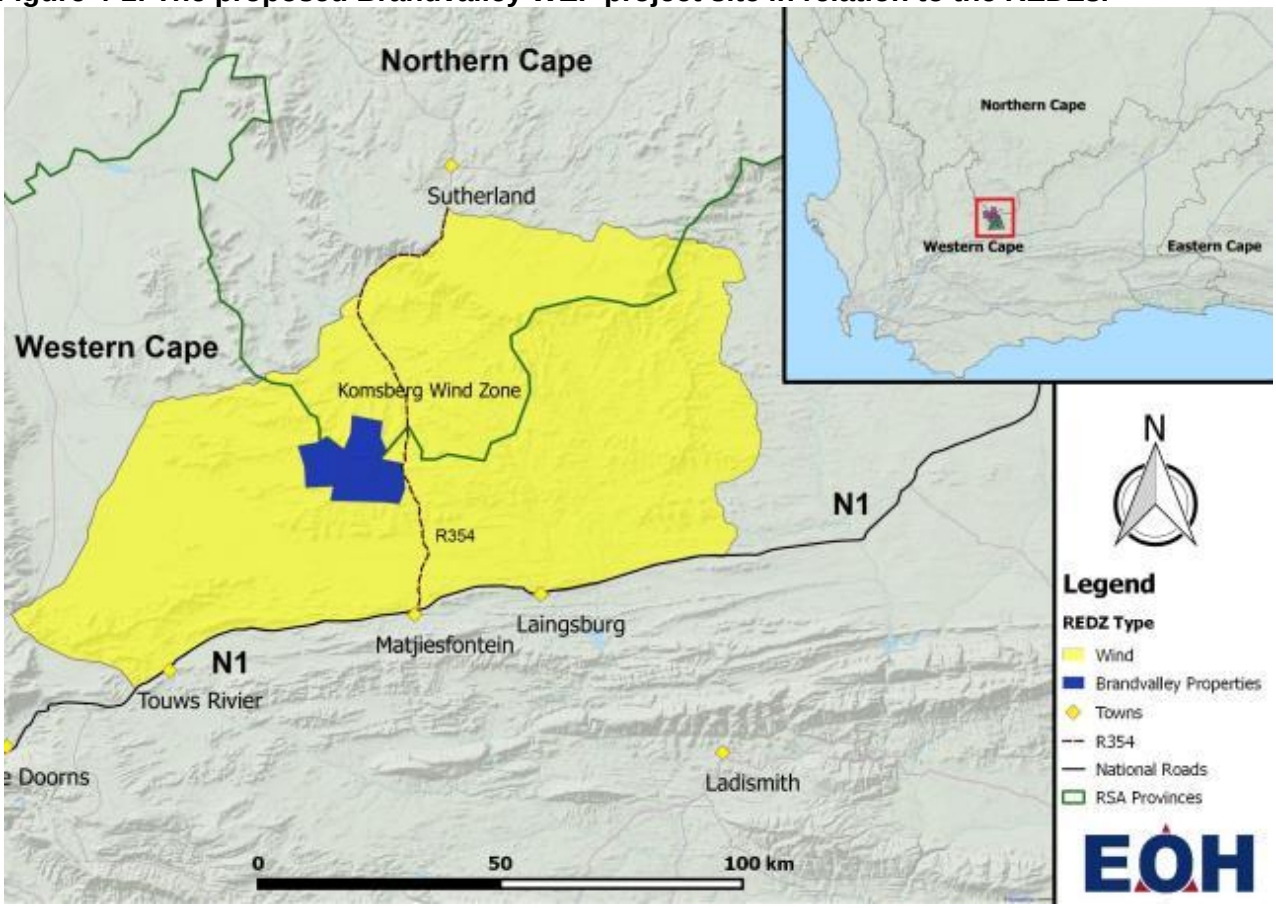


Figure 4-2: The proposed Brandvalley WEF project site in relation to the REDZs (zoomed in).

4.3.4 Proximity to other wind energy projects and electrical infrastructure

There are other wind energy developments and electrical infrastructure proposed and existing in close proximity to the Brandvalley WEF. These facilities are in various stages of development ranging from application phase to authorisation (environmental authorisation and preferred bidder). Although each location has its own wind patterns, the close proximity of wind farms in an area does have environmentally preferred advantages such as limiting certain impacts to that location as opposed to impacting a number of areas. It also confirms the region/locality as a high wind resource and a suitable area for renewable energy development. The following renewable energy projects are located within a 30km buffer around Brandvalley WEF:

- Konstabel Solar Project;
- Roggeveld Wind Project;
- Karreebosch Wind Project;
- Komsberg East and Komsberg West Wind Projects;
- Perdekraal Wind Project;
- Witberg Wind Project;
- Sutherland Wind and Solar Project;
- Hidden Valley Wind Project;
- PV Solar Project, south of Sutherland;
- Suurplaat Wind Project;
- Gunstfontein Wind Project;
- Komsberg Substation; and
- Rietkloof Wind Project.

Furthermore, there are Eskom high voltage transmission lines (one 786kV and two 400kV power lines) running immediate south of the project area, running between the Komsberg station and the Kappa substation.

The recently built 765kV line runs from the Gamma substation near Victoria West past the Kappa substation near Touwsriver (southwest of the project site) to connect to the Omega substation near Koeberg. This is part of Eskom's grid strengthening project for power transmission and distribution in South Africa.

The Komsberg capacitor station located northeast of the project site has two 400 kV lines running through its capacitor banks from the Droerivier substation to the Bacchus and Muldersvlei substations, respectively, via the Kappa substation.

The approved renewable energy projects located in the vicinity are intended to be connected to the Komsberg or Kappa substations. The Komsberg substation will be upgraded to connect more projects to the grid.

Projects located within the 30km buffer radius at the time of when specialist undertook their site assessments were considered in the cumulative impact assessment. Please refer to Chapter 9 for the assessment of cumulative impacts.

4.3.5 Wind resource

The Karoo, and more specifically the proposed location, is identified as a feasible area for wind energy in terms of the Wind Atlas for South Africa (WASA) for the Western Cape and parts of the Northern, Western and Eastern Cape Provinces. WASA is a tool for identifying areas suitable for large-scale wind power generation and to provide more accurate wind resource data to identify potential off-grid wind generation location opportunities, using high climatological (30-year) annual mean wind speed (m/s) 100m above ground level. Figure 4.3 below indicates the proposed location in relation to the WASA.

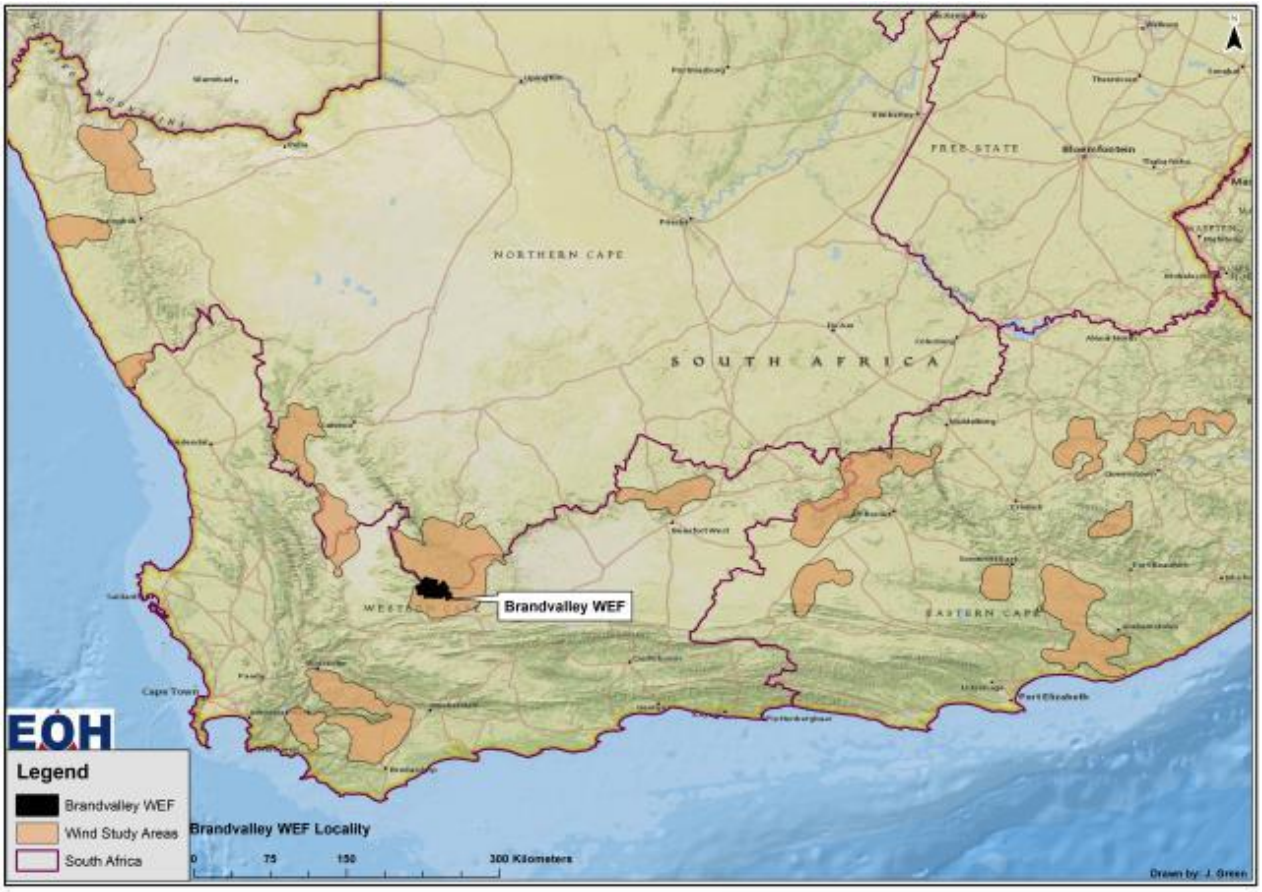


Figure 4-3: The Proposed Brandvalley WEF located within an area of high wind energy resources as identified by WASA.

Brandvalley WEF is located in an area where three wind projects were selected as preferred bidders under the Round 4 REIPPPP. This is a good indication that the area has high wind resources and the projects are competitive for succeeding in the REIPPPP.

Brandvalley Wind Farm, the applicant, has monitored the wind resource in the greater area for the past five years and has confirmed the high wind resources with certainty. The direct project area is currently being monitored by six wind monitoring masts to confirm the onsite wind resource which has informed the preliminary layout of the facility.

4.3.6 Grid capacity and access

Grid access is deemed favourable for this site due to the close proximity of the existing Eskom Capacitor station, which is planned to accommodate a 400kV Substation. The current Komsberg substation area is currently proposed to be expanded as a hub for connecting future developments in the area. The distance from a substation directly affects construction costs and losses associated with power transmission over a distance. The existing Eskom Komsberg Substation has sufficient grid capacity for the proposed project to connect.

Similar to the Renewable Energy SEA, Eskom's Electricity Grid Infrastructure Strategic Environmental Assessment (Grid SEA) is also underway. The SEA is in accordance with the government's commitment to implement the NDP and improve on infrastructure. More specifically, the Grid SEA is in support of SIP 10, which aims to achieve "Electricity and distribution for all". The area in which the Brandvalley Wind Farm is proposed is currently within the corridor planned to be strengthened by Eskom as part of the Grid SEA. The Grid SEA aims to provide widespread distribution of electricity throughout South Africa and to initialise economic development within areas limited to electricity access to meet the countries economic and social development needs.

4.3.7 Land suitability

The current land use is Agricultural which is desirable as the majority of farming practices can continue simultaneously to construction and operation of the wind farm. The landowners are supportive of the development and do not view the development as conflicting with their current land use practices.

4.3.8 Turbine import and transportation

The project area is in close proximity to the N1 national road. The R354 is the main arterial road providing access to the project area, where there are a number of existing local, untarred roads providing access within the project area. The close proximity to existing roads is desirable as this will facilitate transport of construction materials and turbines. Existing roads will be upgraded and used as far as possible in order to develop fewer new roads.

4.3.9 Social

As described in Section 7.1.16, the area is characterised by high unemployment rates and low levels of education. The proposed WEF has a potential to create much needed employment opportunities for unskilled locals during the construction phase. Training opportunities will also be afforded to qualified local people who can be up-skilled to undertake certain roles during the construction and operational phases.

In terms of the needs on the local community, the IDPs identified the need for development, social services, education and employment opportunities in this area. The Brandvalley WEF has a potential to make positive contribution towards the identified community needs. In terms of the economic development requirements of the REIPPPP, the project will commit to benefits for the local community, including job creation, localisation and community ownership.

A percentage of the revenue per annum from the operational wind energy facility will be made available to the community through a social beneficiation scheme, in accordance with the DoE bidding requirements of the REIPPPP. Therefore, the potential for creation of employment and business opportunities, and the opportunity for skills development for the local community is significant. Secondary social benefits can be expected in terms of additional spend in the nearby towns due to the increased demand for goods and services.

4.4 Summary on need and desirability

The need and desirability of the Brandvalley WEF can be summarised as follows:

- The project site has high wind resources as confirmed by onsite wind monitoring campaigns. The economic viability of a WEF and success in the REIPPPP directly depend on the strength of the wind resource, amongst other key factors.
- Proximity to grid connectivity via the Komsberg Substation.
- The national need for establishment of additional generation capacity through renewable energy resources.
- The local need for community upliftment through additional employment opportunities to be potentially created within the project area and economic development contributions to be committed in terms of the REIPPPP.
- Site extent and the option for the current land use namely agriculture to be retained.
- Landowner support for wind farm development.
- Being located within one of the areas earmarked for renewable energy development through the SEA Development
- Ease of grid connection as supported by being within an area identified in the Electricity Grid Infrastructure SEA.
- The proximity to the N1 and secondary roads for access during the construction and operation phases for the transportation of material and components.

5. RELEVANT LEGISLATION

According to Appendix 3(3) of the EIA Regulations (GN R. 982 of 2014), *an Environmental Impact Report must contain all the information necessary for the competent authority to consider and come to a decision on the application, and must include—*

e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to legislation and policy context;

The development of the proposed Brandvalley WEF will be subject to various South African legislative requirements. In addition to the environmental authorisation, there are other permits, contracts and licenses that will need to be obtained by the applicant for the proposed project, some of which fall outside the scope of the EIA.

5.1 Relevant National Legislation

The relevant national legislation, policies and conventions to which South Africa is a signatory to are described in Table 5-1 below.

Table 5-1: Relevant Legislation.

LEGISLATION	RELEVANCE TO THE PROPOSED PROJECT	PERMIT / LICENCE / COMMENT REQUIRED	COMMENT
ENVIRONMENTAL			
The Constitution of South Africa (Act 108 of 1996)	The WEF applicant has an obligation to ensure that the proposed activity is ecologically sustainable, will not result in pollution and ecological degradation while demonstrating economic and social development and upholding environmental rights.	N/A	-
National Environmental Management Act (Act 107 of 1998) (NEMA)	This EIA was undertaken in terms of NEMA requirements. The WEF applicant must be mindful of the principles, broad liability and implications associated with NEMA and must eliminate or mitigate any potential impacts.	X	-
Environmental Impact Assessment (EIA) Regulations, 2014	The proposed development triggers the three lists of activities, published on 4 December 2014, as Listing Notices GN R.983, R.984, and R.985. These Listing Notices define the activities that require, respectively, a Basic Assessment (applies to activities with limited environmental impacts listed in GN R. 983 and R.985), or a Scoping and EIA (applies to activities which are significant in extent and duration listed in GN R. 984) process. Based on the NEMA EIA listed activities identified by the EAP, namely the Listing Notice 2 (GN R.984), the proposed project's EIA application will be subject to the Scoping and EIA reporting process as stipulated in the Regulations. The relevant competent authority is the National DEA. This EIA will be submitted to the DEA to ensure that the national environmental principles, fair decision making and integrated environmental management approach is applied through the process. The assessment and associated environmental management plan aim to prevent pollution and ecological degradation, promote conservation and secure ecological sustainable development and use of natural resources while promoting justifiable economic and social development, as outlined in the Act.	X	-
The National Environment Management: Biodiversity Act (Act 10 of 2004) (NEM:BA)	The project development area located within the Western Cape is considered to be a Critical Biodiversity Area which means there are potentially sensitive and potentially irreplaceable vegetation. Within the Northern Cape, the CBAs are associated with south-facing slopes and are based on the assumption that these areas are important as refuges for fauna and flora in the face of climate change. To avoid and or mitigate threats to any endangered ecosystems all impacts on sensitive ecosystems were assessed in	X	A permit may be required depending on the outcome of the final site walkthrough to inform

LEGISLATION	RELEVANCE TO THE PROPOSED PROJECT	PERMIT / LICENCE / COMMENT REQUIRED	COMMENT
	detail during the EIA process to ensure the impacts of the proposed development are understood and can be mitigated; The specialist ecology assessment identified protected species on site that might be at risk due to project related activities. It was recommended that a final site walkthrough be undertaken to inform the micro-sitting and the permit applications in terms of NEM:BA. To avoid alien vegetation from establishing on disturbed areas, appropriate measures will be implemented as described in the EMPr.		micro-sitting of the infrastructure.
National Water Act (Act 36 of 1998)	The WEF and its associated infrastructures could potentially alter the bed, banks, course or characteristics of a watercourse. For instance, road crossings. Once the layout is approved and exact locations of the watercourse crossing confirmed, the WEF applicant will apply for the relevant water authorisations from the DWS.	X	-
National Environmental Management: Waste Act (Act. 59 of 2008)	Construction activities will generate construction related waste that will need to be disposed of at a registered landfill site if the waste cannot be recycled or reused. Waste generated will be dealt with in a manner compliant with the requirements of the Act.	N/A	-
National Environmental Management: Air Quality Act (Act 39 of 2004)	The clearing of vegetation, turbines foundation excavations, stockpiles and transportation of materials might result in dust fall out. It is expected to be below the dust control regulations of 2013 since mitigation measures will be implemented to reduce dust fall out. Dust control regulations were published under Government Notice R827 in Government Gazette 36974 of 1 November 2013.	N/A	-
National Veld and Forest Fire Act (Act 101 of 1998)	The proposed project must register as a member of the fire protection association in the area as required in Section 3 of the Act. The applicant will be required to take all practical measures to ensure that fire breaks are prepared and maintained according to the specifications contained in Section 12 - 14 of Chapter 4 of the Act.	N/A	-
National Forests Act (Act 84 of 1998)	If any protected trees in terms of this Act occur on site and would need to be removed, the applicant will require a licence from the Department of Agriculture, Forestry and Fisheries to perform any of the above-listed activities. The ecologist confirmed that no protected trees will be impacted by the proposed development.	NA	-
Conservation of Agricultural Resources Act (Act 43 of 1983)	Approval will be required from the Department of Agriculture, Forestry and Fisheries (DAFF) for any activities on the land zoned for agriculture and any proposed rezoning or sub-divisions of agricultural land. An agricultural potential assessment was conducted to determine how the proposed development may impact on the agricultural production potential of the WEF site. Comment from DAFF will be obtained. The area is currently used for grazing and will continue to be used for grazing after construction. The majority of infrastructure are proposed in areas of low agricultural potential. Access roads will be routed to avoid any cultivated land.	X	-
Subdivision of Agricultural Land Act (Act 70 of 1970)	Long-term lease agreements (over 10 years) on portion/s of agricultural land require the consent from the Minister of Agriculture, Forestry and Fisheries before they can be registered. Some of the leases for the project may be on portions of the properties and will require a consent from DAFF.	X	Separate applications will be submitted to DAFF in respect of lease agreements that trigger SALA (Act 70 of 1970)
Mineral and Petroleum Resources Development Act (Act 107 of 2002) (MPRDA)	Borrow pits and or quarries will potentially be required to source material for road and turbine construction. However, this application will be submitted separately to the competent authority namely the DMR.	NA	-

LEGISLATION	RELEVANCE TO THE PROPOSED PROJECT	PERMIT / LICENCE / COMMENT REQUIRED	COMMENT
Astronomy Geographic Advantage Act (Act 21 of 2007)	The purpose of the Act is to preserve the geographic advantage areas that attract investment in astronomy. The entire Northern Cape Province excluding the Sol Plaatjie Municipality had been declared an astronomy advantage area. The Northern Cape optical and radio telescope sites were declared core astronomy advantage areas. The Act allowed for the declaration of the Southern Africa Large Telescope (SALT), MeerKAT and Square Kilometre Array (SKA) as astronomy and related scientific endeavours that had to be protected. The proposed project is located within the Sutherland Central Astronomy Advantage Area, which was declared by the Minister of Science and Technology and published in the Government Gazette (No. 37434, Notice 199 of 2014) on 12 March 2014 as part of the Astronomy Geographic Advantage (AGA) Act of 2007. The proposed project is approximately 73km from SALT. Night lights will be compliant to the requirements of the CAA and lighting of other infrastructure will be limited as far as possible. Dust and light impacts will be mitigated through measures described in the EMPr. Due to the distance, it is not anticipated that the Brandvalley WEF will impact SALT. SKA provided a comment and confirmed that the closest SKA-station is 75km from the Brandvalley WEF and will therefore not impact SKA. SALT, SKA and SAAO were invited to provide comments on the proposed project.	x	Comments were received from SAAO and SKA. See Appendix C-6
SOCIAL			
Occupational Health and Safety Act (85 of 1993)	The applicant must be mindful of the principles and broad liability and implications contained in the Operational Health and Safety Act and mitigate any potential impacts.	N/A	Applicable at all stages of development. All contractors need to adhere to Act.
National Heritage Resources Act (25 of 1999)	The project was registered with South African Heritage Resource Agency (SAHRA) and HWC. Both authorities responded to the Notices of Intent to Develop (NID), which were submittedon 19 February 2016. A heritage impact assessment, palaeontology impact assessment and visual impact assessment were undertaken to inform this EIA.	X	
PLANNING			
National Road Traffic Act (No. 93 of 1996) (NTRA)	All the requirements stipulated in the NRTA will need to be complied with during the construction and operational phases of the proposed WEF.	X	N/A for the EIA process.
The Spatial Planning and Land Use Management Act 16 of 2013 (SPLUMA)	The development will obtain land use approval for establishing renewable energy on land zone for agricultural use. In the Western Cape the scheme regulations permit reneable energy as Consent use in Agricultural Zone	X	An application for approval will be submitted to the relevant municipality.
Civil Aviation Act (Act No. 13 of 2009): 13th Amendment of the Civil Aviation Regulations (2011)	Due to requirements of the Act to ensure the safety of aircrafts, the WEF applicant must engage directly with the Civil Aviation Authority (CAA) regarding the structural details of the facility.	X	Comment will be requested from the CAA. An approval will be obtained from the CAA for the turbine

5.2 Applicable legislation and standards for noise

5.2.1 National

- South Africa - GNR.154 of January 1992: Noise control regulations in terms of section 25 of the Environment Conservation Act (ECA), 1989 (Act No. 73 of 1989).
- South Africa - GNR.155 of 10 January 1992: Application of noise control regulations made under section 25 of the Environment Conservation Act, 1989 (Act No. 73 of 1989).

The South African Noise Control Regulations describe a *disturbing noise* as **any** noise that exceeds the ambient noise by more than 7 decibels (dB). This difference is usually measured at the complainant's location should a noise complaint arise. Therefore, if a new noise source is introduced into the environment, irrespective of the current noise levels, and the new source is louder than the existing ambient environmental noise by more than 7dB, the complainant will have a legitimate complaint. A noise *disturbance or nuisance* as defined in the national legislation means any sound which disturbs or impairs the convenience of any person. The Western Cape Noise Control Regulations are similar to the National Noise Control Regulations in that the definition of a disturbing noise also refers to **any** noise that exceeds the ambient noise by more than 7dB.

5.2.2 Provincial

- Provincial Government of the Western Cape – PN 200 (2013) Noise Control Regulations

The Western Cape Strategic Wind Initiative Document (May 2006) can be used for guidance. The Western Cape does not prescribe any specific noise limits for wind turbines other than to recommend a setback distance of 400m from residences (including rural dwellings). It is recommended that a setback distance of 500m be used for this project. This is based on this authors experience on similar projects.

The Western Cape Noise Control Regulations define a disturbing noise as:

a noise, excluding the unamplified human voice, which:

a) exceeds the rating level by 7 dBA;

b) exceeds the residual noise level where the residual noise level is higher than the rating level;

c) exceeds the residual noise level by 3 dBA where the residual noise level is lower than the rating level; or

d) in the case of a low-frequency noise, exceeds the level specified in Annex B of SANS 10103.

National Standards

The most applicable standard for planning purposes used in this study is SANS 10103:2008 which provides typical rating levels for noise in various types of districts, as described in the Table 5-2 below. Ideally, in such areas one does not want to experience any anthropogenic noise pollution.

Table 5-2: Typical rating levels for noise in various types of districts.

Type of District	Equivalent Continuous Rating Level, LAeq,T for Noise					
	Outdoors (dB(A))			Indoors, with open windows (dB(A))		
	Day-night	Daytime	Night-time	Day-night	Daytime	Night-time
Rural Districts	45	45	35	35	35	25
Suburban districts with little road traffic	50	50	40	40	40	30
Urban districts	55	55	45	45	45	35

Type of District	Equivalent Continuous Rating Level, LAeq,T for Noise					
	Outdoors (dB(A))			Indoors, with open windows (dB(A))		
	Day-night	Daytime	Night-time	Day-night	Daytime	Night-time
Urban districts with one or more of the following: Workshops; business premises and main roads	60	60	50	50	50	40
Central business districts	65	65	55	55	55	45
Industrial districts	70	70	60	60	60	50

SANS 10103:2008 defines Daytime as 06:00 to 22:00 hours and night time as 22:00 to 06:00 hours. The rating levels in the table above indicate that in rural districts the ambient noise should not exceed the **guideline** 35 dB(A) at night and 45 dB(A) during the day. The day / night (24hour) rating limit is 45 dB(A). These levels can thus be seen as the maximum target levels for any noise pollution sources. If the current ambient (residual) noise exceeds the rating limit, then actual ambient (residual) limit will be used when a noise complaint arises in terms of the Environment Conservation Act - Noise Control Regulations and the Western Cape Noise Control Regulations.

See Appendix H for the noise impact assessment.

5.3 Other Relevant Policy, Guidelines and Legislation

The above list of applicable legislation should not be regarded as definitive or exhaustive, and it is probable that additional legislative requirements could be identified. This is particularly applicable to any relevant municipal by laws that will have to be adhered to. The Terms of Reference (ToR) for most of the respective specialist studies included the need for a review of all relevant legislation and guidelines pertaining to the proposed development and to their given fields of expertise. Other legislation that may be relevant to the proposed wind energy project are listed in the sections below.

5.3.1 International

- The 1992 United Nations Framework Convention on Climate Change (UNFCCC).
- The Kyoto Protocol (2002).

5.3.2 National

- Basic Conditions of Employment Act (Act no 75 of 1997).
- Electricity Regulation on New Generation Capacity (Government Gazette No 32378 of 5 August 2009).
- Electricity Regulation Act (Act No. 4 of 2006).
- Employment Equity Act (Act no 55 of 1998).
- Industrial Policy Action Plan 2011/12 – 2013/14.
- Integrated Energy Plan for the Republic of South Africa, March 2003.
- Integrated Resource Plan for Electricity 2010-2030.
- Long Term Mitigation Scenarios (2007).
- Municipal Systems Act (Act 32 of 2000).
- National Development Plan (2011).
- National Climate Change Response White Paper (2012).
- National Energy Bill (2008).
- Strategic Infrastructure Projects (SIP) (2012).
- SIP 8: Green energy in support of the South African economy.
- SIP 9: Electricity generation to support socio-economic development.
- The Environment Conservation Act No. 73 of 1989 (ECA) Noise Control Regulations, which specifically provide for regulations to be made with regard to the control of noise, vibration

and shock, including prevention, acceptable levels, powers of local authorities and related matters.
- The Mountain Catchment Areas Act No. 63 of 1970 provides for catchment conservation.
- The Skills Development Act No. 97 of 1998 promotes the development of skills.
- The Telecommunication Act of 1966 which has certain requirements with regard to potential impacts on signal reception.
- The Tourism Act No. 3 of 2014 provides for the promotion of tourism and regulates the tourism industry.
- The Development Facilitation Act No. 67 OF 1995 Provides for development and planning.
- White Paper on Energy Policy for South Africa (Energy White Paper).
- White Paper on Renewable Energy Policy (2003) (Renewable Energy White Paper).

5.3.3 Provincial

Northern Cape

- Northern Cape Planning and Development Act No 7 of 1998 regulates planning and development within the province (superseded by the Spatial Planning and Land Use Management Act 16 of 2013 (SPLUMA)).
- Northern Cape Environmental Implementation Plan (EIP) is a key framework promoting environmental management and co-operative governance.

Western Cape

- Western Cape Land Administration Act 6 of 1998 regulates land and land usage (superseded by the Spatial Planning and Land Use Management Act 16 of 2013 (SPLUMA)).
- Western Cape Planning and Development Act 7 of 1999 regulates planning and development within the Province.
- Western Cape Nature Conservation Laws Amendment Act (No. 3 of 2000).
- Cape Nature and Environmental Conservation Ordinance (No. 19 of 1974).
- Western Cape Noise Control Regulations 2013.

The DEA&DP 2010 and 2014 EIA Guideline and Information Document Series were considered throughout the EIA phase, informing the EIA process.

The following plans and frameworks are relevant to the project area and are discussed in detail in Chapter 4.2.3 of this report.

Relevant district planning documentation includes:
- The Cape Winelands District Municipality IDP (2012/13 – 2016/17), EMF (May 2011) and SDF (2007).
- The Central Karoo District Municipality IDP (2012-2017).
- The Namakwa District Municipality IDP (2012-2016) and SDF (Online interactive page).

The relevant local planning documentation includes:
- The Karoo Hoogland Local Municipality IDP (2015/2016) and SDF (2010).
- The Witzenberg (Ceres) Local Municipality IDP (2012/2017) and SDF (2006)/SDF draft (2012).
- The Laingsburg Local Municipality IDP (2012/2017).

5.4 Conservation and planning tools

Several conservation planning tools are available for the area to inform land-use planning, environmental assessments and authorisations and natural resource management in order to promote sustainable development. These tools allow for the determination of any sensitive and

important areas from a vegetation and faunal point of view at the scoping stage of a development. They allow for the fine-tuning of plans and turbine layouts with a view to reducing potential environmental impacts at the planning stage of the development. The tools used are outlined in Table 5-3 below.

Table 5-3: Conservation and planning tools considered for the proposed project.

Tool	Motivation	Relevancy	Notes
NATIONAL			
Protected Areas National Environmental Management: Protected Areas (Act No. 57 of 2003)	Protected areas are areas that are already conserved. Areas in close proximity to the proposed development may be affected by the development and thus must be taken into account.	Low relevancy. No protected areas occur within approximately 20km of the site.	There are no protected areas within 20km of the site.
National Protected Areas Expansion Strategy (NPAES)	The objective of the NPAES is to form an overarching strategic framework for a protected area network that 'conserves a comprehensive, representative and adequate sample of biodiversity and maintains key ecological processes across the landscape and seascape.' The areas earmarked by this study should be protected.	Relevant. The project area does not fall within a protected area; however it does fall within NPAES focus areas of the Western Karoo as indicated in Figure 5.1 below.	Please see Section 7.1.5.
IBA	IBAs are globally recognized areas essential for the protection of bird species. In order to be classified as an IBA, an area must contain Globally threatened species, restricted range species, biome restricted species or congregations of species.	Relevant. The project area is approximately 40km from Anysberg Nature Reserve IBA.	Please see Section 7.1.7
SKEP	SKEP is a bi-regional and development programme for Namibia and South Africa implemented for conservation of these ecosystems. Priority areas are identified to have conservation value and are most vulnerable.	Relevant. The project area is approximately 12km from Roggeveld Edge/Overberg Pass SKEP Bird Areas. SKEP vegetation groups are identified within the area.	Please see Section 7.1.5
National Wetlands Inventory	Wetlands are very important aspects of the	Relevant. There are important wetlands	See section 7.1.10

Guideline Document	ecosystem as they are process areas. Not only do they form habitat for both flora and fauna, they also perform vital ecosystem functions. It is for this reason that wetlands are always rated with a high sensitivity and should be conserved.	within the project area which should be protected. In addition, a pan has been noted to occur within the project boundary. The cables and access roads are likely to cross at least one watercourse.	
National List of Ecosystems that are Threatened and in need of Protection. (NEM:BA) NEM:BA includes a National list of ecosystems that are threatened and in need of protection.	The NEM:BA provides a list of threatened terrestrial ecosystems. This has been established as little attention has historically been paid to the protection of ecosystems outside of protected areas. The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems.	Low Relevant. No threatened ecosystems occur within the project area.	See section 7.1.5
National Freshwater Ecosystem Priority Areas (NFEPA) Guideline Document	A nationwide strategy developed for the protection of freshwater biodiversity defined all of South Africa's freshwater ecosystems according to their contribution to biodiversity, their risk of loss, and by considering both these variables- their need for protection.	Relevant. There are wetlands and rivers of NFEPA status found within the project area.	See section 7.1.10

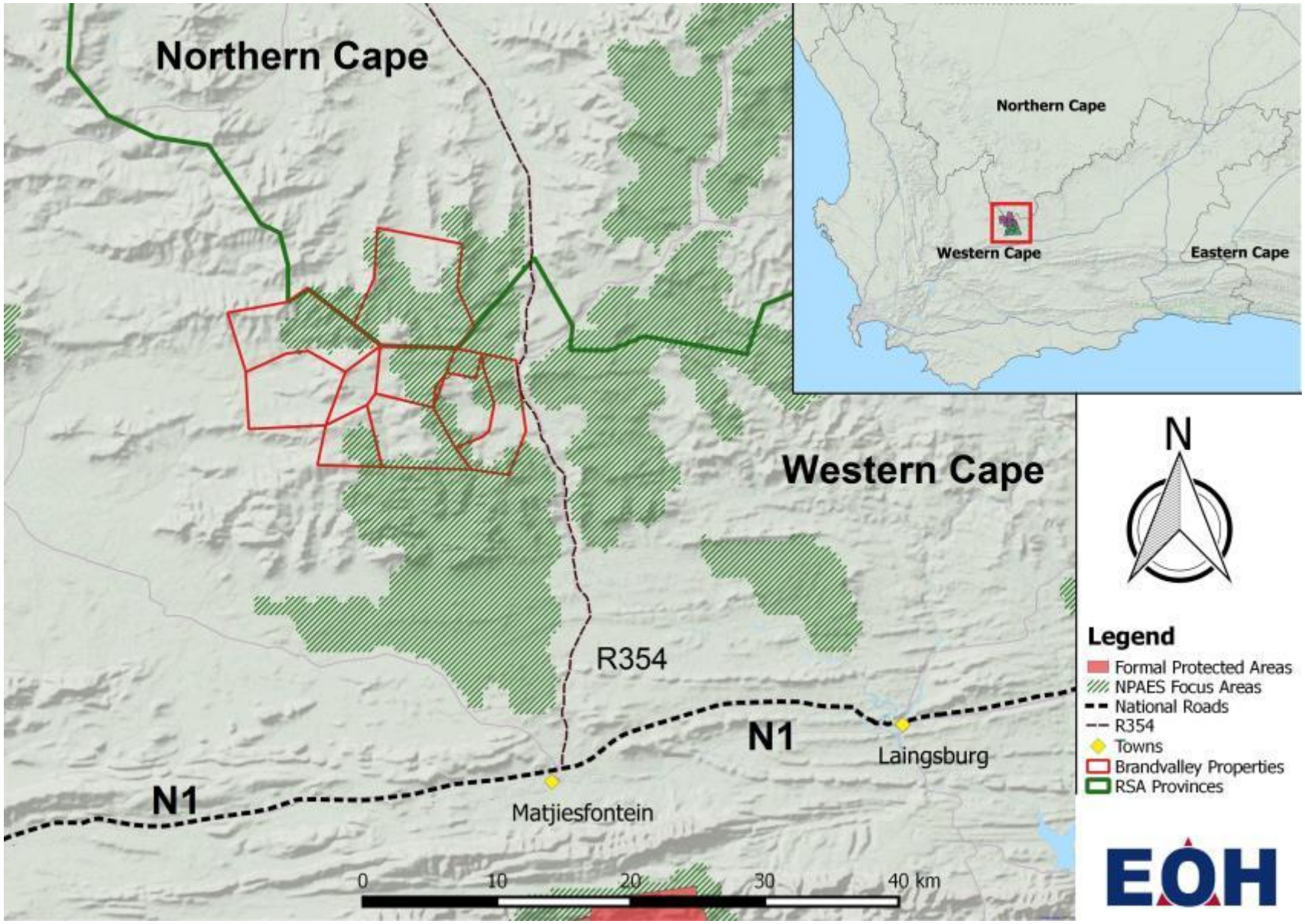


Figure 5-1: National Protected Area Expansion Project Focus Areas surrounding the proposed project area.

5.4.1 National Freshwater Ecosystem Priority Areas (NFEPA)

In designing the National Wetlands Inventory, the Department of Environmental Affairs and Tourism (DEAT) (now called the DEA), through the Wetlands Conservation Programme, embarked on a thorough process of consultation with stakeholders in the country, as well as with the United States National Wetlands Inventory (NWI), a unit of the United States Fish and Wildlife Services. The classification system forms a fundamental basis on which wetlands diversity and condition will be assessed and analysed.

The inventory dataset presents information on the extent, location and distribution of wetlands systems in South Africa. Upon completion of the project, a clear picture will exist of the extent, distribution and diversity of South Africa's wetlands, in the form of Geographic Information Systems (GIS) based digital coverage and printed maps. Wetland habitats were mapped and classified from remote sensing imagery. The methodology for mapping wetlands, as well as the kind of remote sensing to be used, was determined in the pilot study. Spatial information generated through the remote sensing mapping exercise will be stored in a GIS linked to a database containing supplementary wetland attribute information.

The national wetland coverage generated by the inventory seeks to establish a baseline for measuring future change in wetland area, function and values, and permit status, and if possible, trends analyses to be carried out in order to assess the need for, or effectiveness of, specific wetland conservation strategies. These analyses will be incorporated into various conservation and environmental management reports. The Wetland Classification System has been developed and applied to the National Wetlands Inventory.

NFEPA map products provide strategic spatial priorities for conserving South Africa’s freshwater ecosystems and supporting sustainable use of water resources. These strategic spatial priorities are known as Freshwater Ecosystem Priority Areas, or FEPAs. FEPAs were determined through a process of systematic biodiversity planning and involved collaboration of over 100 freshwater researchers and practitioners. FEPAs were identified based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands and estuaries (Implementation Manual for Freshwater Ecosystem Priority Areas, 2011).

There were seventeen (17) wetland units identified in the area, with three (3) natural wetland units of NFEPA status. These wetlands have a natural land cover that is greater than, or equal to, 75%. There is one sub-quaternary catchment of FEPA status and five (5) rivers, including the Wilgebos (unmodified, natural), Muishond (unmodified, natural), Kleinpoorts (unmodified, natural), Tankwa (moderately modified) and Ongeluks (moderately modified), located within the project area, none of which are flagship status (Figure 7-10). The impact of the proposed development on NFEPAs will be assessed during the EIA phase.

6. PUBLIC PARTICIPATION

According to Appendix 3(3) of the EIA Regulations (GN R. 982 of 2014), *an Environmental Impact Report must contain all the information necessary for the competent authority to consider and come to a decision on the application, and must include—*

(h) a full description of the process followed to reach the proposed preferred site including–

(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;

(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;

In line with the above-mentioned legislative requirement, this Chapter of the report provides the details of the Public Participation Process (PPP) conducted during the EIA process.

Since the two EIA processes are intended to run concurrently, some tasks for the PPP will be combined for Brandvalley and Brandvalley WEFs. Going forward the PPP will be split between the two facilities for written notification. Adverts and public meetings will remain combined.

Interested and Affected Parties (I&APs) play an important role in the EIA process, as many of their concerns and issues can be included in the project proposal, to ensure a development which is as environmentally and socially acceptable as possible.

There are four key steps in the PPP to ensure that I&APs are informed of the proposed development and afforded sufficient opportunity to raise comments and or concerns. These include:

a. Identifying potential I&APs;
b. Notifying I&APs through:
    i. Site notices;
    ii. Written notice;
    iii. Advertisements;
    iv. Public meeting;
c. Making provision for I&APs to review and comment on all draft reports before they are finalised and submitted to the competent authority; and
d. Compiling a record of responses to any comments and concerns provided by the I&APs and including and addressing these concerns in final reports.

6.1 Identifying Potential Interested and Affected Parties

In the Pre-assessment Phase, prior to the Scoping Phase, CES identified any persons/organisations that were considered to have potential interest in the proposed project. This included government bodies, landowners, neighbours, extended neighbours (within 5km radius of the project area), organs of state, key stakeholders and any persons responding to the inception advertising or notification. A database comprising of all the relevant interested persons/ organisation was compiled together with their contact details to inform them of the initiation of the project. The list of I&APs includes:

- Landowners adjacent and neighbouring the proposed site for development
- Department of Environmental Affairs: Directorate Biodiversity and Conservation
- Department of Environmental Affairs and Development Planning (DEA&DP)
- Department of Environment and Nature Conservation (DENC)
- Department of Defence (DoD)
- Department of Water and Sanitation (DWS)
- Department of Energy (DoE)
- Department of Agriculture, Forestry and Fisheries (DAFF)
- Western Cape Department of Agriculture
- Department of Science and Technology (DST)

- Department of Mineral Resources (DMR)
- South African Heritage Resources Agency (SAHRA)
- Heritage Western Cape (HWC)
- Northern Cape Provincial Heritage Resources Authority (NCPHRA)
- Ratepayers Associations
- Farmers Association
- Cape Nature
- South African Civil Aviation Authority (SACAA)
- South African Astronomical Observatory (SAAO)
- South African Large Telescope (SALT)
- Square Kilometre Array (SKA)
- Endangered Wildlife Trust (EWT)
- Air Traffic and Navigation Services (ANTS)
- Wildlife and Environment Society of South Africa (WESSA)
- South African Weather Service (SAWS)
- Birdlife South Africa
- Eskom
- Sentech
- Telecommunication service providers
- Provincial and District Roads Departments
- South African National Roads Agency Limited (SANRAL)
- Non-governmental Organisations (NGOs) and Community Based Organisations (CBOs)
- Witteberg Private Nature Reserve
- Namakwa District Municipality
- Cape Winelands District Municipality
- Central Karoo District Municipality
- Witzenberg (Ceres) Local Municipality
- Laingsburg Local Municipality
- Karoo Hoogland Local Municipality
- Various Ward Councillors:
    - Ward 12 Councillor of the Witzenberg (Ceres) Local Municipality
    - Ward 4 Councillor of the Witzenberg (Ceres) Local Municipality
    - Ward 3 Councillor of the Karoo Hoogland Local Municipality
    - Ward 1 Councillor of the Laingsburg Local Municipality
- Laingsburg Tourism

The list of I&APs is provided in Appendix C-2.

6.2 Notifying Interested and Affected Parties of the EIA

According to Section 41(2) of the EIA Regulations (GN R.982 of 2014):

The person conducting a public participation process must take into account any relevant guidelines applicable to the public participation as contemplated in section 24J of the Act and must give notice to all potential interested and affected parties of an application or proposed application.

Section 41(2) of the EIA Regulations (GNR 982 of 2014) requires:

(e) Using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desirous of but unable to participate in the process due to-
(i) Illiteracy;
(ii) Disability; or
(iii) Any other disadvantage.

As indicated above and discussed below, I&APs were notified through the following:

- Site notices;
- Written notice;
- Advertisements; and
- Public meeting.

6.2.1 Site Notice

Section 41(2) of the EIA Regulations (GNR 982 of 2014) requires:
(a) Fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of -
(i) The site where the activity to which the application or proposed application relates is or is to be undertaken; and
(ii) Any alternative site.
Section 41 (3) of the EIA Regulations (GNR 982 of 2014) requires:
A notice, notice board or advertisement referred to in subregulations (2) must –
(*a) give details of the application or proposed application which is subjected to public participation; and*
(b) state –
(i) whether basic assessment or S&EIR procedures are being applied to the application;
(ii) the nature and location of the activity to which the application relates;
(iii) where further information on the application or proposed application can be obtained; and
(iv) the manner in which and the person to whom representation in respect of the application or proposed application may be made.
Section 41 (4) of the EIA Regulations (GNR 982 of 2014) requires:
A notice board referred to in subregulation (2) must –
(a) be of a size at least 60cm by 42cm; and
(b) display the required information in lettering and in a format as may be determined by the competent authority.

In accordance with this requirement and with Section 41(4), three (3) 800x600mm single sided foam-board mounted notice boards were placed on the boundary of the proposed project area on Thursday 30th July 2015. The locations, content and photographs of the fixed notices are provided in Appendix C-5. Table 6-1 below provides the coordinates of the site notices placed.

Table 6-1: Coordinates of Site Notices Placed.

Site Notices	Latitude	Longitude
Site Notice 1	-33.08177900	20.59238100
Site Notice 2	-32.95112100	20.54862200
Site Notice 3	-33.22319900	20.58149100

In addition, posters, in Afrikaans and in English, were placed at the Municipal Building in Laingsburg, at the Laingsburg Public Library and at Touws River Public Library on the 31st of July 2015. Copies of the poster and photographs of the placed posters are provided in Appendix C-5.

6.2.2 Written Notices

Section 41(2) of the EIA Regulations (GNR 982 of 2014) requires:
b) Giving written notice, in any of the manners provided for in Section 47D of the Act, to:
(i) The occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
(ii) Owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is

to be undertaken;
(iii) The municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
(iv) The municipality which has jurisdiction in the area;
(v) Any organ of state having jurisdiction in respect of any aspect of the activity; and
(vi) Any other party as required by the competent authority.

In accordance with this requirement, written notices were distributed via email or registered post to all I&APs as identified by EOH CES. There have been three rounds of notification letters to date, including notification letters to:

1. Inform I&APs of the proposed project – sent on the **27th of August 2015**.
   The initial round of notification letters served to inform all I&APs of the proposed WEFs and provided a web link to the Background Information Document (BID), available in both English and Afrikaans. The BID provided basic preliminary information on the proposed project, the EIA process and contact details for registration as an I&AP. Hard copies of the BID were provided on request. The BID is reproduced in Appendix C-1.

2. Inform I&APs of the release of the Scoping Report
   The second round of notification letters were circulated to inform all I&APs of the release of the Draft Scoping Report (DSR) for the proposed Brandvalley WEF project for public review. The notification letters provided information regarding the review period (from **25 January 2016** until **23 February 2016**), where the DSR could be accessed and details regarding the open day and public meeting.

   The DSR was available at the Laingsburg Public Library, the Touws River Public Library and electronically on both the G7 and EOH CES websites. Proof of the availability of the report is provided in Appendix C-4.

   I&APs whose email notification that could not be delivered, were notified via registered mail on the **29th of January 2016** and were informed of the extended comment period until Monday 29th of February 2016.

3. Inform I&APs of the release of the EIA Report

   A third round of notification letters were circulated to inform all I&APs of the release of the Draft Environmental Impact Report (DEIR) for the proposed Brandvalley WEF for a 30-day public review period. These notification letters provided the dates of the comment review period, where the DEIR can be accessed and details regarding the open day and public meeting associated with the EIA Phase of the proposed project.

A fourth round of notifications will be circulated to inform all I&APs of DEA's decision.

Any persons/organisation that has requested to be registered as an I&AP since the date on which the written notices were distributed and the adverts were placed, has been added to the I&AP database and has received a BID. These I&APs will be kept informed throughout the EIA process.

6.2.3 Advertisements

Section 41(2) of the EIA Regulations (GNR 982 of 2014) requires:
(c) Placing an advertisement in:
(i) One local newspaper; or
(ii) Any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;
(d) Placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this

paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph.

Advertisements placed in the Pre-Assessment PPP phase to notify I&APs of the proposed project were placed in two Provincial Newspapers (*Die Beeld* on 27 August 2015 in Afrikaans and *The Cape Times* on 27 August 2015 in English) and in one local newsletter (*Die Windpomp Nuusbrief*) on 27 August 2015 in order to:

- Inform the wider public of the intention to undertake an EIA for the proposed project, and;
- Invite them to register as I&APs.

Advertisements were placed in two Provincial Newspapers *(Die Volksblad* on the 27th of January 2016 and in *Die Burger* on the 25th of January 2016, both in Afrikaans) and in one Local Newspaper *(Die Noordwester* in English) on 29th January 2016 to notify I&APs of the availability of the DSR and to invite them to attend the public meeting.

6.3 Public Review Period of Draft Scoping Report and Public Meeting

Section 43 of the EIA Regulations (GNR 982 of 2014) requires:

(1) A registered interested and affected party is entitles to comment, in writing, on all reports or plans submitted to such party during the public participation process contemplated in these Regulations and to bring to the attention of the proponent or applicant any issues which that party believes may be of significance to the consideration of the application, provided that the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application.

(2) In order to give effect to section 14O of the Act, any State department that administers a law relating to a matter affecting the environmental must be requested, subject to regulation 7(2), to comment within 30 days.

The Draft Scoping Report was made available for public review from the **Monday 25 January 2016 to Tuesday 23 February 2016** (30 calendar days), extended to 29 February 2016. The documents were made available through the following methods:

1. Hard copies of the Draft Scoping Report were made available at: Laingsburg Public Library (Van Riebeeck Street, Laingsburg) and the Touws River Public Library (Corner Jane and Logan Streets Touws River).
2. Hard/ electronic copies were circulated to organs of state to request comments.
3. Electronic copies were available on the link (http://data.g7energies.com/eia/brandvalley) and link (www.cesnet.co.za/public-documents).

During the 30 day public review period (Monday 25 January 2016 to Tuesday 23 February 2016) for the DSR an open day and a public meeting was held on Thursday the 11th February 2016 from 15h30. Notice of this was advertised in the *Die Burger* (Afrikaans), *Die Volksblad* (Afrikaans) and in *The Noordwester* (English) prior to the meeting. All registered I&APs to date were informed in writing of the meeting venue and date, along with all other significant stakeholders engaged with to date.

Minutes were taken during the public meeting, including all comments and questions from I&APs in attendance as well as any responses given from the EAP (Marc Hardy) or the applicant. Please refer to Appendix C-6 for the attendance register and the minutes.

6.4 Public Review Period of Draft EIA Report and Public Meeting

The Draft Environmental Impact Assessment Report was made available for a public review period from 25 May 2016 to 24 June 2016 (30 calendar days). The document was made available through the following methods:

1. Hard copies of the Draft EIA Report were made available at: Laingsburg Public Library (Van Riebeeck Street, Laingsburg) and the Touws River Public Library (Corner Jane and Logan Streets Touws River).
2. Hard/ electronic copies were circulated to organs of state to request comments.
3. Electronic copies available on the link (http://data.g7energies.com/eia/brandvalley).

During the 30-day public review period (25 May 2016 to 24 June 2016) (for the Draft Environmental Impact Assessment an open day and public meeting will be held on Wednesday 22 June 2016 in the Laingsburg flood museum. Notice of this were included in writing in the letters of notification distributed to all I&APs including the date, venue and time of the meeting.

6.4 Interested and Affected Parties Database

Section 42 of the EIA Regulations (GNR 982 of 2014) requires:
A proponent or applicant must ensure the opening and maintenance of a register of interested and affected parties and submit such a register to the competent authority, which register must contain the names, contact details and addresses of-

1) All persons who, as a consequence of the public participation process conducted in respect of that application, have submitted written comments or attended meetings with the proponent, applicant or EAP;
2) All persons who have requested the proponent or applicant, in writing, for their names to be placed on the register; and
3) All organs of state which have jurisdiction in respect of the activity to which the application relates.

A Register or Database has been created including all I&APs identified or requested to be registered to date containing the relevant contact person's names, contact details and addresses made available. The Register were updated throughout the Scoping and EIA process to include all I&APs' contact details of those who responded to the advertisement(s) and/or requested to be registered as I&APs. The Register to date is provided in Appendix C-2.

6.5 Comments from Interested and Affected Parties

Section 44 of the EIA Regulations (GNR 982 of 2014) requires:

(1) The applicant must ensure that the comments of interested and affected parties are recorded in reports and plans that such written comments, including the responses to such comments and records of meeting, are attached to the reports and plans that are submitted to the competent authority in terms of these Regulations.
(2) Where a person desires but is unable to access written comments as contemplated in sub regulation (1) due to –
(i) lack of skills to read or write;
(ii) disability; or
(iii) any other advantage;
Reasonable alternative methods of recording comments must be provided for.

A record of all comments and/or issues received by I&APs, together with a note of the responses given, was maintained in a Comments and Response Register (Appendix C-6). To date, the following comments were received from Interested and Affected Parties:

- Mr Matthys L. Heyns indicated support for the proposed project
- SANRAL provided information on the potential permits and approvals required for the transportation of abnormal loads, any upgrades to existing national roads and indicated information requests and the need to consult with them. The requirements were incorporated into the EMPr.
- Mr Steve Swanepoel raised an objection to the proposed project based on concerns relating to impacts on the existing airstrip, impacts to the character of the Karoo, tourism, visual impacts, ecological impacts, the viability of the project and socio-economic impacts.

A Visual, Ecology and Socio-economic Impact Assessment was undertaken to address his concerns.

- Falcon Oil and Gas commented on the impact the proposed wind farm would have on their shale gas fracking plans within the same area as the wind farm.
- Mr Cornelius P. Willemse requested that the area be fenced off.
- Sentech commented that there will be no impact on any of the Sentech networks, because of remote location of the WEF.
- Mr Warren Petterson, a nearby landowner submitted his objection followed by comments and concerns on the proposed project.
- Eskom (John Geeringh) provided requirements for works at or near Eskom infrastructure.
- The Department of Environmental Affairs and Development Planning (DEA&DP) provided comments on the proposed project including comment on the proposed listed activities and an indication of which impacts are to be assessed in the EIA Phase of the proposed project.
- South African Astronomical Observatory (SAAO) informed that the proposed facilities are within the Sutherland Central Astronomy Advantage Areas declared by the Minister of Science and Technology and requested that light and dust pollution are included in the assessment and that mitigation measures are provided to minimise the potential impacts. Mitigation measures were included in the EMPr to address dust and light impacts.
- Square Kilometre Array (SKA) informed that the nearest SKA station if SKA-2379 approximately 75km from the proposed location and therefore the WEF poses a very low risk of detrimental impact on SKA and thus no mitigation measures are required at this stage.
- CapeNature provided comments on the proposed project including: a request for clarity on certain project information; a request for the implementation of the precautionary approach to the proposed project; comment on the specialist assessments and monitoring to be undertaken; information regarding the biophysical environment and sensitive areas (CBAs, ESAs and FEPAs) and certain requirements/requests from CapeNature.

Responses will be provided to all parties that submitted comments. All comments and received on the Draft EIA Report and responses provided by the EAP and applicant will be submitted to DEA.

6.6 Summary of Public Participation Tasks undertaken and scheduled for the EIA phase

The Public Participation Process were divided into three phases which allowed for sufficient stakeholder engagement at a Pre-assessment Phase, a Scoping Phase as well as at the EIA phase in line with the EIA requirements. The tasks carried out at each phase are described in the table below:

Table 6-2: Summary of Public Participation Process in the Scoping and EIA Process.

Date	Phase	Meeting and/or deliverable	Objective
14 July 2015	Pre-Assessment	Meeting with the DEA	A pre-application meeting was held with the applicant, environmental consultant and DEA to determine and clarify the appropriate way forward to conduct the Environmental Impact Assessment for the proposed Brandvalley and Rietkloof Wind Energy Facilities (WEF).
30 July – 27 August 2015		Distribute pre-assessment notifications as stipulated in the Sections outlined above	To inform all I&APs of the proposed project and to comply with Section 41 of the EIA Regulations.
14 – 18 December 2015		Compile Comments and Response Table	As per legal requirements all issues and/or comments raised by registered interested and affected parties needs to be documented in writing and responded to by the EAP.
25 January 2016- 23 February 2016 (extended until 29 February 2016)	Scoping Phase	Distribute notifications of the availability of the Draft Scoping Report (DSR) for public review as stipulated in the Sections outlined above	To inform I&APs of release of DSR and to comply with Section 40 of the EIA Regulations.
11 February		Open House/Public Meeting	In order to inform all I&APs of the outcome of

Date	Phase	Meeting and/or deliverable	Objective
2016			the Scoping Report.
3 March 2016		Comments received on the Draft Scoping Report were compiled into a Comments and Response Table. This Comments and Responses Table were circulated to all parties who provide comments and were included to the Final Scoping Report for submission to DEA..	As per legal requirements all issues and/or comments raised by registered interested and affected parties needs to be documented in writing and responded to by the EAP. Decision making by the DEA on the acceptability of the plan of study for EIA.
25 May 2016 – 24 June 2016	EIA Phase Notification of the decision	Distribute notifications of the availability of the Draft EIR for public review as stipulated in the Sections outlined above	To inform I&APs of release of DEIR and to comply with Section 40 of the EIA Regulations.
22 June 2016		Hold open house event	In order to ensure that all I&APs have the opportunity to provide input to the proposed project and have their concerns addressed.
25 May 2016 - 24 July 2016		Compile Comments and Response Table for incorporation into the Final EIR and circulation to all parties who submitted comments.	As per legal requirements all issues and/or comments raised by registered interested and affected parties needs to be documented in writing and responded to by the EAP
November 2016		Al registered interested and affected parties will be notified of the decision taken by the DEA to either reject the project or issue an environmental authorisation. Notification will be done through written notification. The wider public will be informed of the decision through advertisements.	Inform all interested parties of the DEA's decision in accordance with Section 4 (2) of the 2014 EIA Regulations.

7. DESCRIPTION OF THE AFFECTED ENVIRONMENT

According to Appendix 3(3) of the EIA Regulations (GN R. 982 of 2014), an Environmental Impact Report must contain all the information necessary for the competent authority to consider and come to a decision on the application, and must include—
(h) A full description of the process followed to reach the proposed preferred site including:–
(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic and cultural aspects;

This Chapter of the report provides a description of the ecological, social and economic description of the environment that may be directly or indirectly affected by the proposed project. This Chapter is informed by the baseline descriptions prepare by the various specialists. For complete baseline descriptions, see specialist reports included in Appendix H.

7.1 The Bio-Physical Environment

The project area is located approximately 60km south of the town of Sutherland, in the Northern Cape Province and approximately 30km north from Matjiesfontein, in the Western Cape Province. The town of Laingsburg is a further 30km east of Matjiesfontein, along the N1 national road in the Western Cape Province. The proposed WEF falls within both the Western Cape and the Northern Cape Provinces. In the Northern Cape Province, it falls within the Karoo Hoogland Local Municipality in the Namakwa District Municipality. In the Western Cape, it falls within the Laingsburg and Witzenburg Local Municipalities in the Central Karoo and Cape Winelands District Municipalities, respectively. A biodiversity summary of each municipality is provided in Table 7-1 below.

Table 7-1: Biodiversity summary for the municipalities in which the proposed project area falls (BGIS, 2015).

	Karoo Hoogland Municipality	Laingsburg Municipality	Cape Winelands Municipality
Size (ha)	2939678.2ha	878448ha	1076276.2ha
Area remaining natural (%)	99%	96.6%	91.6%
Reserves (distance from the project site)	Tankwa Karoo National Park (~75km)	Anysberg Nature Reserve (~30km) Gamkapoort Nature Reserve (~100km) Gamkaskloof (Die Hel) Nature Reserve (~100km) Groot Swartberg Nature Reserve (~100km) Klein Swartberg Mountain Catchment Area (~70km) Towerkop Nature Reserve (~80km)	Anysberg Nature Reserve (~30km) Ben-Etive Nature Reserve (~90km) Bokkeriviere Nature Reserve (~60km) Boosmansbos Wilderness Area (~100km) Cederberg Mountain Catchment Area (~100km) Koue Bokkeveld Mountain Catchment Area (~100km) Langeberg -Oos/East Mountain Catchment Area (~100km) Langeberg -Wes Mountain Catchment Area (~60km) Matroosberg Mountain Catchment Area (~90km) Tankwa Karoo National Touw Local Authority Nature Reserve Park (~50km) Warmwaterberg Nature Reserve (~80km)
Biomes	Fynbos Nama-Karoo Succulent Karoo	Albany Thicket Fynbos Nama-Karoo Succulent Karoo	Fynbos Succulent Karoo
No. of vegetation types	14	19	31
Threatened terrestrial ecosystems	None	None	Kouebokkeveld Alluvium Fynbos (Endangered – EN) Cederberg Sandstone Fynbos (Vulnerable

			– Vu) Ceres Shale Renosterveld (Vulnerable – Vu) Kouebokkeveld Shale Fynbos (Vulnerable – Vu) Montagu Shale Renosterveld (Vulnerable – Vu)
Water Management Areas	Gouritz Lower Orange Olifants/Doorn	Gouritz Lower Orange Olifants/Doorn	Gouritz Lower Orange Olifants/Doorn
No. of rivers	28	8	23
No. of wetlands	3099	420	1641

7.1.1 Climate

The project area has an arid to semi-arid climate. The project area experiences rainfall throughout the year with peak rainfall occurring during the winter season (from May to August). The mean annual precipitation (MAP) is 150mm, with the project area receiving the lowest rainfall (4mm) in January and the highest (28mm) in June (Figure 7-1).

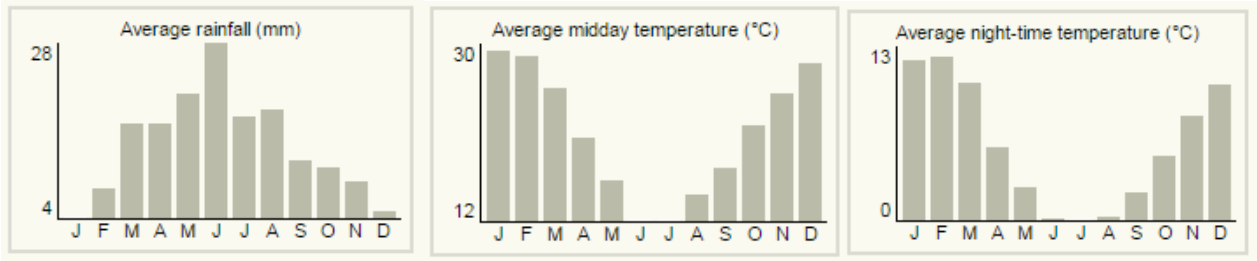


Figure 7-1. The average annual rainfall, midday and night-time temperature.6

The average midday temperatures range from 12.4°C in June to 29.3°C in January. The lowest temperatures are experienced in July with average temperatures of 0°C at night. The mean annual temperature (MAT) is approximately 16°C and the incidence of frost is relatively high (approximately 30 days). The wind direction is predominately north-west with average high wind speeds of up to 7 meters per second (m/s).

Sutherland has cold temperatures and commonly experiences snow in the winter season. The average annual temperature for Sutherland is 11.3°C and the average annual minimum temperature is a low of 2.8°C. The town of Laingsburg is located in a semi-dessert region with hot and dry summers of temperatures, commonly reaching temperatures higher than 30°C. The winter season experience much lower temperatures with occasional snow occurring in the surrounding area.

7.1.2 Geology and Topography

The surrounding area consists of a slightly undulating to hilly landscape, while the majority of the project area comprises slopes and broad ridges of low mountains and escarpments as shown in Plate 7-1, Plate 7-2 and Figure 7-2.

6 Source: (SA Explorer, 2015)

Plate 7-1: Photograph illustrating the topography of the outer southern regions and surrounding area of the project area.

Plate 7-2: Photograph illustrating the general topography of the project area.

The Brandvalley Wind Farm site is characterised by high hills and ridges on the north and central areas, grading into open undulating hills and ridges southwards. The profile along the north to south transect (Figure 7.2) shows that the overall landscape decreases in height from 1 073 meters above sea level (masl) in the north to 885masl at the southern sections of the Brandvalley Wind farm. The highest point is at the central area of the Brandvalley Wind farm at 1 313masl and the lowest at the southernmost point at 885 masl. The landscape changes from undulating hills in the north to a flat, open valley in the south. Figure 7-3 and 7-4 below depicts where crossectional profiles T1 (north-south) and T2 (east-west) have taken to determine the structure of the landscape. The overall landscape altitude decreases westward form 1 158 masl in the east to 912 masl in the west with the highest point at 1 488 masl in the central area (de Kock, 2016).

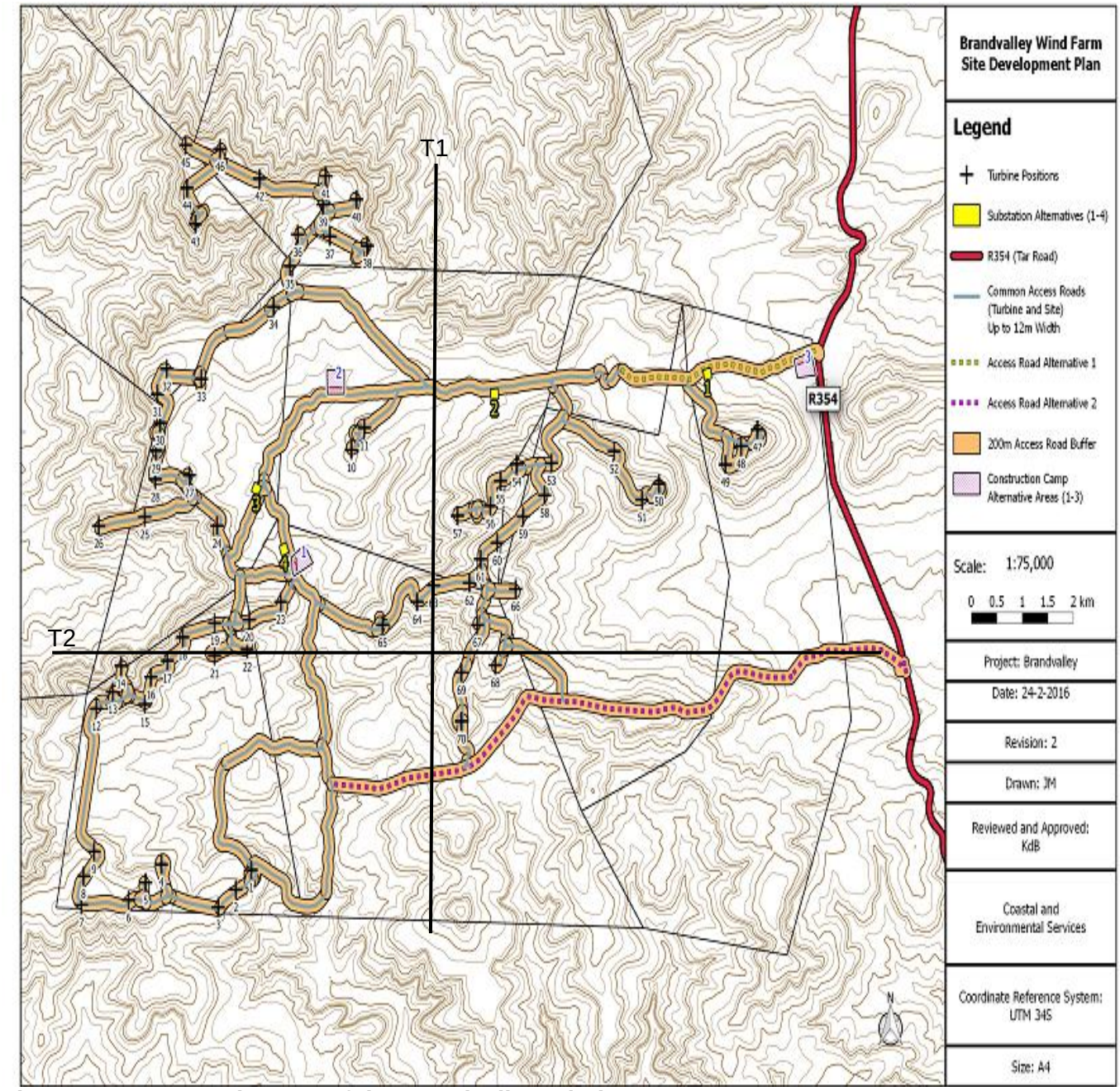


Figure 7-2 Topography map of the Brandvalley Wind Farm area

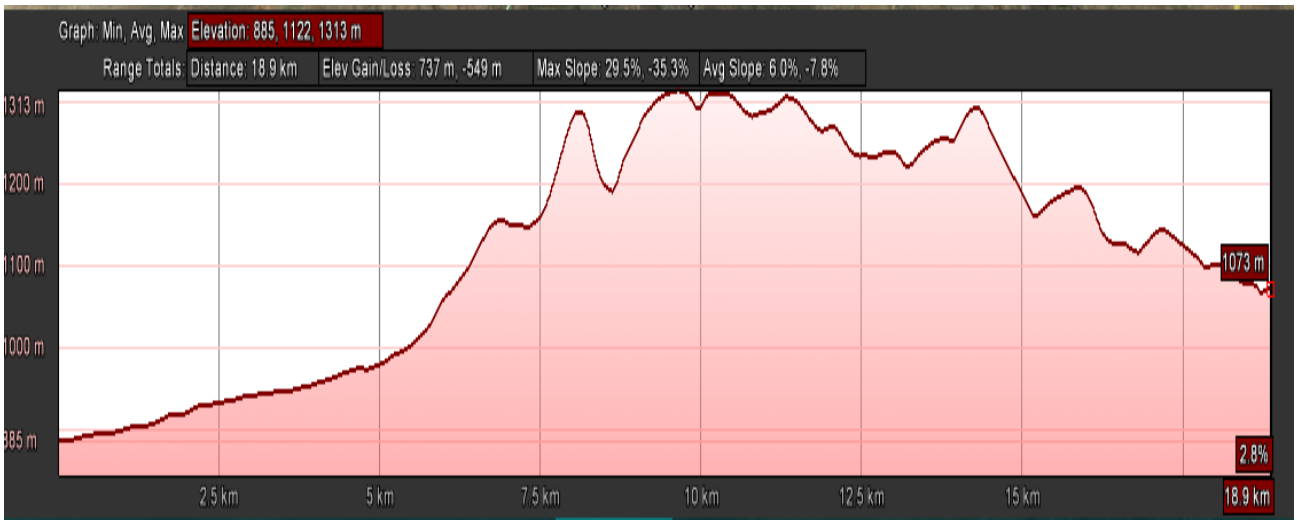


Figure 7-3: North-south transect profile along line T1 as shown in Figure 7.2

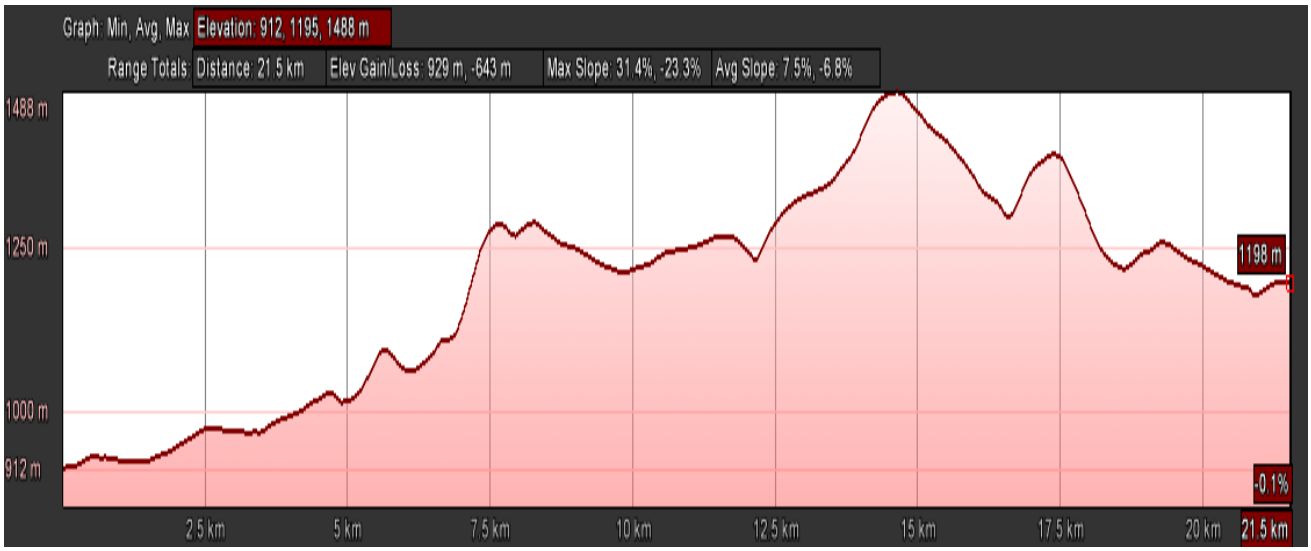


Figure 7-4: An east-west transect profile along line T2 as shown in Figure 7.2

The underlying geology of most of the project area comprises of clayey soils of Fc and Ib land types located on the mudstones and sandstones of the Adelaide Subgroup of the Beaufort Group, with smaller areas of arenite shale (Figure 7-6). The properties located on the northern and western sections of the project area additionally comprise sandstone, shale and mudstone of the Permian Waterford Formation of the Ecca Group and lithified sedimentary rock of the Dwyka Group of Fc and Ib land types. The Beaufort, Ecca Group and Dwyka Groups are all of the Karoo Supergroup.

The majority of the project area comprises Lithosols, shallow soils with minimal development on hard or weathering rock, with or without intermittent diverse soils. Lime is generally present in parts or most of the landscape. The central portion of the project area comprises rock with limited soils.

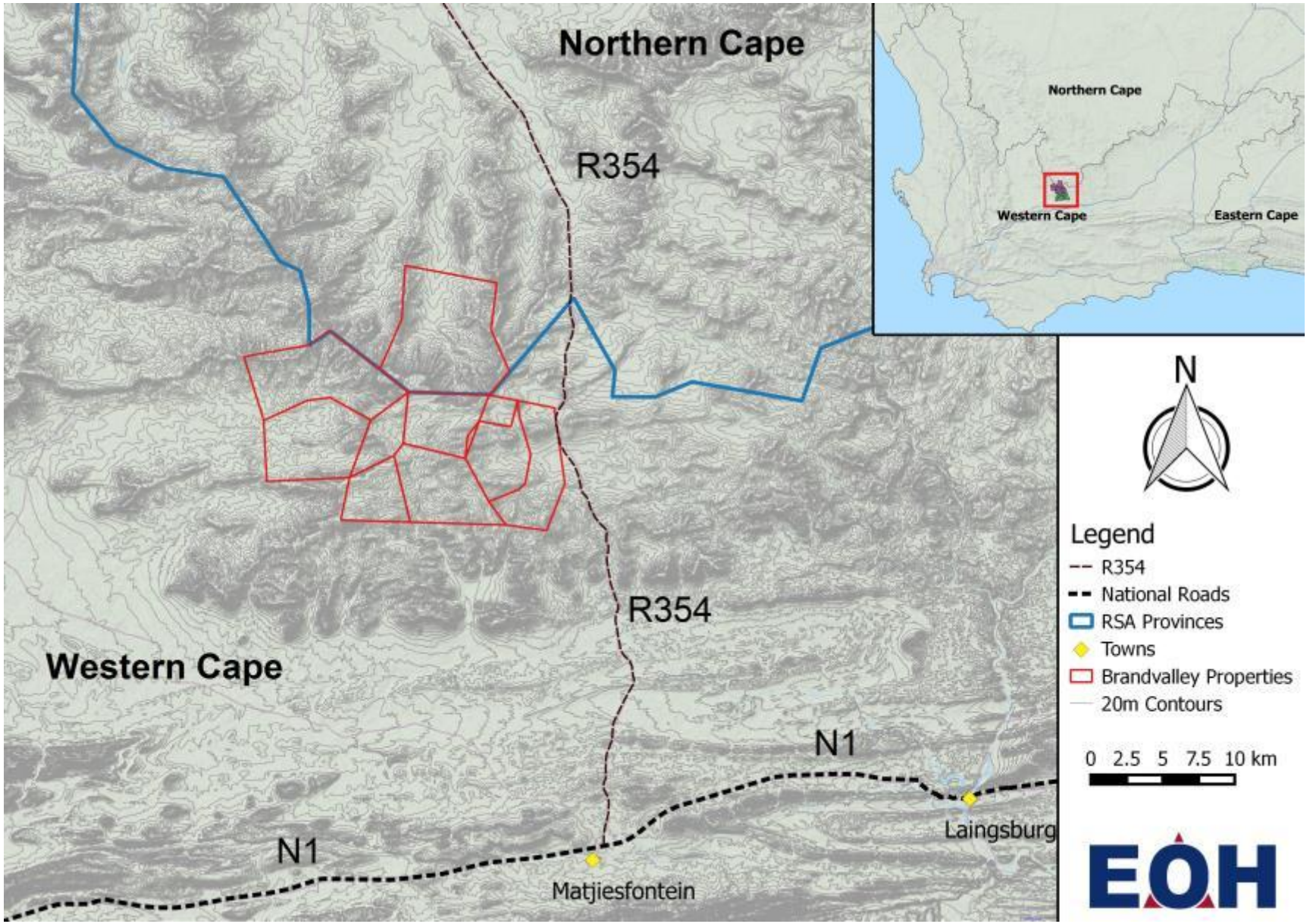


Figure 7.5: The topography of the proposed Brandvalley WEF project area.

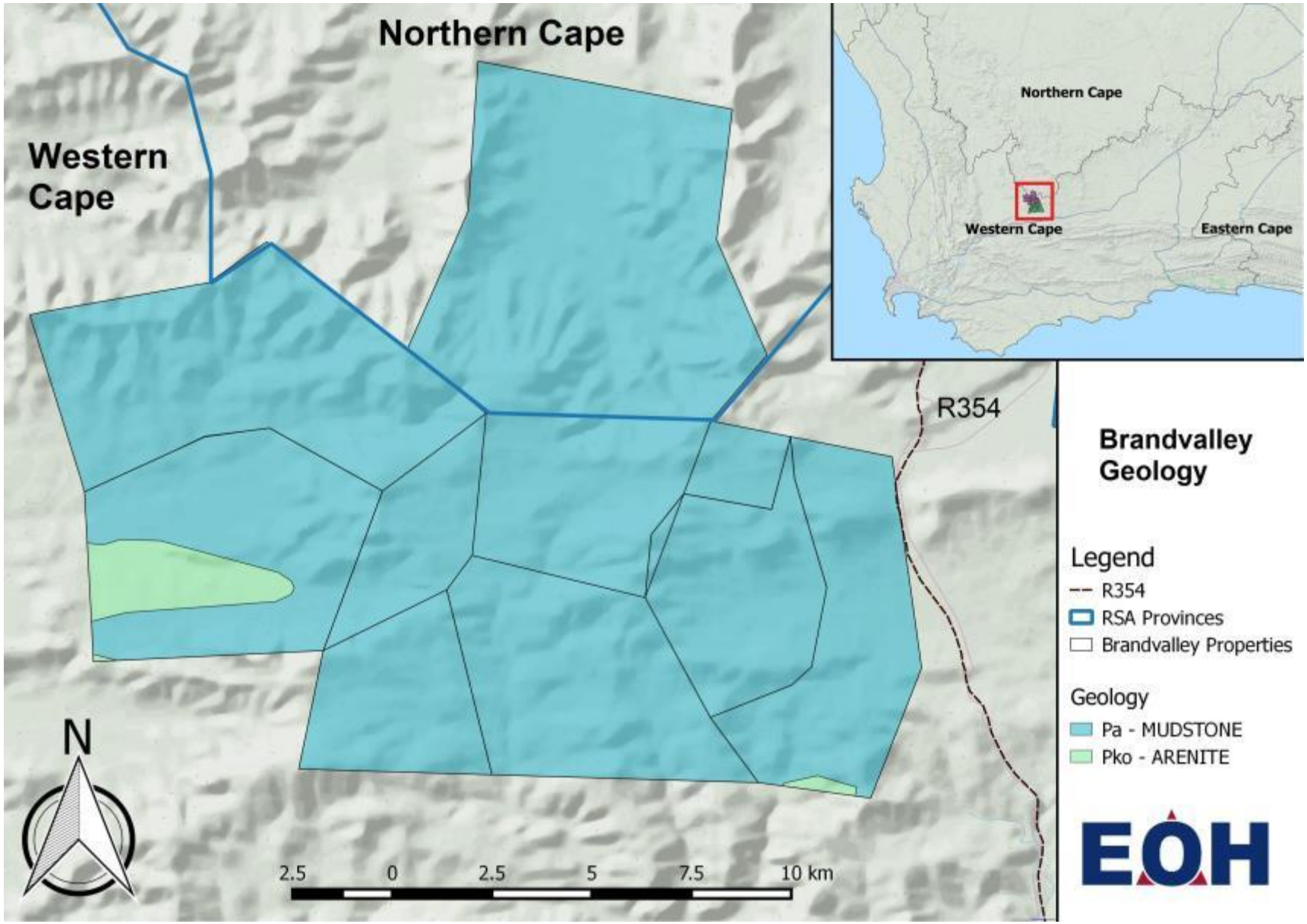


Figure 7-6. The geology of the proposed Brandvalley WEF.

7.1.3 Soils

Soils within the Brandvalley WEF consist mostly of rocks with limited soils grading in steep areas grading to soils with minimal development that are usually shallow, overlying rock of weathering rock, with or without intermittent diverse soils southwards. Lime may be present in parts of the landscape. The dominant soil forms were identified within the Brandvalley Wind Farm site as:

- Mispah soil form (14 000ha)
- Glenrosa soil form (16 600ha)

The bulk of infrastructure (approx. 90%) will be located on Mispah soils. The remainder which includes only 2 turbines and associated access roads will be located on Glenrosa soils.

The Mispah soil form consists of a shallow orthic A horizon overlying hard rock, or surface bare rock with no soil horizon. The hard rock is classified as horizontally orientated, hard, fractured sediments which do not have any distinct vertical channels containing soil material, and bedrock. The A horizon is mostly non-calcareous and not bleached and are therefore classified as Myhill soil family. Localised areas however reflect calcareous a horizons and therefore are classified as Carnarvon soil family. See Plate 7.3 for photos of Mispah soil forms found onsite.

	
Orange undifferentiated soil with pebbles	Bleached undifferentiated soil with rock fragments and rocks

Plate 7.3: Photos of Mispah soil forms found onsite

The Glenrosa soil form consists of a surface horizon that cannot be classified as organic, humic, vertic or melanic although it is sometimes darkened by organic matter. It is therefore classified as an orthic A horizon. Subsoil directly underlies the orthic A horizon and merges into the underlying rock. This layer consists mostly of fresh or weathered parent rock and therefore is classified as a lithocutanic B horizon.

The A horizon is bleached most of the time while the B horizon are hard, non-calcareous with no sign of wetness, and therefore are classified as Bergsig soil family. See Plate 7.4 for photos of Glenrosa soil forms found onsite.

	
Bleached soils with a well-defined plant root layer over a meter thick.	Redish-orange soil up to 90cm thick.

Plate 7.4: Photos of Glenrosa soil forms found onsite

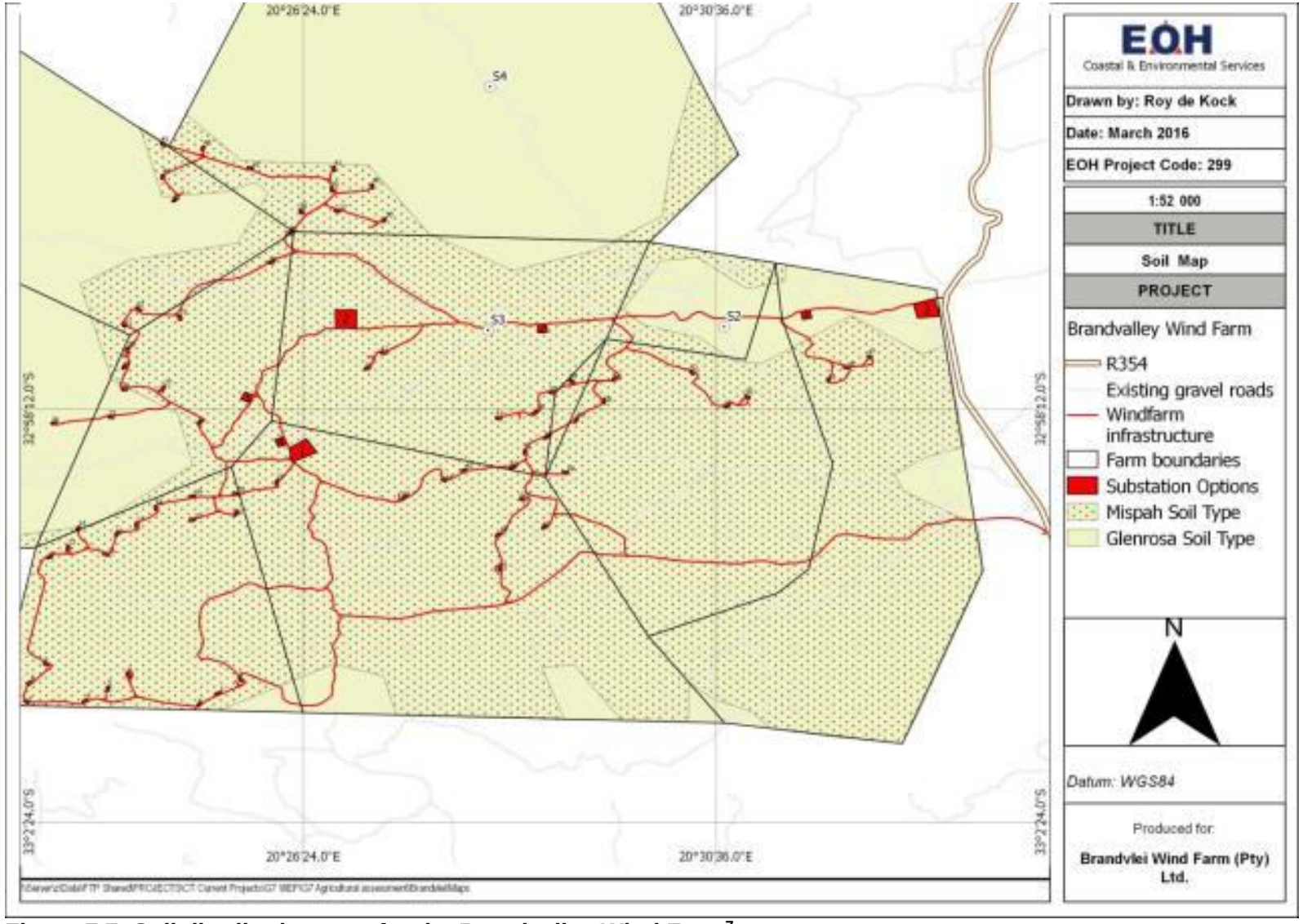


Figure 7.7: Soil distribution map for the Brandvalley Wind Farm[7]

[7] Please note that this map incorrectly identified construction camps as substation options. Please see Figure 3-3 for the correct layout of the infrastructure.

Soil samples were collected on Glenrosa soil form which contains a hard orthic A horizon occurring on a fine lithocutanic B horizon while soil samples were also collected from a shallow orthic A horizon overlying hard rock (called Mispah soil form).

All soils within the Brandvalley Wind Farm site occur on sand with a low organic content. Soils to the west of the site have higher TEC reflecting clay and clay loams.

Table 7.2 summarises average conditions of soils found onsite:

Table 7-2: Average soil conditions within the Brandvalley WEF site

Measured condition	Mispah Soils	Glenrosa Soils
pH	6.2	6.9
Organic content	1.94%	1.29%
Ca	47.75%	61.73%
Mg	27.16%	27.34%
K	3.89%	4.55%
Na	2.42%	1.82

Soil pH is considered as optimum between 6.5 and 7 (slightly acidic) for the highest plant nutrient availability for most crops. Mispah soils falls within this range while Glenrosa soils are slightly more acidic and may require lime addition for certain crops like asparagus, onion, sweet clover and afalfa. Most other crops are considered as tolerant for both soil pH rates (de Kock, 2016).

7.1.4 Agricultural Potential

Any land is considered to have potential for agricultural practices if it meets all requirements for cultivation purposes, as stipulated in the Conservation of Agricultural Resources Act (No. 43 of 1983), and is:

- Under permanent irrigation, or
- Can be classified into one of the soil forms and families as listed by the Soil Classification System of South Africa, and
- The effective soil depth is equal to or greater than the minimum as listed by the Department of Agriculture guidelines, and
- The average topsoil clay content falls within the limits as listed by the Department of Agriculture guidelines.

All the properties impacted by the WEF have been classified by the Department of Agriculture (reference: AGIS) as agricultural land and has the potential for either crop or livestock farming. An Agricultural Impact Assessment was undertaken to determine th agricultural potential of the proposed area for development.

Land Capability

Land capability is defined as the inherent capacity of land to be productive under sustained use and specific management methods. Land capabilities are derived by combining the land systems information with climatic, agronomic and forestry data.

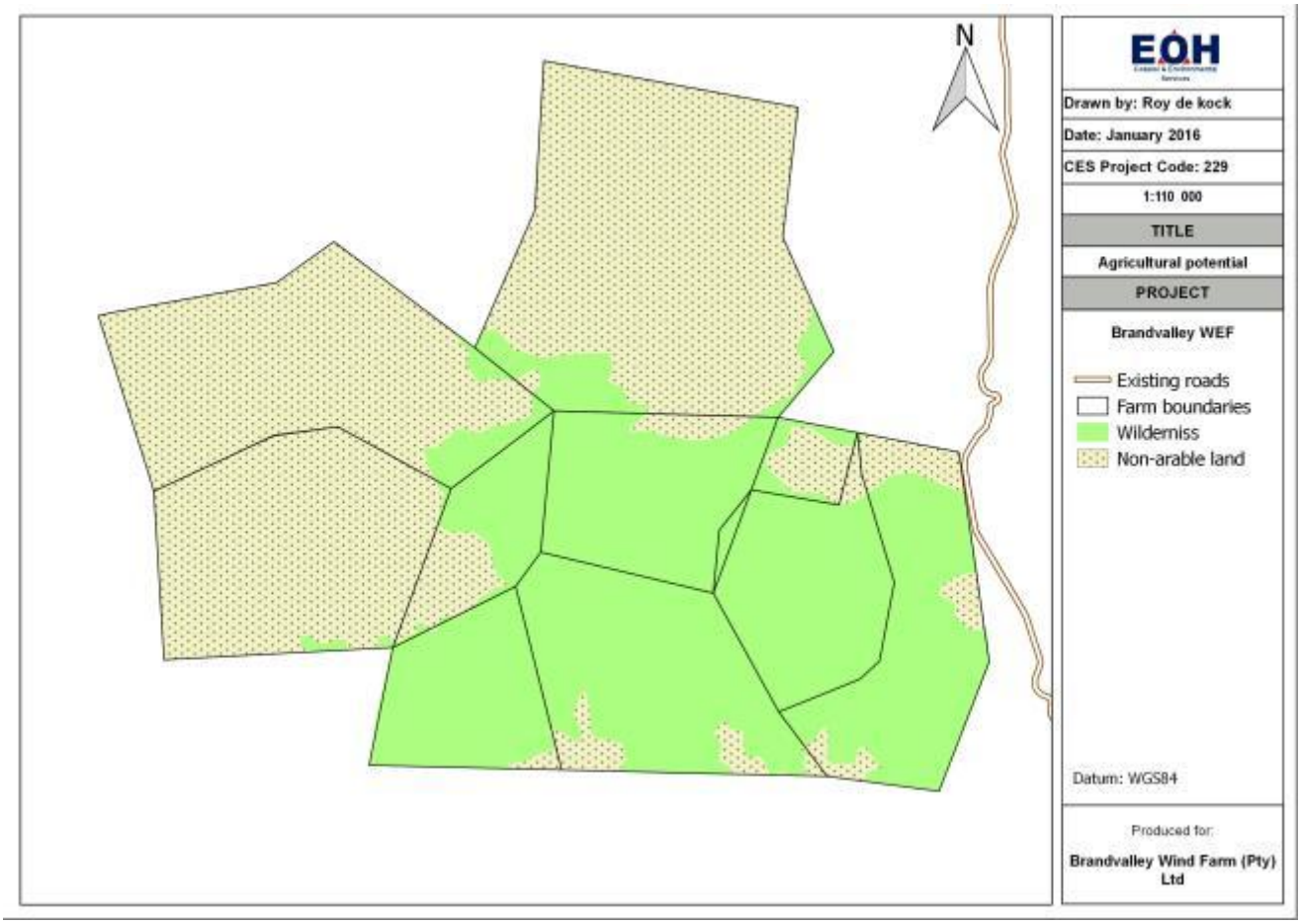


Figure 7-8: Agricultural potential of project site.

The Brandvalley WEF has been classified as non-arable agricultural land with a low potential for grazing livestock and, unless under irrigation, no potential for field crops or horticulture (Figure 7-4). Generally, agricultural activities are compatible with a wind farms and can continue in tandem.
A large portion of land in are classified as wilderness where dense vegetation and undulating topography renders the land unsuitable for commercial agriculture. An agricultural impact assessment that will be undertaken by a specialists during the EIA phase will further inform the determined classifications. This was groundtruthed to inform the EIA Specilaist study phase.

Grazing Capacity

The grazing capacity of a grazeable portion of a homogeneous unit of vegetation can be defined as the area of land required to maintain a single animal unit (AU) over an extended number of years without deterioration of the vegetation or soil (ha/AU). An AU, also commonly referred to as a large stock unit (LSU), is defined as an animal with a mass of 450 kg, which gains 0.5 kg/day on forage with a digestible energy percentage of 55 %.

Agricultural practices in the area consist mainly of small stock farming (Dorper and Dohne Merino sheep). Small amounts of wool are also produced. No other livestock were observed.

Based on the agricultural potential onsite, DAFF has determined the grazing capacity to be between 18-25 hectare per large stock unit (ha/LSU) on low undulating landscapes and 26-30 ha/LSU on steep mountainous areas. Grazing capacity potential was determined in 1995 by DAFF to be between 41-80 ha/LSU increasing to 26-30 ha/LSU towards the eastern sections.

The site specific grazing capacity are also influenced by the different vegetation the various soils support. Grazing capacity in areas with Mispah soil is considered as low (26-30 ha/Animal Unit according to AGIS). Although small stock farming (Dorper and Dohne Merino sheep) are practised in areas with Glenrosa soils, grazing capacity is considered as low to moderate (18-25 ha/Animal Unit according to AGIS).

Grazing onsite is not utilised to its fullest potential capacity, but this is as a result of water availability. See Figure 7.9 below for the grazing potential of Brandvalley WEF.

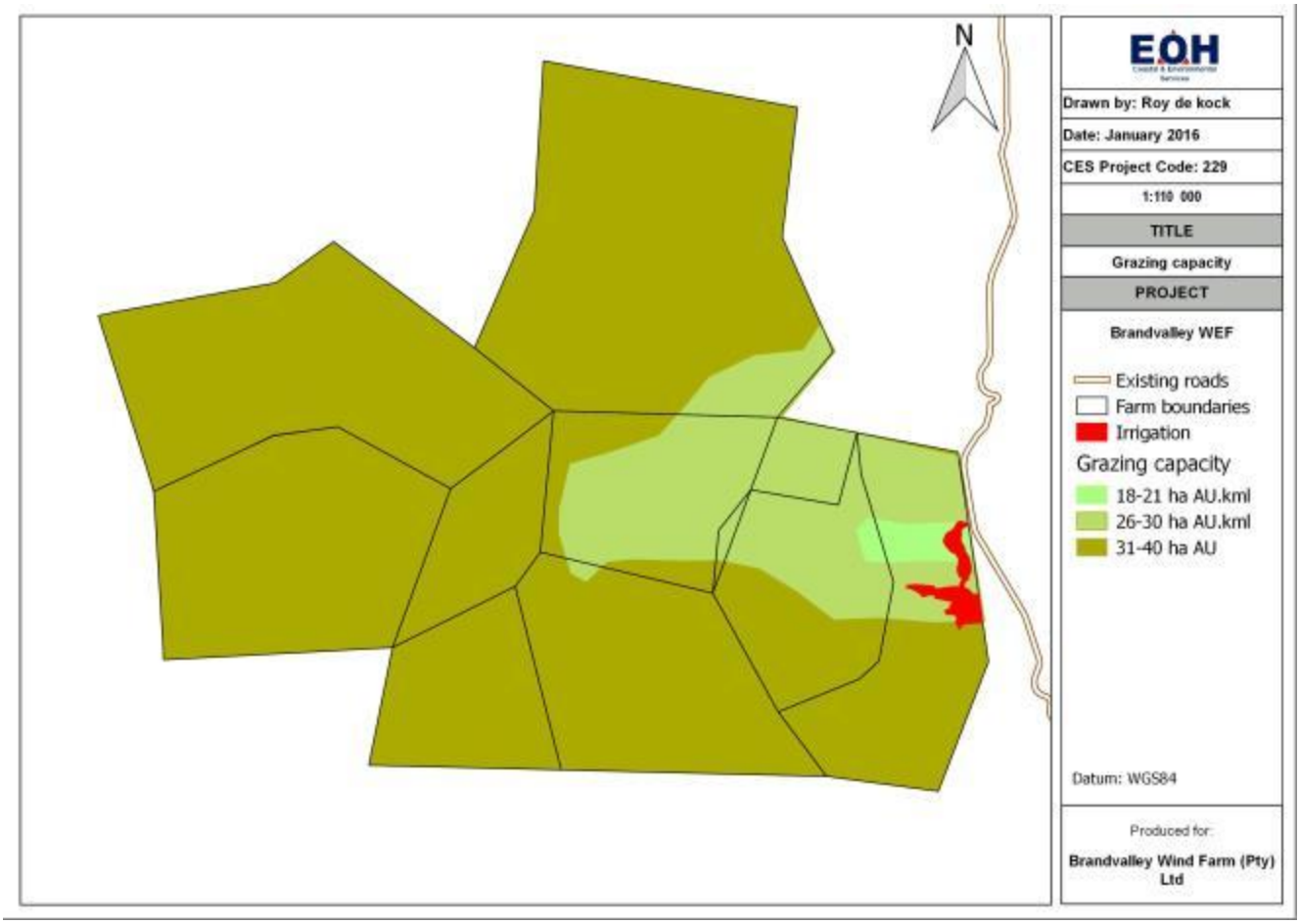


Figure 7-9: Grazing capacity of proposed project site.

Cropping potential

Mispah soils are not suitable for dryland cropping or irrigation and accommodate a limited variety of vegetation. Glenrosa soils are also not suitable for dryland cropping. Irrigation of cash crops is only possible along riverbeds, provided that irrigation dams are constructed to aid water availability. Less than 10% of the Brandvalley Wind Farm site is suitable for this.

Crops under irrigation were mapped as high sensitivity in Figure 7.10 below.

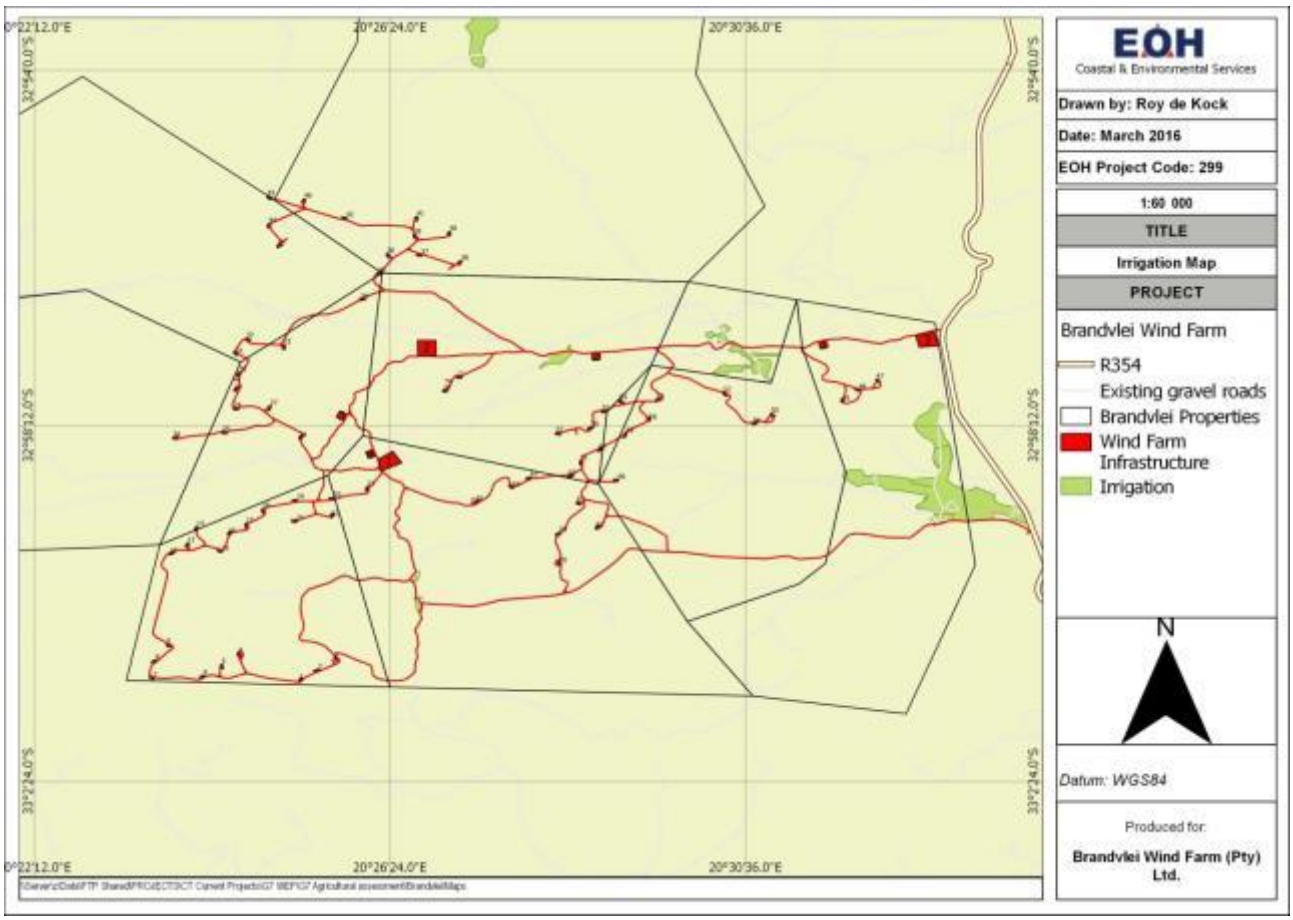


Figure 7-10: Crops under irrigation on the project site.

7.1.5 Vegetation

Regional Context of the Vegetation

The project area falls within the Fynbos Biome of the Shale Renosterveld Group of the Karoo Renosterveld Bioregion and the Succulent Karoo Biome, of the Rainshadow Valley Karoo Bioregion (Mucina and Rutherford, 2006). The Fynbos Biome, with a Mediterranean-climate, comprises three naturally fragmented vegetation types, namely Fynbos, Renosterveld and Strandveld, which are dominated by small-leaved, evergreen shrubs that regenerate when exposed to fire. The Fynbos Biome is one of two biomes that is endemic to South Africa. The Succulent Karoo Biome covers approximately 111 000km and is therefore the fourth largest biome in southern Africa. The Succulent Karoo is one of only two semi-arid biodiversity hotspots in the world. The Succulent Karoo experiences winter rainfall in comparison with the Nama Karoo with summer rainfall. The combination of both summer and winter rainfall contributes to the high biodiversity occurring in the area. The vegetation of the area includes Central Mountain Shale Renosterveld, occurring in majority of the project area, and Koedoesberge-Moordenaars Karoo, found in the northern and western regions of the project area (Figure 7-6).

Succulent Karoo Ecosystem Programme (SKEP)

The Succulent Karoo biome extends from the south-west through to the north west of South Africa and up into Namibia (Driver et al., 2003). It is classified as one of the 25 internationally recognised biodiversity hotspots and is the world's only arid hotspot. It is remarkably diverse with 6,356 plant species, 40% of which are endemic and 17% of which are listed on the Red Data list. Despite this rich diversity and high level of endemism, only 3.5% of the biome is formally conserved. As a result, the biome's diversity is under pressure from human impacts, especially mining, agriculture, overgrazing and climate change. The goal of the SKEP is therefore to provide a framework to guide conservation efforts of this unique biome (Driver et. al., 2003). SKEP is defined as a bi-

regional development programme for Namibia and South Africa implemented for conservation of these ecosystems. Priority areas are identified to have conservation value and are most vulnerable. The three main aims of the project are to:

- "provide a hierarchy of priority actions to guide conservation efforts and donor investment in the biome (both on and off formal reserves);
- build human resource capacity to implement the plan by including training and mentorship activities as part of the planning process; and
- generate the institutional and government support required to ensure its effective implementation.

SKEP describes the vegetation types found in the project area as Mountain Succulent Karoo, Renosterveld and Upland Succulent Karoo (Figure 7-7).

Both Mucina and Rutherford (2006) and Succulent Karoo Ecosystem Plan (SKEP) have mapped the vegetation for the region. These were groundtruthed by an ecology specialist to inform the EIA process (see Appendix H for the ecology impact assessment). These vegetation maps and descriptions of the vegetation types are presented below in Figure 7.11.

Vegetation types

Central Mountain Shale Renosterveld occurs in the Western and Northern Cape on the southern and southeastern slopes of the Klein Roggeveldberge and Komsberg below the Komsberg section of the Great Escarpment as well as farther east below Besemgoedberg and Suurkop and in the west in the Karookop area. It is associated with clayey soils overlying Adelaide Subgroup mudstones and subordinate sandstones with landtypes mostly Ib and Fc. Although this vegetation type is classified as Least Threatened, it has a very limited extent of 1236km2 and is not formally conserved anywhere. Levels of transformation are however low and it is considered to be 99% intact. Although no endemic species are known to occur within this vegetation type, little is known about this Renosterveld type and it has been poorly sampled. Experience from this and other projects in the area indicate that this should be considered to be a relatively sensitive vegetation type with a relatively high abundance of species of conservation concern and in context of the site should in fact be considered to have a higher sensitivity than those areas of Koedoesberge-Moordenaars Karoo.

According to Mucina & Rutherford (2006) the **Koedoesberge-Moordenaars Karoo** vegetation type has an extent of 4714km2. This unit occurs in the Western and Northern Cape on the Koedesberge and Pienaar se Berg low mountain ranges bordering on the southern Tanqua Karoo and separated by the Klein Roggeveld Mountains from the Moordenaars Karoo in the broad area of Laingsburg and Merweville. Koedoesberge-Moordenaars Karoo is associated with slightly undulating to hilly landscape covered by low succulent scrub with scattered tall shrubs. It occurs on mudstones, shale and sandstone of various origins including Adelaide Subgroup, Ecca Group and Dwyka Group diamictites, which give rise to shallow skeletal soils. Land types are mainly Fc and lesser extents of Ib. This vegetation type is classified as Least Threatened and has not been significantly impacted by transformation. Conservation status is however poor and of the target of 19% only a very small proportion is conserved within the Gamkapoort Nature Reserve. At least 14 endemic species are known from this vegetation type, which is high number considering that this vegetation unit occupies less than 5000km2. In addition, the majority of listed species known from the broader area are associated with this vegetation type. It is however very poorly known and little research has been conducted within this unit. Within context of the site, this vegetation unit usually occupies the lower-lying hills and becomes dominant in the south and is clearly associated with areas of lower rainfall and an increased predominance of karroid shrub species.

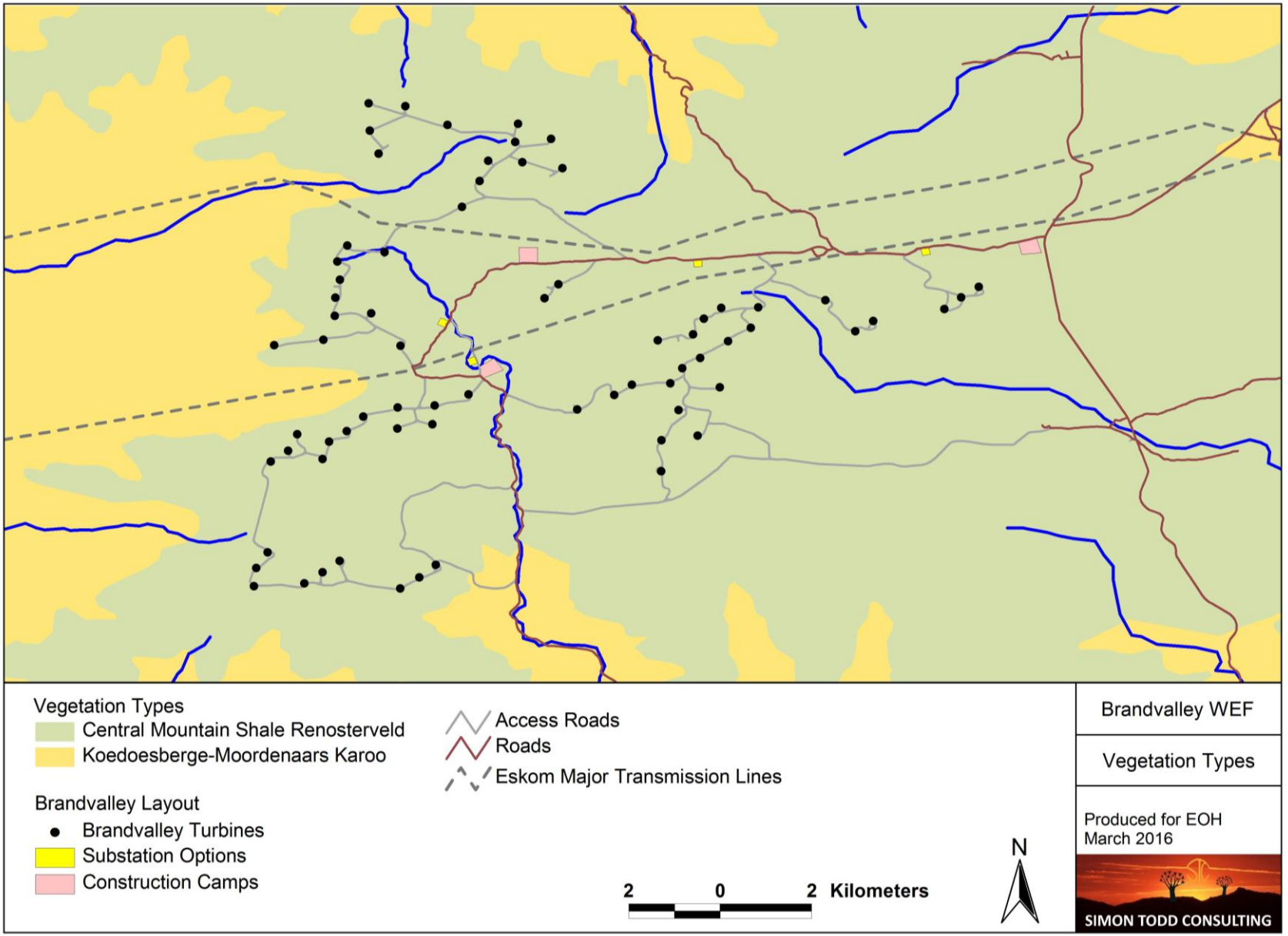


Figure 7-11: Vegetation map showing the vegetation classification of the proposed project area and proposed project infrastructure

Plate 7-5: Photographs illustrating the vegetation types found in the project area.

Listed and protected plant species

The only species of conservation concern that were observed at the site were Brunsvigia josephinae (VU), Eriocephalus grandiflorus (Rare) and Ehrharta eburnea (NT), but it is certain that there are a number of additional species present as well. Species of concern are likely to be concentrated along the alluvial soils of the drainage lines and on the high-lying ridges of the site above 1350m. The latter are of particular concern as a significant amount of impact would be concentrated within these areas. Apart from the red data listed species, there are many provincially protected species present at the site.

However, it is important to note that these acts are intended to protected rare and endemic or otherwise significant species and not common and widespread species which may form the dominant species over large parts of the site. A final list of affected species would be identified through a walk-though of the final development footprint prior to construction and would be a requirement for provincial permitting of the development.

Critical Biodiversity Areas & Broad Scale Ecological Processes

The site itself lies along the boundary of the Western Cape and Northern Cape as well as along the boundary between the Central Karoo and Winelands District Municipalities within the Western Cape. As a result, the site lies at the junction of three different conservation plans and Figure 7-12 below is a composite of all these different plans. Those parts of the site within the Northern Cape fall within the planning domain of the Namakwa District Biodiversity Sector Plan, while the Western Cape Sections are within the Biodiversity Assessment of the Central Karoo District Municipality as well as that for Cape Winelands District Municipality. The Biodiversity Assessments identify Critical Biodiversity Areas (CBAs) which represent biodiversity priority areas which should be maintained in a natural to near natural state. The CBA maps indicate the most efficient selection and classification of land portions requiring safeguarding in order to meet national biodiversity objectives. Once gazetted, and incorporated into municipal SDFs and bioregional plans, such fine-scale plans are recognized under NEMA and the various activities listed under the act as described in Section 2.4 come into effect. The CBA map for the general area surrounding the site is depicted below in Figure 7-12.

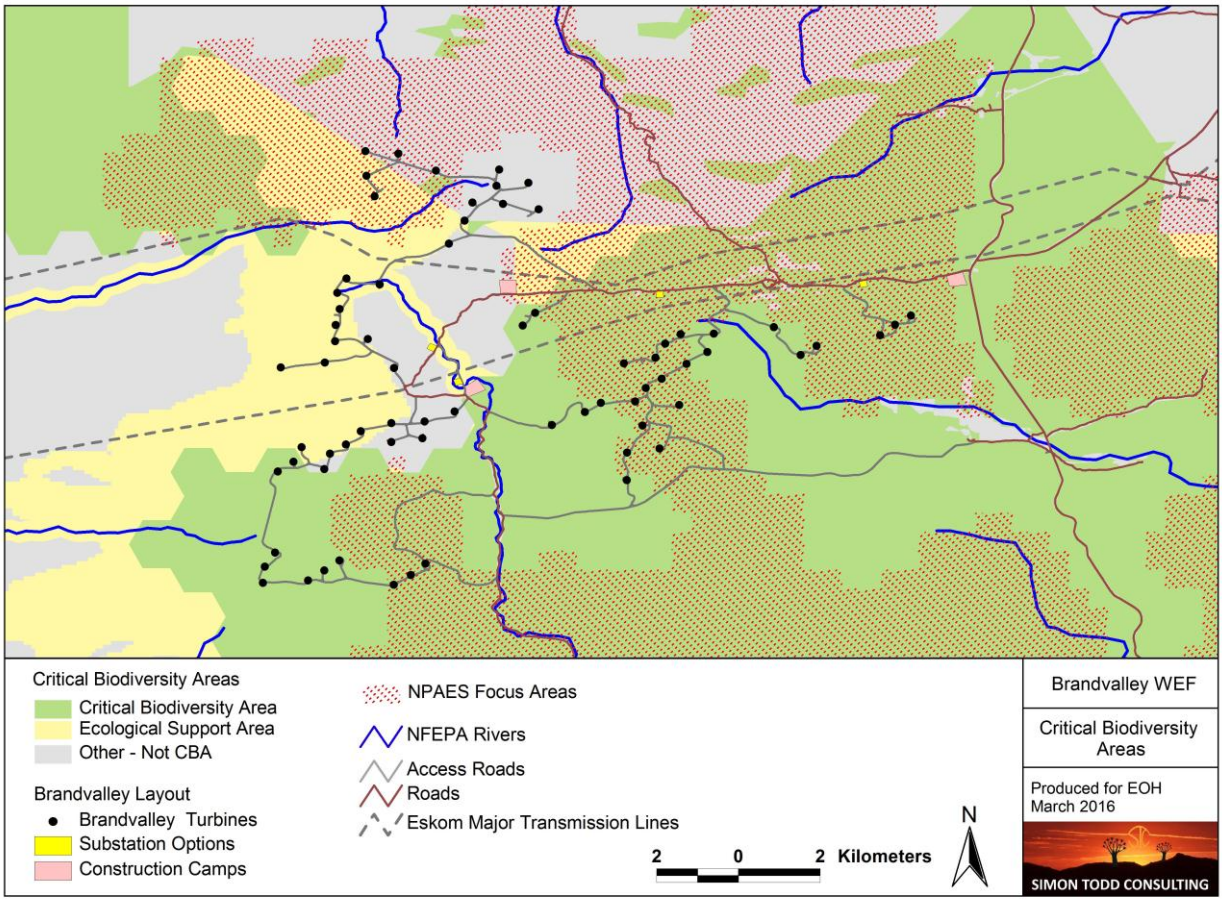


Figure 7-12. Amalgamated Critical Biodiversity Areas map of the proposed Brandvalley Wind Farm and the surrounding area.

The objective of CBAs is to identify biodiversity priority areas which should be maintained in a natural to near natural state. Development within these areas is not encouraged and may not be compatible with the objectives of the CBA. The likely implications and impacts of development within the CBAs and their immediate environment was a concern for the Brandvalley development

and therefore an ecology impact assessment was undertaken to establish why the area has been identified as a CBA and if there are any mitigation measures that can be implemented that can significantly reduce or avoid impacts to the CBAs.

Within the study area, the extensive CBA is based on the fact that the area has been identified as a priority area within the National Protected Area Expansion Strategy for South Africa (NPAES). Therefore, the implications of this is that the impact of the development is likely to be on broad-scale connectivity rather than the direct loss of biodiversity within the development footprint, as well as on future land-use options for the area, which would have reduced potential as a conservation area following development. Within the Northern Cape, the CBAs are associated with south-facing slopes and are based on the assumption that these areas are important as refuges for fauna and flora in the face of climate change. Although there is no impact on CBAs within the Northern Cape, there is a large discrepancy along the Western Cape-Northern Cape boundary in terms of areas defined as CBAs, with most of the Western Cape being classified as CBA and only the south-facing slopes of the Northern Cape being classified as CBA. This is problematic because it is clear that the approach used to derive the CBA maps within each area is not harmonized and the CBA map for the Namakwa District was made at a much coarser scale than that for the CKDM and Winelands. The ultimate effect of this is that the CBA map for the Northern Cape fails to adequately capture the important ecological pattern and process of the area.

Within vegetation types that are highly transformed, CBAs include a large proportion of irreplaceable vegetation fragments that cannot be substituted. However, within the study area, all the vegetation types present are little transformed, with both Koedoesberge-Moordenaars Karoo and Central Mountain Shale Renosterveld being 99% intact. Within semi-arid areas where the majority of vegetation is natural, there are often many choices as to which areas could fall under CBAs and the final solution may be a design issue rather than a clear-cut biodiversity-priority one. Overall, the CBA maps for the study area are considered inadequate for use at a fine scale and the data collected on-site is considered to be of greater weight than the CBA status. This is particularly important with regards to the parts of the site within the Northern Cape, the majority of which is not mapped as CBA, but was observed in the field to be clearly the most sensitive part of the site. Therefore, the CBA status of the site is considered secondary to the actual assessed biodiversity status of the different parts of the site. Within the Western Cape, the higher ridges are identified as the most important and the lower lying areas are generally considered significantly less sensitive. Where CBAs have been designed for connectivity and not to capture high biodiversity areas, they are less vulnerable to habitat loss and in the current case, there are significant gaps in the strings of turbines and it is not likely that the development would disrupt the connectivity of the landscape for the majority of species.

Protected Areas and National Protected Areas Expansion Strategy (NPAES)

A National Spatial Biodiversity Assessment was conducted in 2004, revealing a lack of protection for a representative sample of the country's biodiversity and ecological processes. The NPAES allows for increased conservation of the country's ecological processes in order to meet national biodiversity targets and achieve ecological sustainability. The strategy provides two methods of expanding the current National Protected Areas and highlights ways in which we can become more efficient and effective in natural resource allocation, including (Government of South Africa, 2010):

The declaration of available, under-utilised and strategic parcels of public land in concordance with the relevant legal requirements for disposal of such land; and Implementing contractual agreements with the affected landowners of private land.

An area is considered important for expansion if it contributes to meeting biodiversity thresholds, maintaining ecological processes or climate change resilience. Forty-two (42) focus areas for land-based protected area expansion have been identified within South Africa and are composed of large, intact areas suitable for the creation or expansion of large protected areas. NPAES sets targets for protected area expansion and provides recommendations procedures for achieving increased protection of identified areas.

The project area does not fall within a protected area; however it does fall within the Western Karoo NPAES focus areas of the Western Karoo (Figure 7-11). The impact of the WEF on this was assessed in the ecological impact assessment and key findings are provided in chapter 9.

In terms of the impact of the development on the NPAES Focus Area, the total extent of habitat lost to the current development is not highly significant and would not compromise the overall availability of land to meet conservation goals within the affected NPAES. However, the density of renewable energy developments in the area is high and the cumulative impact of development may have an impact on future conservation options in the area. It is however also pertinent to consider the extent to which wind energy development is compatible with biodiversity conservation. The actual footprint of the development is low and the majority (98%) of the affected area will remain intact. With mitigation and avoidance, the impact on vegetation and plant species can be reduced to an acceptable level and as such, the development can be considered compatible with the maintenance of plant diversity. Although many fauna will become habituated to the turbines and will not be significantly impacted, some fauna are likely to avoid the area on a long-term basis. As a result, the development will have some residual impact on fauna, regardless of mitigation. However, the area is a priority area for flora and there are no faunal species within the development area that are a very high conservation priority, the overall impact on biodiversity features of concern would be relatively low. Furthermore, as the total footprint of the development is low, the potential for future rehabilitation of the area after decommissioning of the facility is high and so in the long-term, the potential future conservation value of the area would remain largely intact.

7.1.6 Fauna

Mammals

At least 50 mammal species potentially occur at Brandvalley WEF (see Appendix G for the ecology impact assessment report). Due to the diversity of habitats available, which includes rocky uplands, densely vegetated kloofs and riparian areas, as well as open plains and low shrublands, the majority of species with a distribution that includes the site are likely to be present in at least part of the broader site. The mammalian community is therefore relatively rich and due to the remote and inaccessible nature of large parts of the area probably has not been highly impacted by human activities aside from livestock grazing.

Medium sized carnivores such as jackal and caracal appear to remain relatively common in the area. The ridges, hills and uplands of the site, with rocky outcrops, rocky bluffs and cliffs provide suitable habitat for species which require or prefer rock cover such as Cape Rock Elephant Shrew, Elephantulus edwardii, Hewitt's Red Rock Hare Pronolagus saundersiae, Namaqua Rock Mouse Micaelamys namaquensis and Rock Hyrax, Procavia capensis. The lowlands contain an abundance of species associated with lowland habitats such as deeper soils and floodplain habitats, which includes Brants's Whistling Rat Parotomys brantsii, the Bush Vlei Rat Otomys unisulcatus, Hairy-footed Gerbil Gerbillurus paeba and Common Duiker Sylvicapra grimmia.

A number of antelope are relatively common at the site and would potentially be impacted by the development. Springbuck are confined by fences and occur only where farmers have introduced them or allowed them to persist and should be considered as part of the farming system rather than as wildlife per se. Both Duiker and Steenbok Raphicerus campestris are adaptable species that are able to tolerate moderate to high levels of human activity and are not likely to be highly sensitive to the disturbance associated with the development. Klipspringer Oreotragus oreotragus and Grey Rhebok Pelea capreolus are present along the ridges and are somewhat more specialized in their habitat requirements. Klipspringer are associated with steep slopes, cliffs and rocky outcrops and of the antelope present may be most vulnerable to impact from the development due to greater overlap between their habitat and the distribution of the wind turbines along the larger ridges and escarpments that would be home to this species. In the short-term it would be affected by construction-related noise and disturbance, while in the longer-term it may avoid the proximity of the turbines which would decrease the available habitat.

The Riverine Rabbit Bunolagus monticularis which is listed as Critically Endangered and is regarded as the most threatened mammal in South Africa is known to occur within the broad area. Populations of this species occur between Sutherland and Fraserburg to the northeast as well as in the Tanqua Karoo to the west. The drainage systems within the site do not contain wide flood plains or alluvial terraces which are the known favoured habitat of the Riverine Rabbit. As a result, it is highly unlikely that this species occurs at the site and an impact on this species is therefore not considered likely.

Reptiles

There is a wide range of habitats for reptiles present at the site, including rocky uplands and cliffs, open flat and lowlands and riparian areas. As a result, the site is likely to have a rich reptile fauna which is potentially composed of seven tortoise species, 16 snakes, 15 lizards and skinks, two chameleons and 11 geckos. The only currently listed species which may occur at the site is the Karoo Padloper Homopus boulengeri which is listed as Near Threatened.

Species observed in the immediate area or on-site include Karoo Tent Tortoise Psammobates tentorius tentorius, Angulate Tortoise Chersina angulata, Marsh Terrapin Pelomedusa subrufa, Puff Adder Bitis arietans, Karoo Girdled Lizard Cordylus polyzonus, Southern Rock Agama Agama atra, Cape Skink Mabuya capensis and Cape Cobra Naja nivea. Tortoises were relatively abundant at the site and a large number of Angulate Tortoises, Chersina angulata were observed as were several Karoo Tent Tortoises, Psammobates tentorius tentorius. Tortoises may be negatively impacted by the development as they are vulnerable to collisions with motor vehicles and predation by avian predators while traversing open areas. Attractive species such as tent tortoises are also vulnerable to collection for use as pets or trade, and the increased accessibility resulting from the new roads that will be constructed as part of the development would raise the risk for these species.

In general, the major impact associated with the development would be habitat loss and fragmentation for reptiles, with the potential for increased levels of predation being a secondary impact which may occur as a result of vegetation clearing for roads and turbine pads. There do not appear to be any reptiles which are specifically restricted to the higher-lying ridges of the site and which would be particularly vulnerable to impact as a result.


Plate 7.6: Common reptiles at the Brandvalley site include the Angulate Tortoise left and the Karoo Girdled Lizard right.

Amphibians

Although there are no perennial rivers at the site, the larger drainage lines in the area were observed to contain rocky, sheltered pools that are likely to contain water on a near-perennial basis. In addition, there are a number of earth farm dams at the site which would also represent important breeding sites for water-dependent species. The amphibian diversity at the site is however likely to be relatively low as the site lies within the distribution range of only nine frog and toad species. No species of conservation concern are known from the area and all the species which may be present are quite widespread species of low conservation concern.

The Karoo Dainty Frog, Cacosternum karooicum is listed as Data Deficient reflecting the little-known distribution and ecology of this species. To date, the Karoo Dainty Frog has been recorded from a few scattered locations across the Karoo in the Western and Northern Cape, but it is likely that it occurs more widely across the karoo in general. The site also falls within the distribution of two other regional endemic species, the Cape Sand Frog, Tomopterna delalandii and the Raucous Toad, Amietophrynus rangeri. The Cape Sand Frog occurs in lowlands and valleys in fynbos and Succulent Karoo throughout most of the Western Cape and into Namaqualand. The Raucous Toad is more widely distributed and occurs throughout much of South Africa inland and along the east coast into Gauteng and Mpumalanga. There do not therefore appear to be any range-restricted species which occur at the site which would be vulnerable to population-level impacts.

In general, the most important areas for amphibians at the site are the riparian areas, seeps and wetlands and the man-made earth dams which occur in the area. As these are widely recognized as sensitive habitats, impacts to these areas are avoided largely at the design phase of the development and a minimum amount of infrastructure has been located in the vicinity of these features. Consequently, direct impacts on amphibians at the site are likely to be fairly low. Amphibians are however highly sensitive to pollutants and the large amount of construction machinery and materials present at the site during the construction phase would pose a risk to amphibians should any spills occur.

7.1.7 Birds

Important Bird Areas (IBAs) – Birdlife International

The Important Bird Areas (IBAs) is a BirdLife International initiative aimed to identify important conservation areas crucial for long-term survival of bird species that are globally threatened, have a restricted range or are restricted to specific biomes and vegetation types. South Africa is part of 101 Global IBAs and 21 Regional IBAs.

The selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensures that the sites selected as IBAs have true significance for the international conservation of bird populations, and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels.

It is crucial to understand why a site is important, and to do this it is necessary to examine its international significance in terms of the presence and abundance of species that occur there, year round or seasonally. At the global level, a set of four categories and criteria are used to assess the significance of the site.

The global IBA criteria are as follows:

A1. Globally threatened species
Criterion: The site is known or thought to hold significant numbers of a globally threatened species, or other species of global conservation concern.
The site qualifies if it is known, estimated or thought to hold a population of a species categorized by the IUCN Red List as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU). In general, the regular presence of a Critical or Endangered species, irrespective of population size, at a site may be sufficient for a site to qualify as an IBA. For VU species, the presence of more than threshold numbers at a site is necessary to trigger selection.

A2. Restricted-range species
Criterion: The site is known or thought to hold a significant component of a group of species whose breeding distributions define an Endemic Bird Area (EBA) or Secondary Area (SA).
This category is for species of EBAs. EBAs are defined as places where two or more species of restricted range, i.e. with world distributions of less than 50 000 km2, occur together. More than 70% of such species are also globally threatened. Also included here are species of SAs.

A3. Biome-restricted species
Criterion: The site is known or thought to hold a significant component of the group of species whose distributions are largely or wholly confined to one biome.
This category applies to groups of species with largely shared distributions of greater than 50,000km2, which occur mostly or wholly within all or part of a particular biome and are, therefore, of global importance.

A4. Congregations
Criteria: A site may qualify on any one or more of the four criteria listed below:
The site is known or thought to hold, on a regular basis, ≥ 1% of a biogeographic population of a congregatory waterbird species.
The site is known or thought to hold, on a regular basis, ≥ 1% of the global population of a congregatory seabird or terrestrial species.
The site is known or thought to hold, on a regular basis, ≥ 20,000 waterbirds or ≥ 10,000 pairs of seabirds of one or more species.
The site is known or thought to exceed thresholds set for migratory species at bottleneck sites.
The proposed project is in close proximity to two IBAs, namely the Anysberg Nature Reserve and the Swartberg Mounatins (see Figure 7-8).

IBA 1: Anysberg Nature Reserve
The Anysberg Nature Reserve, covering an area of 82 310ha, is located 30km south of Matjiesfontein and 20km south-west of Laingsburg within the Western Cape Province. There have been 212 bird species recorded within the Anysberg Nature Reserve, including several Fynbos and Namib-Karoo biome-restricted assemblage species and other arid-zone species. The IBA has a global IBA status and is triggered by five (5) globally threatened species; including the Blue Crane, Ludwig's Bustard, Southern Black Korhaan Afrotis afra, Martial Eagle and Black Harrier. Regionally threatened species found in the area include the Karoo Korhaan, Verreaux's Eagle, Black Stork, Lanner Falcon Falco biarmicus and Cape Rockjumper. Biome-restricted and restricted-range birds that are common to the IBA include Cape Spurfowl, Cape Bulbul and Karoo Chat. Locally common restricted-range or biome-restricted species are Karoo Lark, Layard's Tit-Babbler, Karoo Eremomela and Namaqua Warbler, while uncommon species in this category are Ludwig's Bustard, Sickle-winged Chat Cercomela sinuata, Cape Rockjumper, Victorin's Warbler, Cape Sugarbird, Cape Siskin, Protea Seedeater Crithagra leucoptera, Orange-breasted Sunbird, Pale-winged Starling and Black-headed Canary.

The Anysberg Nature Reserve is Fully Protected and managed by CapeNature.

IBA 2: Swartberg Mountains
The Swartberg Mountains, covering an area of 179 490ha, is located within the Western Cape and Eastern Cape Provinces, parallel to the Outeniqua Mountains IBA. The IBA comprises of fynbos and karroid endemic species with several restricted-range and biome-restricted assemblage species. There are three (3) globally threatened species found in the area include Martial Eagle, Black Harrier and Hottentot Buttonquail. Regionally threatened species include Verreaux's Eagle, Karoo Korhaan, Lanner Falcon, Cape Rockjumper and African Rock Pipit.

Common restricted-range and biome-restricted species consist of Cape Spurfowl and Cape Bulbul, while locally common species are Cape Sugarbird, Orange-breasted Sunbird, Cape Siskin, Karoo Chat, Layard's Tit-Babbler, Black-headed Canary, Pale-winged Starling and Namaqua Warbler. Uncommon biome-restricted species are Victorin's Warbler Cryptillas victorini, Cape Rockjumper, Protea Seedeater, Karoo Lark, Karoo Long-billed Lark, Sickle-winged Chat Cercomela sinuata and Karoo Eremomela.

The Swartberg Mountains IBA is Partially Protected with several reserves and mountain catchment areas managed by CapeNature found within the IBA.

SKEP - Expert Bird Areas (EBA)

The SKEP initiative, provides expert knowledge from a number of taxonomic groups (amphibians, birds, fish, invertebrates, plants, reptiles and small mammals) to supplement the data on biodiversity features gained through systematic conservation planning. This data was used to map the areas of unique habitats, endemism and species richness. This tool was used to determine whether the project area is located in close proximity to EBAs as identified by SKEP.

Figure 7-13 below provides the location of the project area in relation to IBAs and SKEP EBAs. The project area does not fall within an IBA or a SKEP Expert Bird Area. There are, however IBAs and SKEP Expert Bird Areas located relatively close to the project area. There is an IBA and a SKEP EBA located south of the project area, within the Anysberg Nature Reserve, and a SKEP EBA located north of the site, along the edge of Roggeveld Escarpment and the Overberg Pass and an IBA and SKEP EBA location south-east of the project area in the Swartberg Mountains.

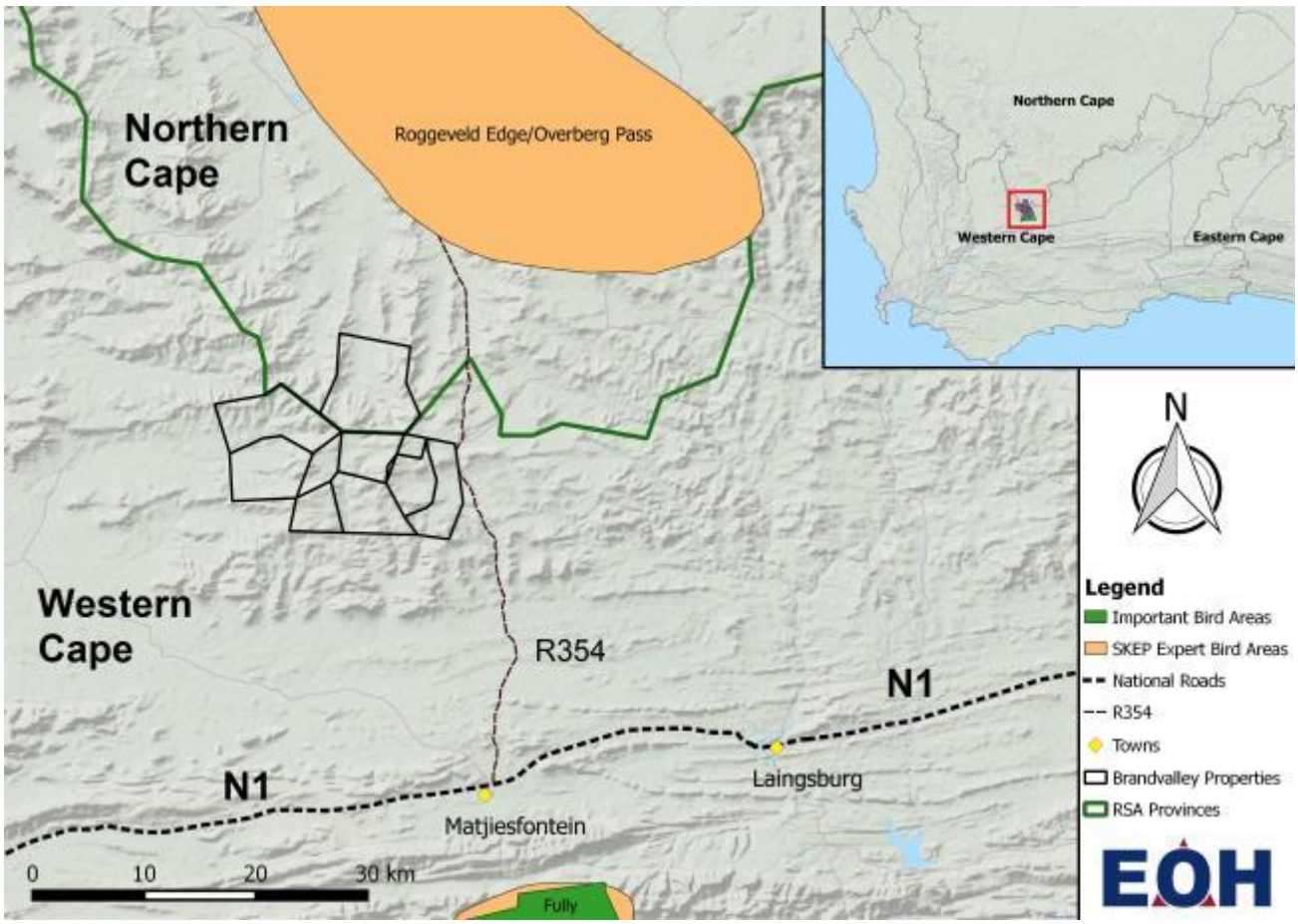


Figure 7-13: IBAs and SKEP EBAs north and south of the proposed project area

7.1.8 12-month pre-construction bird monitoring

The description of the avifauna is based on information collected during the 12-month preconstruction bird monitoring during 2015 - 2016.

Methdology

Four seasonal bird monitoring iterations have already been completed for the project area according to the BirdLife South Africa's guidelines (Jenkins et al., 2015) for pre-construction monitoring, as follows:

- Farm dams were treated as focal sites, including:
- In each seasonal monitoring period, watches by single observers were made from sixvantage points (12 hours per observation) along the hilltops where turbines are proposed.
- Walk transects to record bird species.

- Drive transects conducted by two observers ar a time.

See Figure 7-14 for vantage points, focal points, drive transects and walk transects monitored during this campaign.

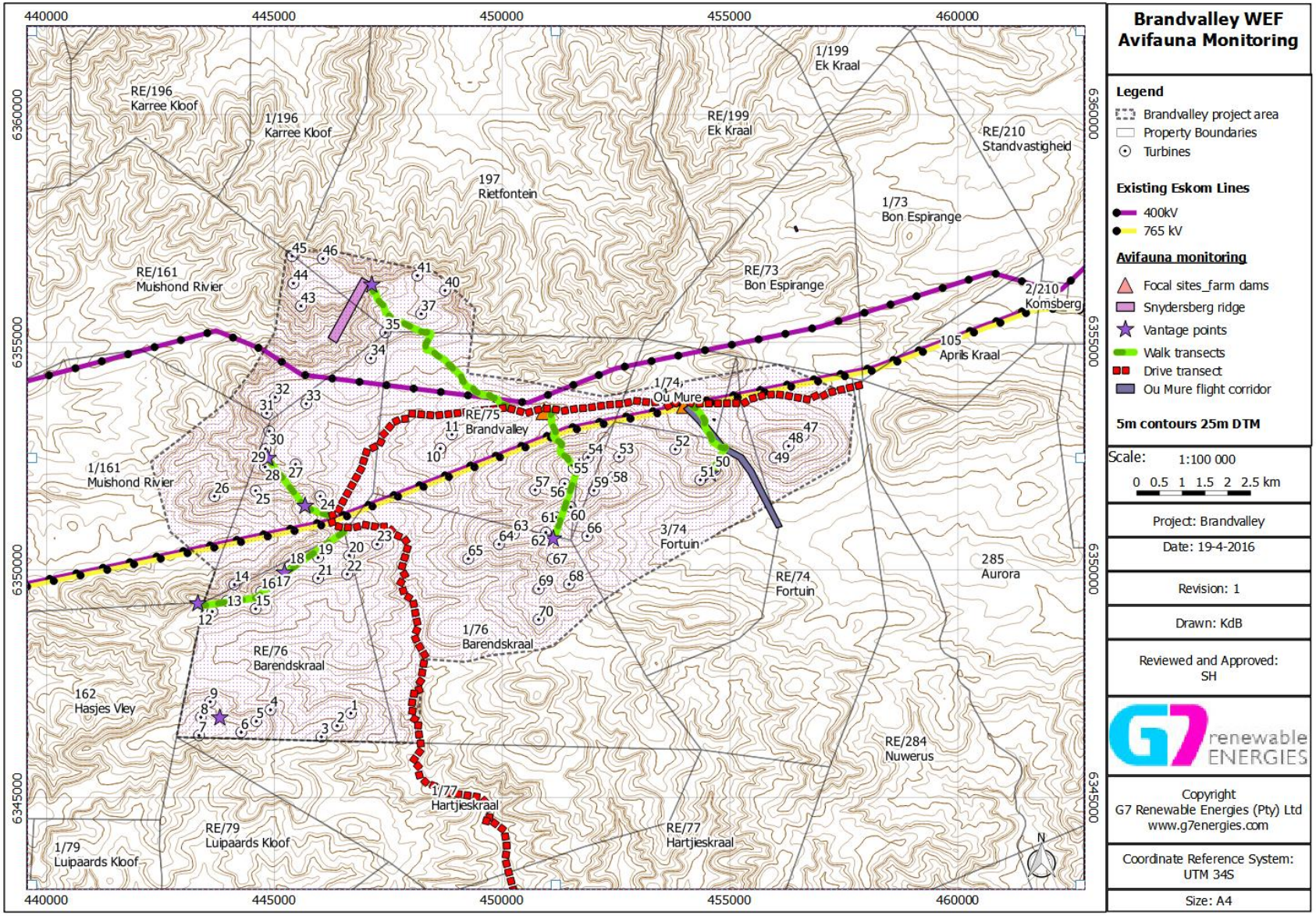


Figure 7.14: Location of Focal sites, drive transect, walk transects and vantage points

Birds of particular concern

In the Brandvalley area five groups of birds are considered to be potentially at risk of collision with turbine blades. These groups are:

a. Large ground foraging species
b. birds of prey;
c. corvids;
d. Other summit species; and
e. Night active birds.

Large ground foraging species

The only large ground foraging species of collision risk concern that were recorded during the four season survey were a single Ludwig's Bustard (Endangered) and Namaqua Sandgrouse (not red listed). Neither species was common.

The single Ludwig's Bustard was seen only once, in the valley near the northern Eskom line. This bustard is a generally lowland foraging species. The greatest collision risk is likely to be with powerlines in the valleys. When these heavily built birds want to fly across ridges to other valleys it is likely that they will use the lowest saddle on the ridge. This would put them at collision risk with any elevated powerlines linking turbine strings. Turbines are considered to be of lower risk potential for this species. Through seasonal surveys of four proposed windfarms across a three-year period in the Roggeveld region Ludwig's Bustards have been recorded only four times and never with more than two individuals at a time. Thus, due to the small data set we lack sufficient knowledge of any routes taken, heights flown, and whether movements are by day or night, all factors that will affect collision risk. However, given the minimal numbers concerned, and the infrequency of occurrence, the risk of collision mortality for this endangered species is considered very low.

The highly distinctive calls of Namaqua Sandgrouse were heard several times in the Brandvalley area and 20 were seen in fields near the farm Ou Mure. In wetter conditions, when forbs grew and produced seeds on the hilltops, flocks of this sandgrouse were quite common on a monitored WEF immediately adjacent to Brandvalley. They often flew along ridges at heights that would bring them into the lower arcs of turbine blades. This species is known to collide with powerlines and so, when the Brandvalley area experiences wetter conditions, sandgrouse must be considered at collision risk both with turbines and powerlines and are likely to be the species most impacted by collisions. Measures are therefore recommended to mitigated this risk.

Birds of prey

Fourteen species of birds of prey have been reported either in the Brandvalley area or on closely adjacent WEFs. Most occur in the valleys where prey is more abundant. In the Brandvalley surveys only four species were recorded at turbine location heights. These were: Verreaux's Eagle, Rock Kestrel, Pale Chanting Goshawk, and Jackal Buzzards. Only the eagle and kestrel were seen with any frequency from vantage points. For both these species many of the recorded flight paths will represent repeated flights by the same individuals – e.g. a kestrel hovering, dropping out of sight and then returning into view or, in the case of the eagle a pair on one day repeatedly circling around the Snydersberg plateaux.

Verreaux's Eagles Aquila verreauxii – Status: Vulnerable. This is the species that has been considered of greatest concern of collision risk with wind turbines in the Roggeveld sub-region. It was one of the two raptor species most commonly observed at or above hilltops. Most summit observations were either brief, as birds flew below summits and out of sight, or the eagles "sky loafed" (prolonged leisurely circling) without any link to ground features and so could not be precisely mapped. It is considered that the total number of individuals recorded in the Brandvalley area was less than six with none clearly resident in the overall Brandvalley area presumably because of the extreme shortage of potential food resources –

no Dassies, few hares and during the survey year no sheep carcasses as all sheep had been moved to valley areas near farmsteads.

All the cliffs visible from within the Brandvalley area were scrutinized for possible nests but none were seen. There is no nearby source of prey (the only active breeding site in the four adjoining WEF areas is close to the only Dassie colony in the same area- some 8 km from the Brandvalley project area). Also, use of the area was spasmodic as indicated in Figure 7.15 below. Thus in the spring survey, there was considerable activity in the Snydersberg area on one day – believed to be repeated passes by the same two individuals – but no activity in the following monitoring period 5 days later. Without association with established nest or roost sites Verreaux's Eagles range widely, especially over areas, like the Roggeveld, where food resources are sparse. Those individual eagles whose position could be related to the ground below favoured areas with steeper slopes.

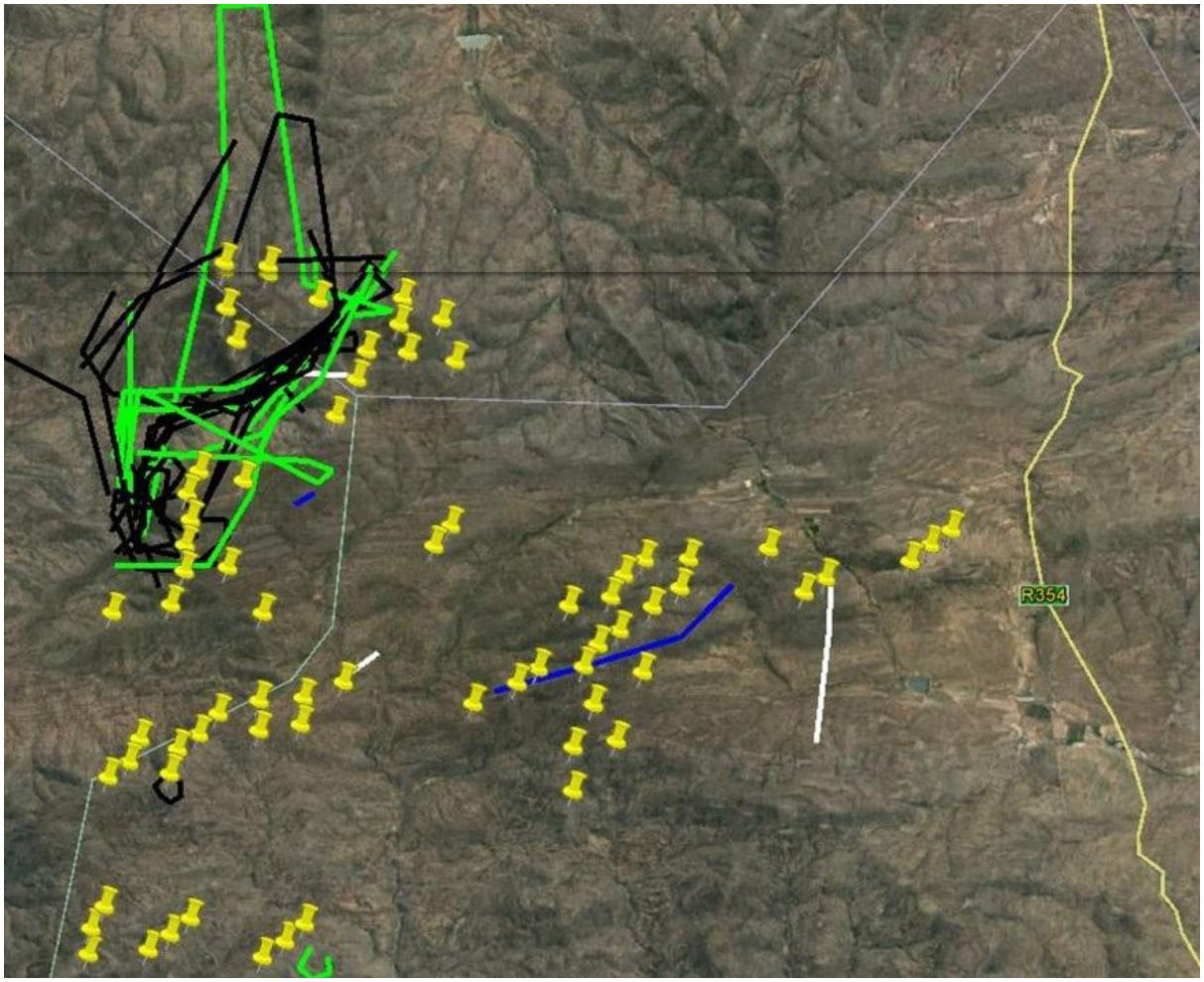


Figure 7.15: Seasonal Verreaux's Eagle flight paths: autumn flights in white, winter flights in black, spring flights in green and summer flights in blue.

Verreaux's Eagles were seen more in winter than in other seasons and only on one day during the summer survey.

Martial Eagle (*Polemaetus bellicosus* –(Pink dot on Figure 7-16) Status: Endangered: The only individual seen was an immature bird observed on one day only, perched on an Eskom pylon during the 2016 summer survey.

Booted Eagle (*Hieraetus pennatus* – (Orange track on Figure 7-16): The only record was in spring when a pair flew along the lower slopes of the ridge that forms the southern edge of the Luiperd valley.

Black Harrier Status: Endangered (Blue track on Figure 7-16). The only observations in the Brandvalley area were of a single bird in the winter survey flying eastwards parallel to the southern Eskom powerline. The pair observed once in spring were close to the southwestern boundary of the Brandvalley southernmost proposed turbine string.

Rock Kestrels (*Falco tinnunculus* – Green tracks on Figure 7-16): These were seen near summits during calmer conditions but more in the valleys during strong winds. Those hovering at summit heights were generally doing so over the upper slopes of adjacent valleys. Direct observations around vantage points indicated a lack of potential prey for kestrels along the hilltops, at least in the dry conditions across the four monitored seasons. Kestrel flights at summits were mainly when birds crossed from one valley to another. During this survey most summit crossings by kestrels were below the predicted turbine blade heights.

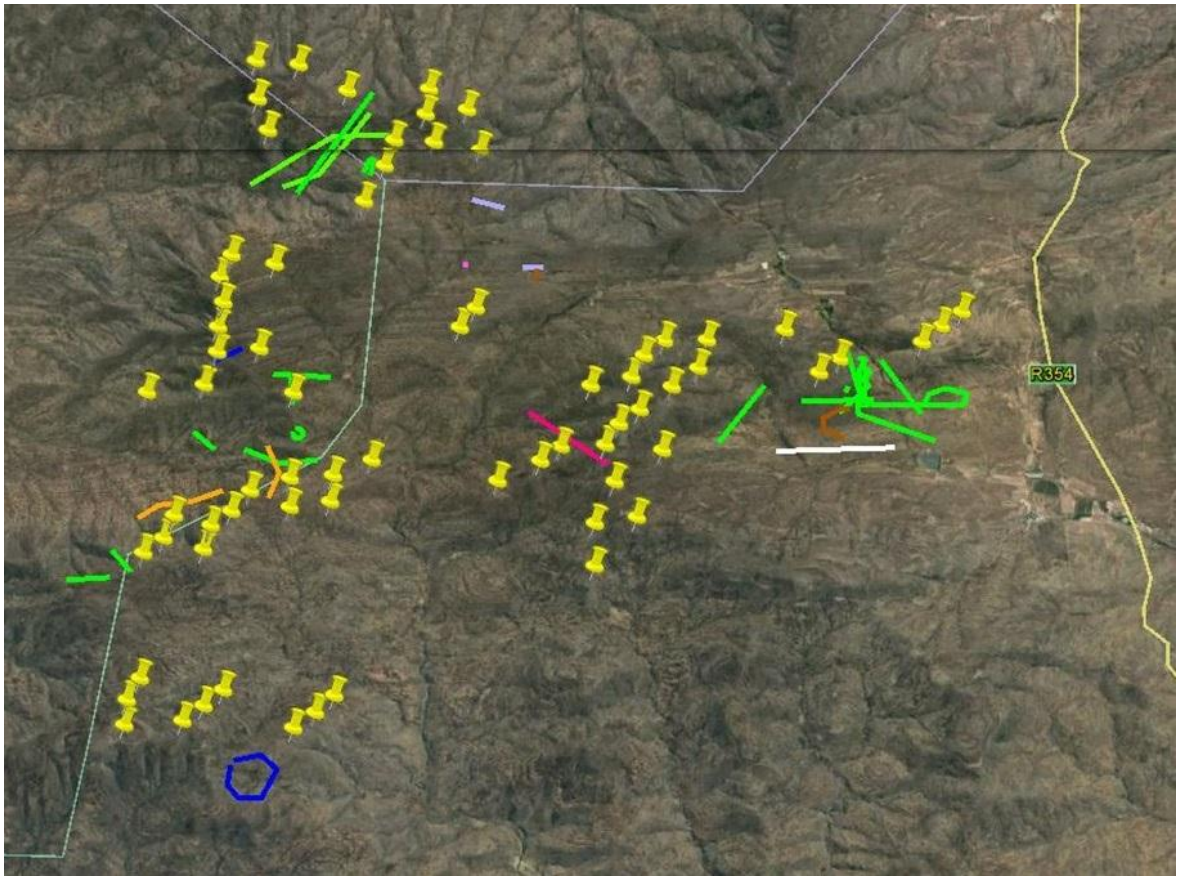


Figure 7-16: All season flight paths of raptors other than Verreaux's Eagles. Legend: Black Harrier – blue; Rock Kestrel – green; Booted Eagle - orange; Pale chanting Goshawk - grey; Martial Eagle - pink; Jackal Buzzard - brown; Steppe Buzzard - white.

Jackal Buzzards (*Buteo rufofuscus* - Brown tracks on Figure 7-17: Individuals were seen in only two seasons. These were during the winter drive transect and in the summer survey when a juvenile was photographed near the Kabeltou gate and an adult flew near the Eskom line north of Brandkop.

Steppe Buzzard (*Buteo buteo* – White track in Figure 7-17): An individual in the summer survey was the only record.

Pale Chanting Goshawk (Grey tracks on Figure 7.17): This species is common in lowland areas outside the Brandvalley area. They were seldom recorded within the area.

Corvids (neither species red-listed)
White-necked Ravens (*Corvus albicollis* - White tracks in Figure 7-17): Members of this species were the birds most widely recorded flying at above hill summit heights. Ravens are

highly intelligent birds, adept at coping with strong and variable winds in mountainous areas. It is considered highly unlikely that they will experience significant mortality through collision with turbine blades. Up to six were seen at a time though usually observations were of single or paired birds. There were concentrations of White-necked Raven flights at two localities across the four seasons. These localities were the same as those used by Rock Kestrels - the saddle between the two Snydersberg plateaux, and of the col in the ridge between the Ou Mure and Fortuin valleys (Figure 10). Noticeably fewer ravens were seen in the hot dry summer survey.

Ravens are winter breeders. In other, better studied, raven species, newly fledged juvenile birds feed on large invertebrates found whilst walking. If this applies to White-necked Ravens then in spring those that have bred successfully must move to lowland areas where, for the juvenile ravens to cope, walking is easier and suitable prey are more abundant. Since collisions are more likely among juvenile than adult birds the likely removal of recently fledged ravens from the ridges will reduce overall collision mortality risk.
As with the Verreaux's Eagle and Rock Kestrel, many of the flight paths represent repeated flights by the same locally operative individuals

Pied Crows (*Corvus albus* - Yellow in Figure 7-17: A few individuals were seen at turbine summit heights. These crows, which are not red-listed, were far less common than ravens and most seemed to be transients passing across, and not resident within, the Brandvalley area.

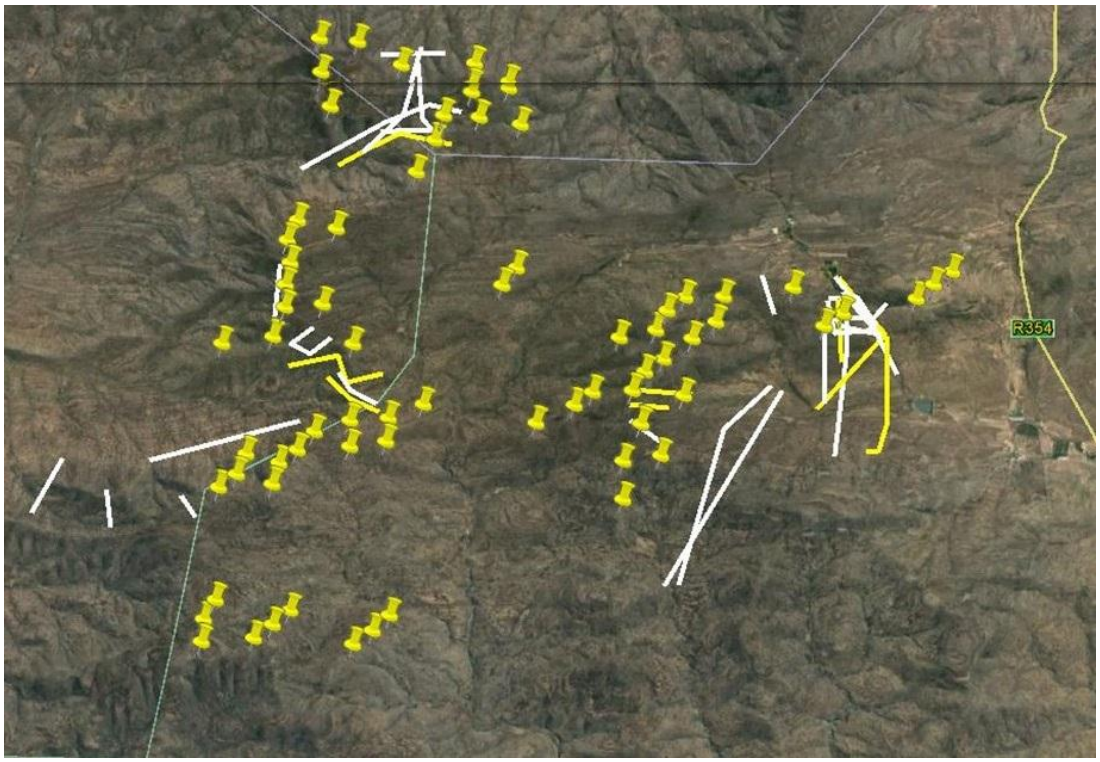


Figure 7.17: All seasons flight paths of corvids.

White-necked Raven – white; Pied Crow - yellow. Note the two areas of concentrated observations: in the northwest where ravens use the saddle between the two Snydersberg plateaux turbine strings; and in the east where ravens used the col in the ridge between the Ou Mure and Fortuin farms.

Other summit species

Odd individuals of several species were recorded on the summits. Seen several times were Cape Bunting, Sickle-winged Chat, Grey-backed Cisticola, Mountain Wheatear, Rock Martin and, in summer, Common Swift. Also occasionally seen were Karoo Prinia, Southern Double-banded Sunbirds, Fiscal Flycatcher, and Cape Penduline Tit. Two pairs of Ground

Woodpeckers were seen once at summit height. None of these species flew at heights that would bring them into collision risk with turbine blades, and most not even at heights that would bring them at risk with the 33kV powerlines linking turbine strings. Noticeably more passerines were seen near the summits on days of calm or low winds days when turbines either would not be operating or with turbine blades moving very slowly.

Night active birds

Diurnal monitoring provides little or no information about the potential risk of birds colliding with turbines or powerlines at night. There are two fundamental types of night activity by birds: foraging and other activities by locally resident species including, in the Roggeveld region, owls, nightjars and thick-knees; and transient, cross-country, movements.

There is unlikely to be any substantial nocturnal use of the hill-top areas by locally active nocturnal bird species as the food resources are too poor to sustain them and the frequent strong winds will deter them. Owls are the most likely to occur but most will remain in the valley bottoms, or forage along the lower slopes, where prey is more abundant. Furthermore, even if they do fly over the ridges, owls are unlikely to fly at turbine blade heights. The two species known or likely to occur in the region take their prey off the ground. They forage in low light conditions when detection of prey, either visually or through hearing, requires them to remain close to the ground.

Birds which are transient across turbine arrays and powerlines are considered at greater risk of collision mortality than birds that are resident in the immediate vicinity of turbines. The risk to transients is increased when their movement is at night. Long distance migrants often fly by night but most do so at heights that will keep them well above turbines even those on the Roggeveld hilltops. Nor is there any particular attraction which would lead them to descend towards this part of the Karoo.

The birds of potentially greatest concern are regionally resident birds that disperse at night. This particularly applies to waterbirds of which, during the wetter 2013 surveys, a surprising number and diversity (>30 species) were recorded on dams in the valleys to the north of Brandvalley. Most waterbirds move between wetlands at night in order to avoid predatory eagles. There is the possibility that, in moving between dams, they would fly across ridges. It is likely that they fly high at night to be able to survey for wetland areas reflecting moonlight. They would thus potentially fly at turbine blade heights. However, in this area the dams lie in relatively deep valleys. It is more likely that, when dispersing, these birds initially fly downstream and so would not cross ridges with their turbine arrays. Their reconnaissance excursions are also likely to be during clear nights and especially during full moon when waterbodies reflect the light and so are more readily detected by birds in flight. These conditions will also illuminate turbines. Most of the waterbird species likely to be involved are not of particular current conservation concern. However, the Maccoa Duck, rated Near threatened, regularly occurs on dams in a valley immediately to the north of the Brandvalley WEF area and can be expected to sometimes fly from there to the Fortuin dam and so across the north-eastern portion of the Brandvalley WEF. It is likely that, especially in headwind conditions, night dispersing birds cross ridges at their lowest points, saddles. The predicted localities of greatest risk for waterbirds will be the saddle where the road from Leeustert to Ou Mure crosses the Spitskop ridge and the col in the ridge between the Ou Mure and Fortuin farm areas. Overall, at this stage of our understanding, the risk of nocturnal collisions is considered to be low and within acceptable levels.

Bird nests

No raptor nest sites were located, nor, with one exception, was any raptor activity seen that indicated a breeding site. The exception was the chasing away of a Pale Chanting Goshawk by a pair of Black Harriers from a valley just outside the Brandvalley area in the spring survey. That the pair was involved in the chase indicates that breeding had not commenced. This area was revisited in the summer survey in January 2016 when no indication of

breeding was found. Given the extremely dry conditions it is unlikely that breeding would have been attempted.

Plate 7-7: View westwards to the Barendskraal plateau (highest area left of centre). The pair of Black Harriers was seen in the bushy vegetated valley on the extreme left middle distance. The road is the one that was followed by drive transects. Note the gently sloped moorland with no substantial cliffs.

All cliffs that might potentially have raptor nests were scrutinized. None of these cliffs housed old or new nests. Most were unsuitable for raptor nests. Many cliffs were a single rock stratum high, and so usually with less than three meter of exposed rock, and accessible to potential predators (including baboons). In the case of taller cliffs most either had overhanging upper strata and lacked ledges, or faced south and so would never be sun warmed during the winter, when most resident birds of prey would breed.

Plate 7.8: Cliffs around the western Snydersberg plateau. Note the tendency for upper strata to overhang slightly hence the lack of ledges suitable for nests, and the small, < 5-7 m, cliff faces.

7.1.9 Bats

Most South African bats are insectivorous and are capable of consuming vast quantities of insects on a nightly basis, however, they have also been found to feed on amphibians, fruit, nectar and other invertebrates. As a result, insectivorous bats are the predominant predators of nocturnal flying insects in South Africa and contribute greatly to the suppression of these numbers. Their prey also includes agricultural pests such as moths and vectors for diseases such as mosquitoes.

Urban development and agricultural practices have contributed to the deterioration of bat populations on a global scale. Many bat species roost in large communities and congregate in small areas. Therefore, any major disturbances within and around the roosting areas may adversely impact individuals of different communities, within the same population, concurrently. Secondly, nativity rates of bats are much lower than those of most other small mammals. This is because, for the most part, only one or two pups are born per female per annum and according to O'Shea et al. (2003), bats may live for up to 30 years, thereby limiting the amount of pups born due to this increased life expectancy. Under natural

circumstances, a population's numbers may accumulate over long periods of time. This is due to the longevity and the relatively low predation of bats when compared to other small mammals. Therefore, bat populations are not able to adequately recover after mass mortalities and major roost disturbances (Marais, 2016).

A confounding number of bat fatalities have been found at the bases of wind turbines throughout the world. Echolocating bats should be able to detect moving objects better than stationary ones, questioning the common occurrence of bat deaths caused by wind turbines. Bat fatalities at wind power facilities are highly variable throughout the year, but there are commonly more bat fatalities than bird fatalities at WEFs (Brinkman et al., 2006). Importantly, bat studies have been done in Europe and the United States of America, but little has been conducted in South Africa. These studies have found that even a few deaths can be seriously detrimental to bat populations, and is thus cause for concern (Hotker et al., 2006). Most bats are struck during periods of migration or dispersal (Hotker et al., 2006; Johnson et al., 2003). Horn et al. (2008) conducted a study on the behavioural responses of bats to wind turbines and discovered the following:

- Bats actively forage near operating turbines
- Bats approach both rotating and non-rotating blades
- Bats followed or were trapped in blade-tip vortices
- Bats investigated the various parts of the turbine with repeated fly-bys
- Bats were struck directly by rotating blades

These behavioural responses of bats to wind turbines explains why many of them are killed, however, there are additional explanations for this behaviour. There are several reasons proposed for the number of bat fatalities, one is that the turbines attract insects, and thus foraging insect-eating bats (Ahlen 2003, Kunz et al. 2007). Alternatively, bats may mistake turbines for trees when they are looking for a roost, or be acoustically attracted to the wind turbines (Kunz et al. 2007). The cause of death is not entirely explained by collision with turbine blades, but instead is caused by internal haemorrhaging. Most bats are killed by barotrauma, which is caused when bats enter low pressure air zones created by turning wind blades fatally affecting their respiratory system. Barotrauma "involves tissue damage to air-containing structures caused by rapid or excessive pressure change".

The bats species list was run through the IUCN, NEM:BA and PNCO databases. All the bat species with distributions that occur within the project area are listed as Schedule II species according to both the Northern Cape and Western Cape PNCO and only the Common Bentwing Bat (Miniopterus schreibersii) is listed as Near Threatened according to IUCN (Table 7-3).

Table 7-3: Showing bat species that have a distribution which co-insides with the project area (Stuart and Stuart, 2007). Species List was assessed against IUCN Red List, NEM: BA, Northern Cape PNCO and Western Cape PNCO.

Family	Scientific Name	Common name	IUCN Red List status	NEMBA	Northern Cape PNCO	WC PNCO
Vespertilionidae	Eptesicus hottentotus	Long-tailed House Bat	Least Concern	-	Schedule II	Schedule II
Vespertilionidae	Miniopterus schreibersii	Common Bentwing Bat	Near Threatened	-	Schedule II	Schedule II
Vespertilionidae	Myotis tricolor	Cape Hairy Bat	Least Concern	-	Schedule II	Schedule II
Vespertilionidae	Neoromicia capensis	Cape Bat	Least Concern	-	Schedule II	Schedule II
Nycteridae	Nycteris thebaica	Egyptian Slit-faced Bat	Least Concern	-	Schedule II	Schedule II
Rhinolophidae	Rhinolophus capensis	Cape Horseshoe Bat	Least Concern	-	Schedule II	Schedule II
Rhinolophidae	Rhinolophus clivosus	Geoffroy's Horseshoe Bat	Least Concern	-	Schedule II	Schedule II
Molossidae	Tadarida aegyptiaca	Egyptian Free-tailed Bat	Least Concern	-	Schedule II	Schedule II

7.1.10 Findings from the 12-month bat monitoring campaign

The following description of the bats present within the focus area are based on information collected during the 12-month preconstruction bat monitoring conducted in 2015 - 2016. The total developable area for the Brandvalley project referred to as the development area, where turbines may be moved to during possible layout iterations, amounts to a total of 1 113.9 ha.

Three factors need to be present for most South African bats to be prevalent in an area: availability of roosting space, food (insects/arthropods or fruit), and accessible open water sources. However, the dependence of a bat on each of these factors depends on the species, its behaviour and ecology. Nevertheless, bat activity, abundance and diversity are likely to be higher in areas supporting all three above mentioned factors.

The site is evaluated by comparing the amount of surface rock (possible roosting space), topography (influencing surface rock in most cases), vegetation (possible roosting spaces and foraging sites), climate (can influence insect numbers and availability of fruit), and presence of surface water (influences insects and acts as a source of drinking water) to identify bat species that may be impacted by wind turbines. These comparisons are done chiefly by studying the geographic literature of each site, available satellite imagery and observations during site visits. Species probability of occurrence based on the above mentioned factors are estimated for the site and the surrounding larger area.

General bat diversity, abundance and activity are determined by the use of a bat detector. A bat detector is a device capable of detecting and recording the ultrasonic echolocation calls of bats which may then be analysed with the use of computer software. A real time expansion type bat detector records bat echolocation in its true ultrasonic state which is then effectively slowed down 10 times during data analysis. Thus the bat calls become audible to the human ear, but still retains all of the harmonics and characteristics of the call from which bat species with characteristic echolocation calls can be identified. Although this type of bat detection equipment is advanced technology, it is not necessarily possible to identify all bat species by just their echolocation calls. Recordings may be affected by the weather conditions (i.e. humidity) and openness of the terrain (bats may adjust call frequencies). The range of detecting a bat is also dependent on the volume of the bat call. Nevertheless, it is a very accurate method of recording bat activity.

Methdology

Bat activity were monitored using active and passive bat monitoring techniques. Active monitoring was done through site visits with transects made with a vehicle mounted bat detector, and passive detection were done through the mounting of passive bat monitoring systems. A total of six systems were installed, three on met masts each with microphones at 10m and 80m, and three on 10m short masts as indicated in Figure 7.18 below. Each detector was set to operate in continuous trigger mode from dusk each evening until dawn (times were correlated with latitude and longitude).

The movements of SM 1 to Brandkop and SM7 to Snydersberg increased additional monitoring of bats at height and therefore in applicable airspace, whilst retaining a microphone at 10m for continuity. The SM1 and Brandkop locations are very close to each other and therefore the data can be considered as identical. SM7 and Snydersberg have similarities in habitat to each other, and the benefit of additional microphones at height motivates this movement.

The data was analysed by classifying (as near to species level as possible) and counting positive bat passes detected by the passive systems. A bat pass is defined as a sequence of ≥1 echolocation calls where the duration of each pulse is ≥2 ms (one echolocation call can consist of numerous pulses). A new bat pass is identified by a >500ms period between pulses. These bat passes were summed into 10 minute intervals which were used to calculate nocturnal distribution patterns over time. Bat activity were grouped into 10 minute periods. Only nocturnal, dusk and dawn values of environmental parameters from the wind data were used as this is the only time insectivorous bats are active. Times of sunset and sunrise were adjusted with the time of year.

The bat activity was correlated with the environmental parameters; wind speed and air temperature, to identify optimal foraging conditions and periods of high bat activity.

There are several bat species in the vicinity of the site that occur commonly in the area. These species are of importance based on their likelihood of being impacted by the proposed WEF, due to high abundances and certain behavioural traits:

- *Miniopterus natalensis,* also commonly referred to as the Natal long-fingered bat, occurs widely across the country but mostly within the southern and eastern regions and is listed as Near Threatened.
- The Egyptian Free-tailed Bat, *Tadarida aegyptiaca*, is a Least Concern species as it has a wide distribution and high abundance throughout South Africa, and is part of the Free-tailed bat family (Molossidae). It occurs from the Western Cape of South Africa, north through to Namibia and southern Angola; and through Zimbabwe to central and northern Mozambique. This species is protected by national legislation in South Africa (ACR 2010).
- *Neoromicia capensis* is commonly called the Cape serotine and has a conservation status of Least Concern as it is found in high numbers and is widespread over much of Sub-Saharan Africa.

Sensitive areas were identified by considering all data collected during the 12-month monitoring campaign. Figure 7.18 depicts the sensitive areas of the site, based on features identified to be important for foraging and roosting of the species that are most probable to occur on site. Thus the sensitivity map is based on species ecology and habitat preferences. This map can be used as a pre-construction mitigation in terms of improving turbine placement with regards to bat preferred habitats on site.

Table 7-4: Description of sensitivity categoies utilised in the sensitivity map

Sensitivity	Description
Moderate Sensitivity	Areas of foraging habitat or roosting sites considered to have significant roles for bat ecology. Turbines within or close to these areas must acquire priority (not excluding all other turbines) during pre/post-construction studies and mitigation measures, if any is needed.
High Sensitivity	Areas that are deemed critical for resident bat populations, capable of elevated levels of bat activity and support greater bat diversity than the rest of the site. These areas are 'no-go' areas and turbines must not be placed in these areas.

Areas not depicted as having a Moderate or High Bat Sensitivity is considered of a Low Bat Sensitivity category.

Table 7-6: Turbines located within bat sensitive areas and their respective buffers

Bat sensitive area	Turbine number
High sensitivity	None
High sensitivity buffer	None
Moderate sensitivity	None
Moderate sensitivity buffer	Turbines 14, 28 – 31, 42 – 45

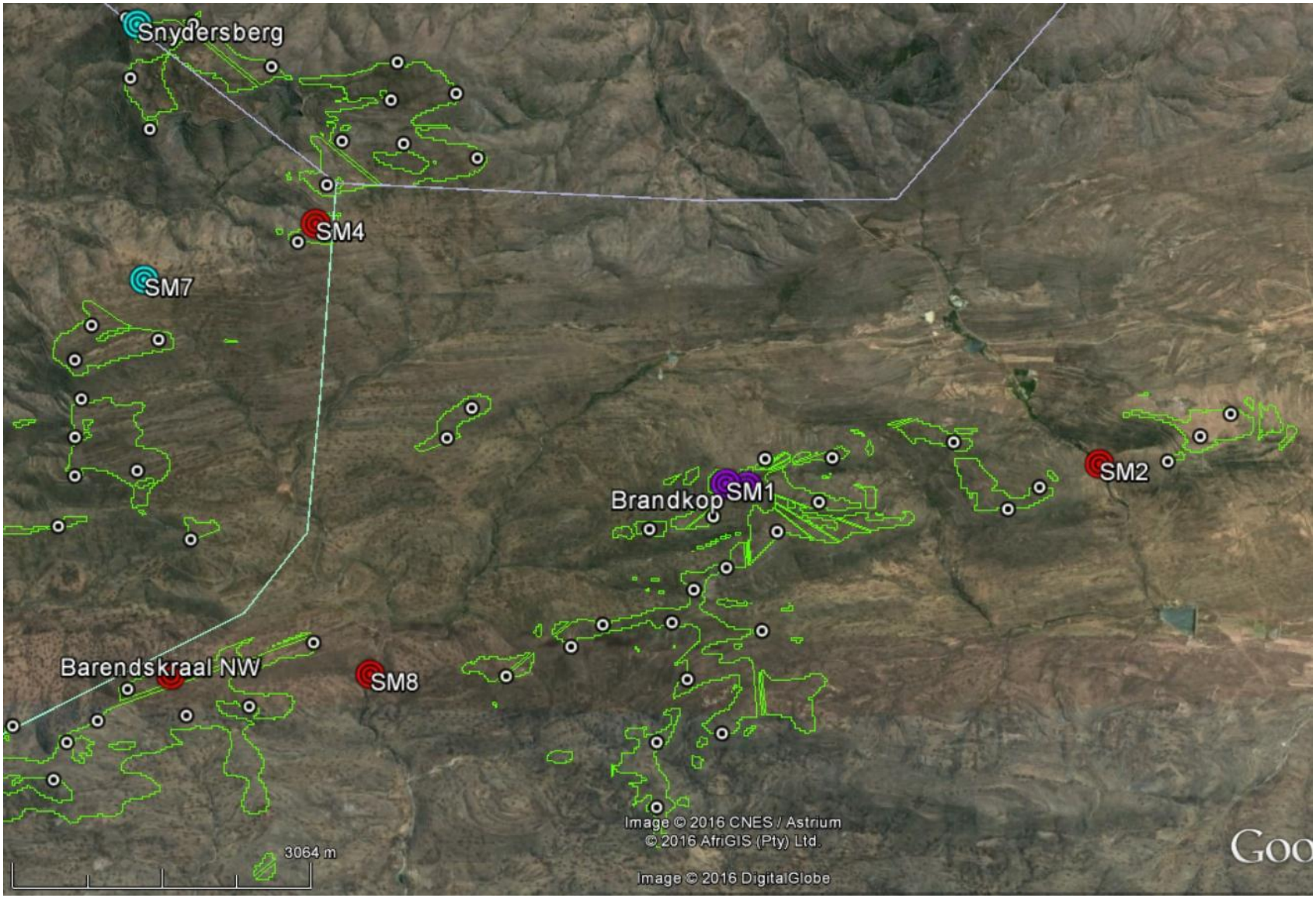


Figure 7.18: Change in location of SM 1 moved to Brandkop, and SM7 moved to Snydersberg.

7.1.11 Surface water features

The proposed development occurs within the following catchments within the Nama Karoo ecoregion as indicated on Figure 7.18:

1. E23A – Wilgebos / Kleinpoorts tributaries of the Tankwa River
2. E22B – Muishond River
3. E22A – Groot River
4. J11D – Roggeveld River

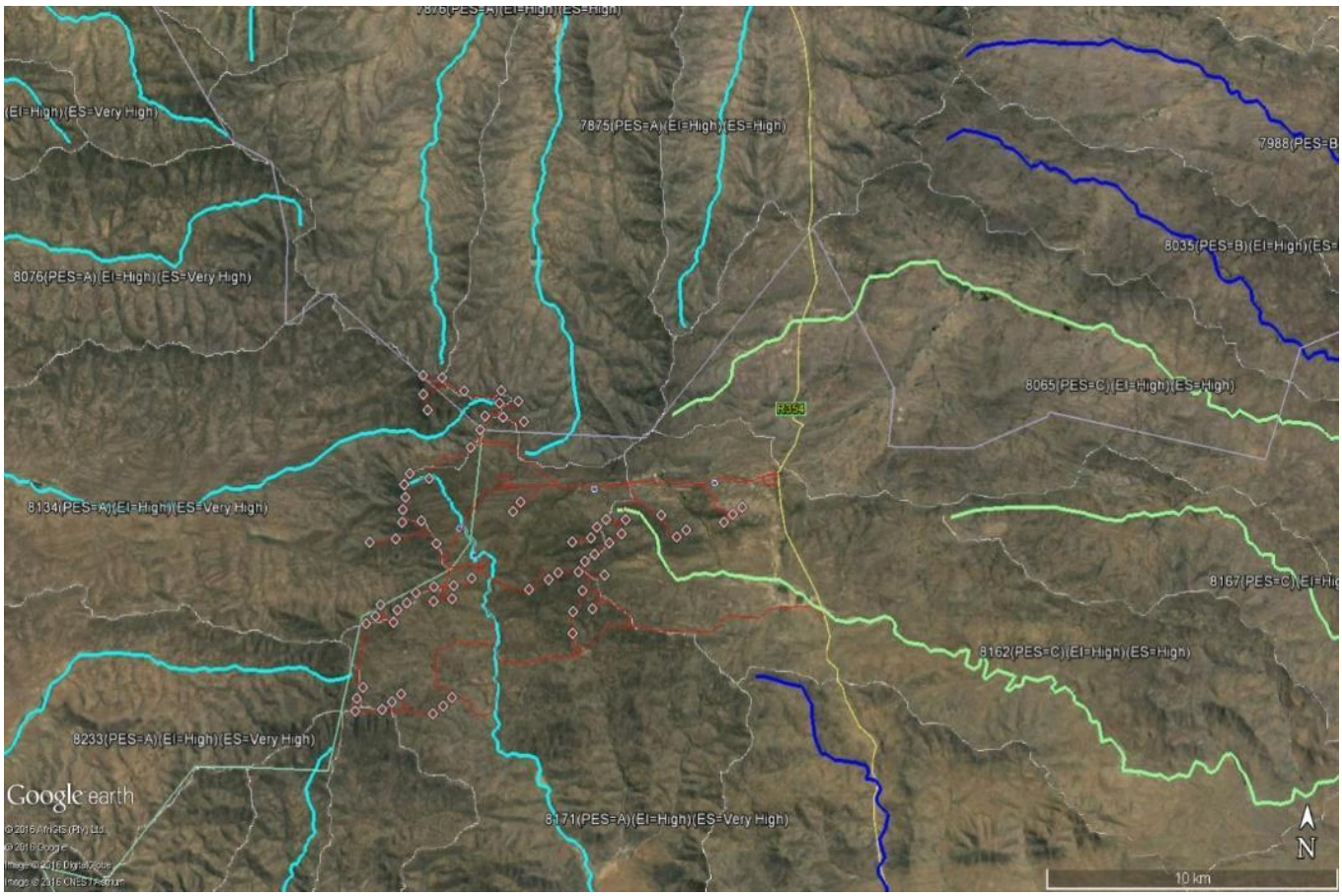
These catchments are characterised by several perennial water courses and drainage lines associated with the mainstem systems listed above.

An aquatic impact assessment was undertaken to identify the surface water features within these catchments and determine the state of these features. Information was also collected to determine the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS). Present Ecological State is a term for the current ecological condition of the resource. Ecological Importance and Sensitivity (EIS) are the terms used to describe the rating of the any given wetland or river reach that provides an indication of the ecological importance of the aquatic system using criteria such as conservation needy habitat or species, protected ecosystems or unique habitat observed. The sensitivity is then derived by assessing the resilience the habitat exhibits under stress as a result of changes in flow or water quality. These analyses were based on the models developed by the Department of Water and Sanitation, with the results producing ratings (A – F), descriptions for which are summarised in Table 7.7.

Table 7-7: Description of A – F ecological categories based on Kleynhans et al., (1999).

ECOLOGICAL CATEGORY	ECOLOGICAL DESCRIPTION	MANAGEMENT PERSPECTIVE
A	Unmodified, natural.	Protected systems; relatively untouched by human hands; no discharges or impoundments allowed
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	Some human-related disturbance, but mostly of low impact potential
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	Multiple disturbances associated with need for socio-economic development, e.g. impoundment, habitat modification and water quality degradation
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	Often characterized by high human densities or extensive resource exploitation. Management intervention is needed to improve health, e.g. to restore flow patterns, river habitats or water quality
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	

The Present Ecological State scores (PES) for the drainage lines and the watercourses in the study area were rated as follows (DWS, 2014 – where A = Natural or Close to Natural & C = Moderately Modified):



Subquaternary Catchment Number	Present Ecological State	Ecological Importance	Ecological Sensitivity
8162	C	High	High
8171	A	High	Very High
8258	A	High	Very High
8233	A	High	Very High
8134	A	High	Very High
7876	A	High	High
7875	A	High	High

It is thus evident that the study area mainstem systems (rivers/water courses) are largely functional and or **have limited** impacts as a result of current land use practices. In other words, the systems observed are largely natural, with small or narrow riparian zones, dominated by Searsia lancea and Vachellia karroo. The only obligate species observed include small areas of Juncus rigidus and Phragmites australis associated with small pools created by road culverts found throughout the study area. Thus the DWS 2014 assessment for each of the study area systems is supported and the current ratings can be upheld for both the mainstem rivers / watercourses but also for the any systems occurring within the subquaternary catchments within the study area.

According to the National Freshwater Ecosystems Priority Area (NFEPA) wetland data, several large natural wetlands could occur within the study area. While the remaining waterbodies are artificial or man-made systems such as dams. However, the natural wetlands observed within the study area, as the potential wetlands observed were either farm dams / borrow-pits, are Juncus (Sedge) dominated valley bottom wetlands, some containing channels, while others, those associated with broader floodplains have no channels. These wetland areas, were dominated by impacts such as the dam, and the conversion to agricultural lands, thus most were Moderately Modified (PES = C), Largely Modified (PES = D) or somewhere between (PES = C/D) (see Figure 7-20b and Figure 7-20c).

These systems do still contain value in terms of acting as sponge areas within an arid environment, providing additional aquatic habitat (mostly for birds) and filtering any runoff due peak flow periods. For this reason, all the wetlands were rated as having a Moderate EIS Score.

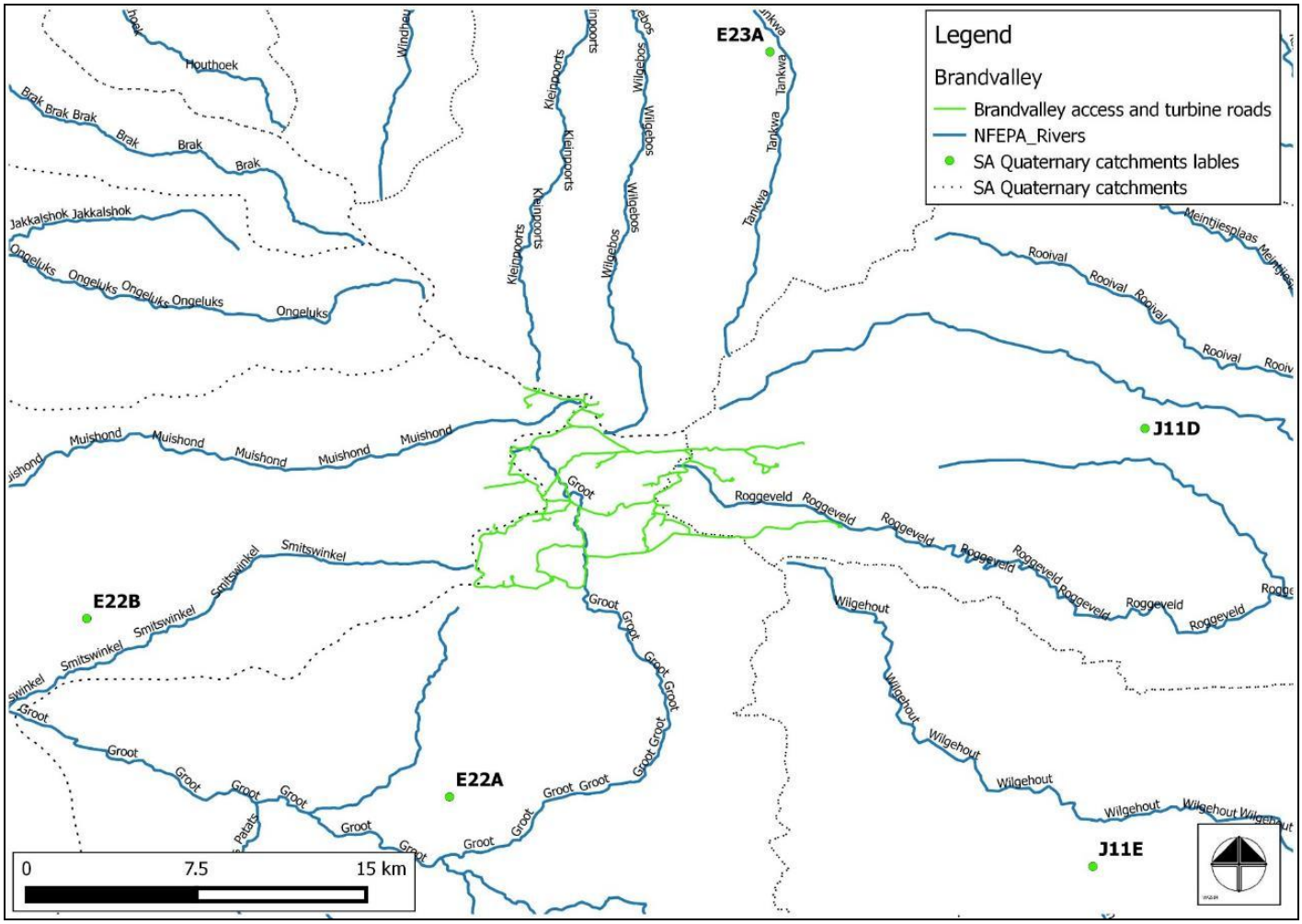


Figure 7.19: The project locality in relation to the various Quaternary Catchments and mainstem rivers as shown by NFEPA

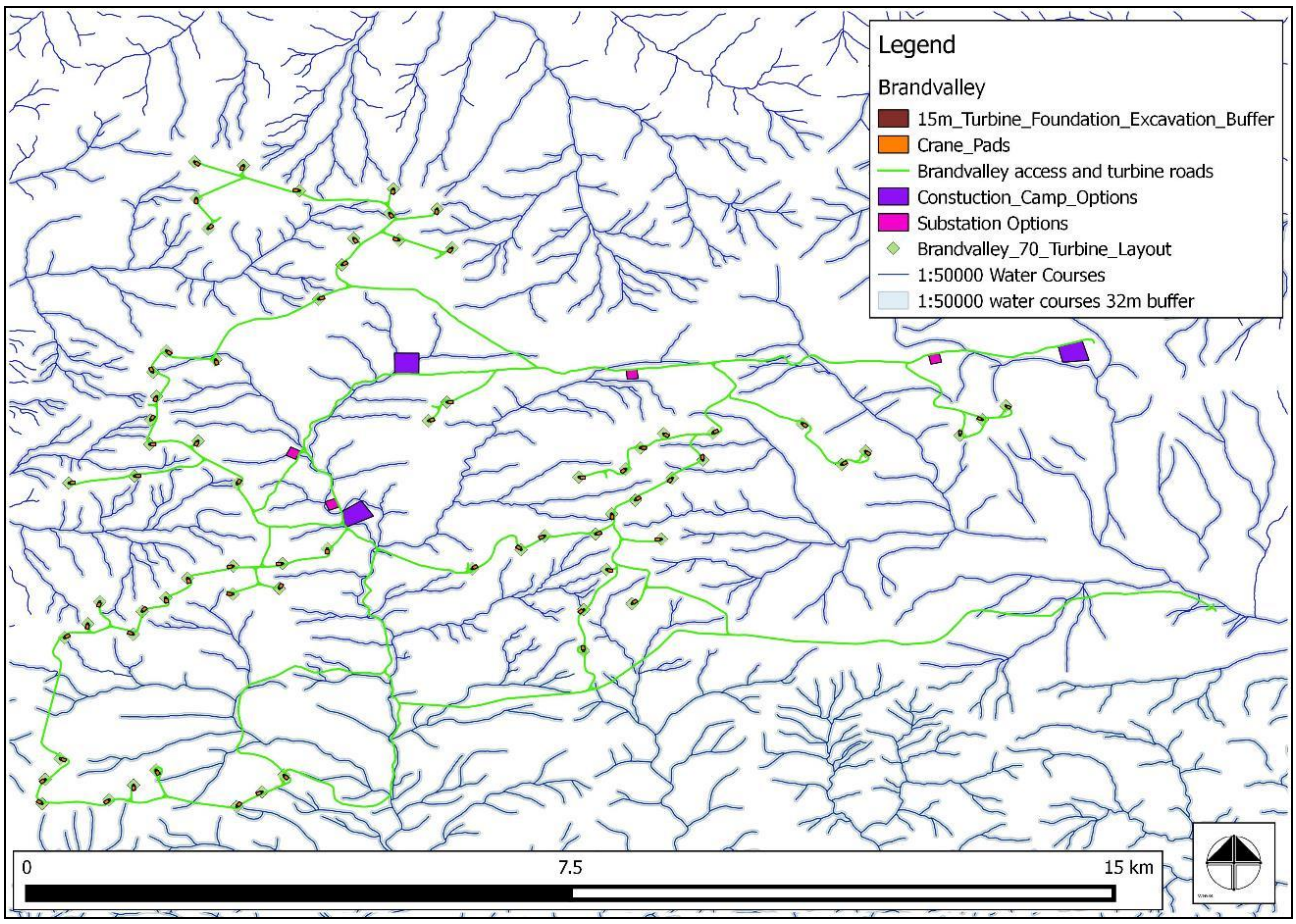


Figure 7-20a: The project locality in relation the known watercourses within the study area.

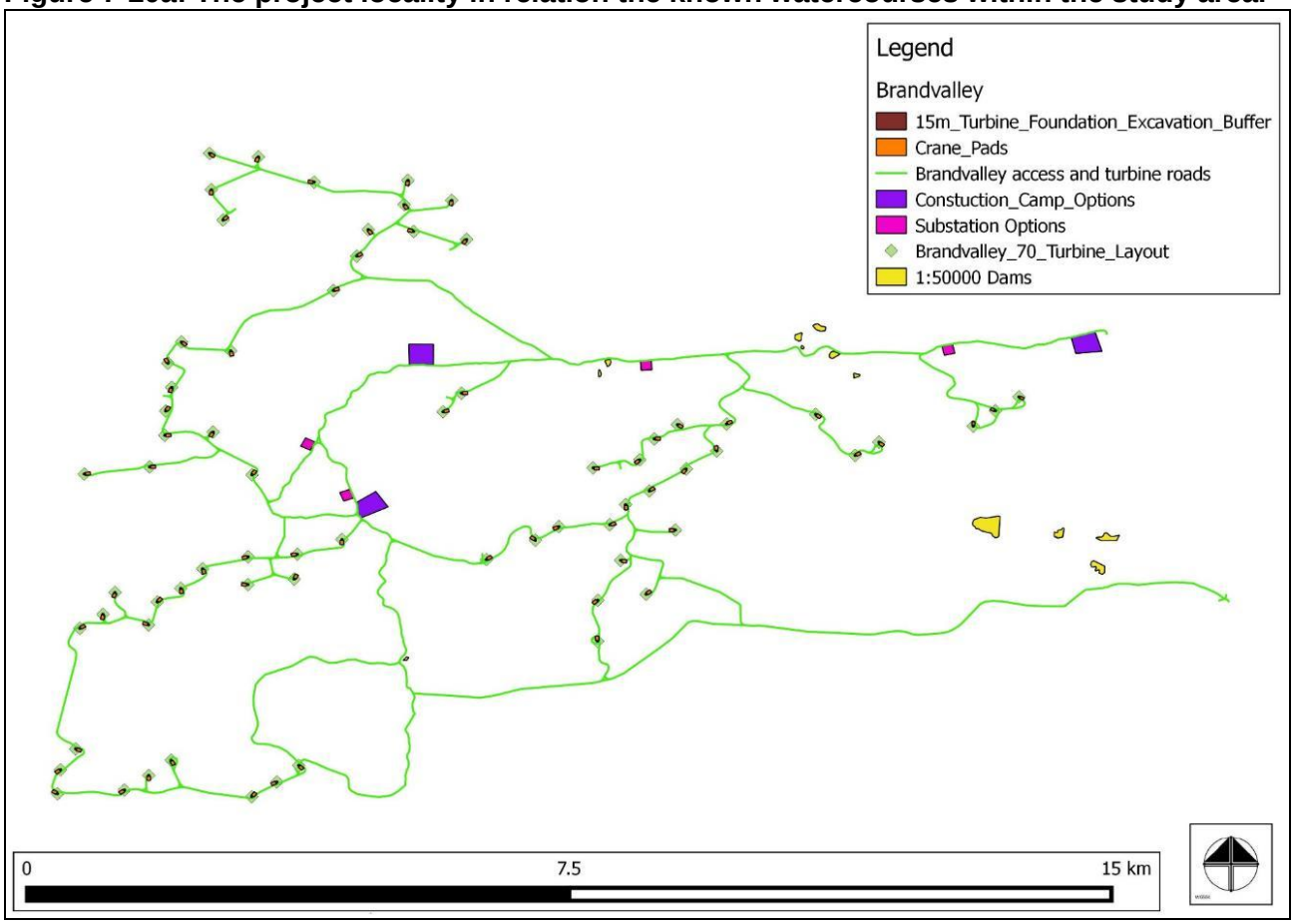


Figure 7-20b: The project locality in relation the known artificial dams within the study area.

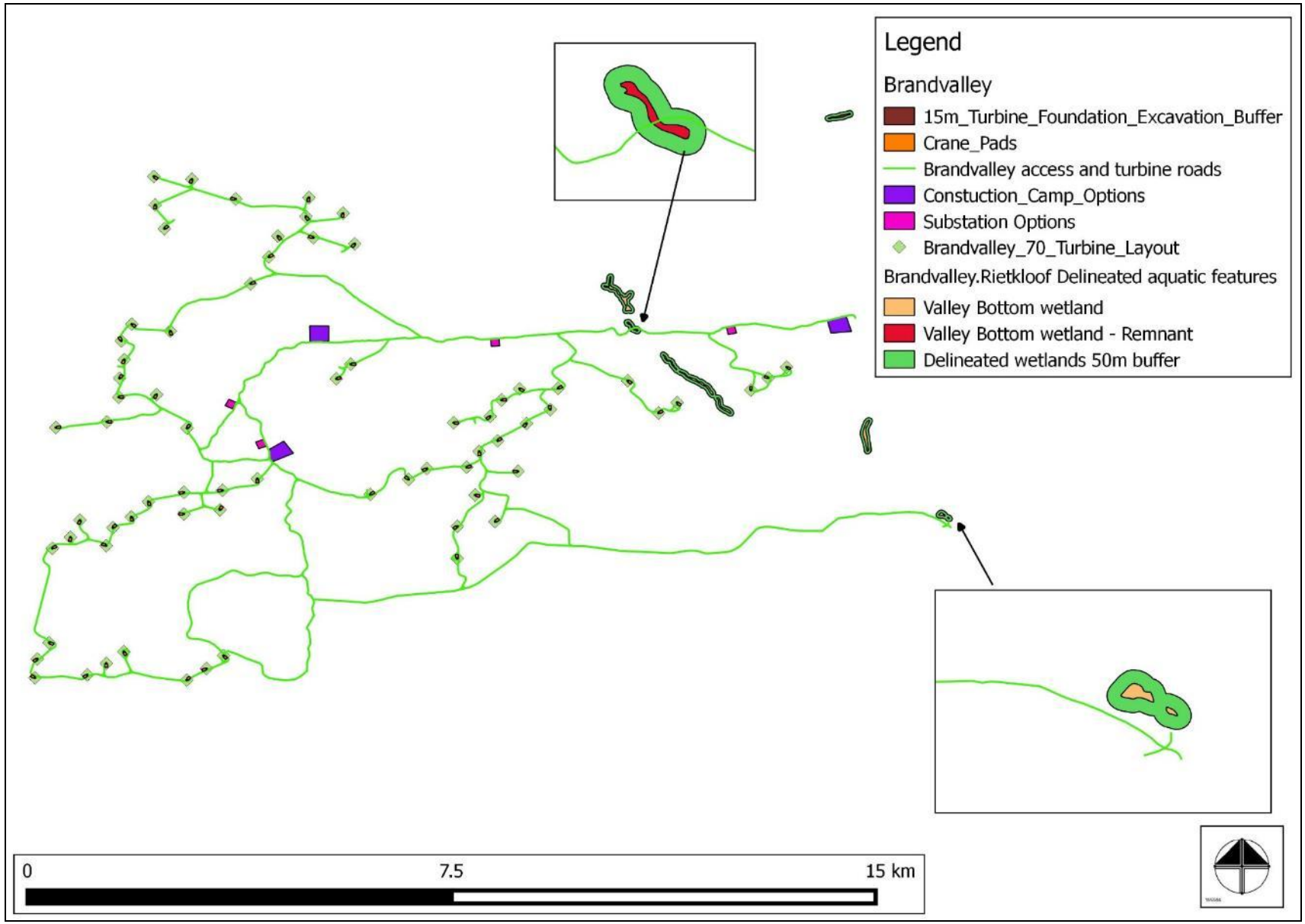


Figure 7-20c: The project locality in relation the delineated natural wetlands observed within the study area together with the assessed PES for the respective wetlands.

The project locality in relation the Freshwater Ecosystems Priority Areas (Nel et al., 2011) indicating both artificial and natural wetlands (Figure 18.d)

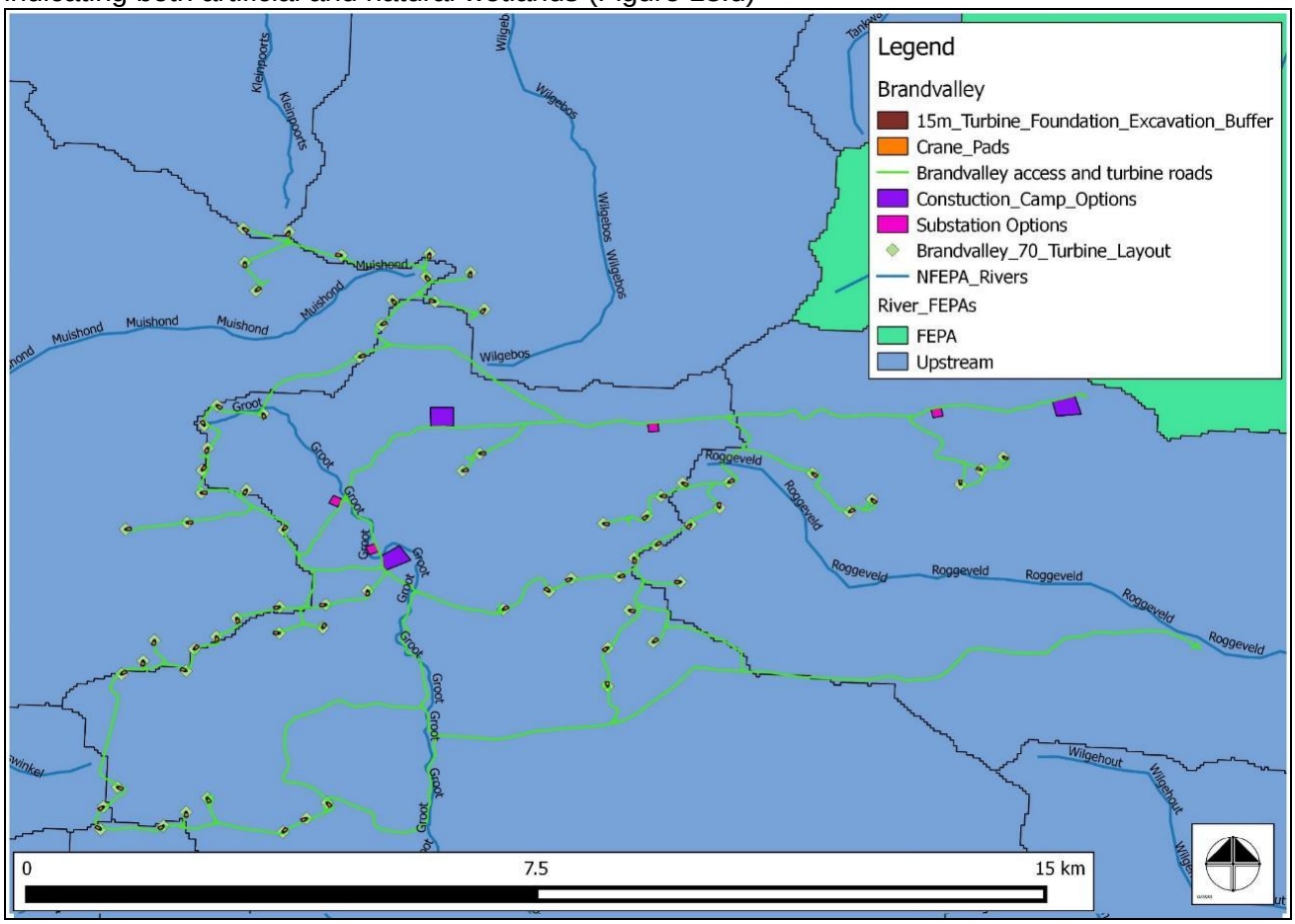


Figure 7-20d: Freshwater Ecosystems Priority Areas within the project area

7.1.12 Ambient sound and noise

The project area is situated in a rural farming community. Noise is defined as any unwanted sound and is measured in decibels. Sounds are characterized by their magnitude (loudness) and frequency. There can be loud low frequency sounds, soft high frequency sounds and loud sounds that include a range of frequencies. The human ear can detect a very wide range of both sound levels and frequencies, but it is more sensitive to some frequencies than others.

The South African Noise Control Regulations (National) describe a *disturbing noise* as **any** noise that exceeds the ambient noise by more than 7dB. This difference is usually measured at the complainant's location should a noise complaint arise. Therefore, if a new noise source is introduced into the environment, irrespective of the current noise levels, and the new source is louder than the existing ambient environmental noise by more than 7dB, the complainant will have a legitimate complaint. A noise disturbance or nuisance as defined in the national legislation means any sound which disturbs or impairs the convenience of any person. The Western Cape Noise Control Regulations are similar to the National Noise Control Regulations in that the definition of a disturbing noise also refers to any noise that exceeds the ambient noise by more than 7dB.

In order to predict the sound pressure level at various locations, ambient noise measurements were taken at the noise sensitive areas that would be impacted during the operational phase. Three Noise Sensitive Areas (NSA's) were selected as monitoring points namely, NSA 2, 5 and 18 as indicated in Tables 7.8 and 7.9. L90 represent the noise sound pressure level for 90 percent of the measurement time.

Table 7-8: Daytime - Commencing at 09:51 on 16th February 2016

NO	AREA	Leq (dBA)	L90 (dBA)	Noise Source
Position 1	NSA 18	56.3	50.7	Noise from trees blowing in wind (main noise source). Tapping noise from windmill. Noise from leaves blowing across the ground. Faint noise from activity inside the house. Noise from birds chirping. Noise from wind chimes.
Position 2	NSA 5	48.9	42.0	Noise from dogs barking / growling (main noise source). Noise from trees blowing in the wind. Noise from people talking nearby. Noise from people working on farm in distance. Noise from vehicle activity on R354. Noise from birds chirping. Noise from leaves blowing on ground.
Position 3	NSA 2	46.4	39.1	Noise from trees blowing in the wind (main noise source). Noise from birds chirping. Noise from people speaking inside house. Tapping noise from decoration on house. Noise from rooster crowing. Noise from gate tapping on wall.

Table 7-9 – Ambient Monitoring Results - Night

Night-time - Commencing at 22:16 15th February and 19:01 on the 16th February 2016

NO	AREA	Leq (dBA)	L90 (dBA)	Noise Source
Commencing at 22:16 on 15 February 2016				
Position 1	NSA 18 (°’”S °’”E)	54.5	50.4	Noise from trees blowing in the wind (main noise source). Noise from wind chimes. Noise from leaves blowing across the ground. Noise from birds chirping. Tapping noise from windmill.
Position 2	NSA 5	57.3	34.5	Noise from dogs barking (main noise source). Noise from leaves blowing across the ground. Noise from crickets. Noise from vehicles driving on the R354.
Position 3	NSA 2	36.8	33.5	Noise from trees blowing in the wind (main noise source). Noise from vehicle activity in the distance. Noise from animal rustling the bushes. Noise from crickets.
Commending at 19:01 on 16 February 2016 (Early evening)				
Position 4	NSA 18	33.8	30.7	Noise from running water (main noise source). Noise from trees blowing in breeze. Tapping noise from windmill. Noise from animals rustling the bushes.

NO	AREA	Leq (dBA)	L90 (dBA)	Noise Source
Position 5	NSA 5	34.7	31.1	Noise from trees blowing in breeze (main noise source). Noise from dogs barking in the distanced. Noise from plane flying over. Noise from crickets. Noise from 2x vehicles driving by on R354. Loud banging noise in the distance.
Position 6	NSA 2	31.2	28.2	Noise from trees blowing in breeze (main noise source). Noise from vehicles driving by in the distance. Noise from crickets. Faint tapping noise from decoration on house.

7.1.13 Heritage and cultural resources

The Brandvalley WEF project area comprises of several historical features including stone walling kraals and cottages as well as both Middle and Later Stone Age stone artefacts alongside water courses and on the flat floodplains. Precolonial occupation was able to be established within the proposed project area.

The overall area is considered as having a medium - high heritage significance.

Precolonial / Stone Age material

Generally, no precolonial archaeological sites would occur within the turbine areas as the areas comprise steep hills and high summits with elevation ranges between 1 100 m and 1400 meters above sea level and would be deemed inhospitable for any type of occupation.

Both Later Stone Age and Middle Stone Age stone artefact scatters were identified on the flat floodplains to the foot of the mountains and within the valleys along water courses. The artefacts were manufactured on hornfels and local shale raw materials.

No other cultural or organic archaeological heritage materials were assumed to be directly related or associated with the stone artefact scatters. In several instances stone artefacts would occur within the same vicinity as historical built environment structures, stone walling features as well as historical artefact scatters, similarly situated on the flat floodplains and within the valleys close to water courses.

Stone Walling Features

Generally part of the built environment, these historical structures have been described separately in this report. Up to 17 stone walling features were documented along the access routes on the flat floodplains and in the valleys. These features include historical stone packed dwellings / cottages as well as kraals, pens, and a threshing floor. Historical artefacts were also located within the vicinity of some of the stone packed dwellings and kraals.

Historical Artefact Scatters

The historical artefacts scatter included fragments of glass, ceramics and metal probably dating to the late 19th century. These scatters are mainly identified to be associated within the vicinity of stone packed dwellings / cottages and / or stone packed kraals.

Built Environment Structures

The site and its surroundings are not highly developed. The built environment structures include those that have not been as being constructed by the historical stone packing method. The structures may be younger than 60 years and with very little or no heritage significance. These include abandoned buildings, used and unused reservoirs and drinking troughs. These structures occur across the landscape along the existing access roads of Brandvalley WEF.

Graves (formal and informal burials)

The historical family cemeteries are usually situated within close proximity or apart of the homestead. Both of these graveyards / informal burials fall outside of the identified boundaries of the homesteads in this study.

Homesteads / Farmhouse Complexes

Six homesteads / farm complexes were identified and demarcated within the proposed Rietkloof WEF area. These have been demarcated purely for ease of reference, description and mitigation measures. Most of these homesteads / farm complexes include historically stone packed features including kraals and dwellings as well as nineteenth century farmhouses, modern buildings and typically historical graveyards. These earlier buildings and features have most likely been modified over time for maintenance purposes for continued and contemporary occupation. The homesteads are situated either adjacent to the proposed access roads or in some cases the proposed internal access roads are expected to go through the homesteads.

These homesteads include the farm house and associated staff accommodation, outbuildings and stone walling features and built environment structures. The concerns have been highlighted in section that discusses the road upgrade and heritage resources that may be impacted along the route.

7.1.14 Paleontological Resources

The geology of the Brandvalley WEF study area is described in Section 7.1.3. Geologically it lies on the gently folded northern margin of the Permo-Triassic Cape Fold Belt (CFB). A total of thirteen mappable rock units or formations are represented within the study area. The great majority of which belong to the **Karoo Supergroup** succession and are Early to Middle Permian in age.

Resistant-weathering sandstone-rich prodeltaic and deltaic sediments of the Middle Permian **Waterford Formations** (**Middle & Upper Ecca Group**) build the central uplands, to the north of the escarpment. The major part of the northern uplands are underlain by continental (fluvial and lacustrine) mudrocks and sandstones forming the lowermost portion of the very thick **Abrahamskraal Formation** (**Lower Beaufort Group**). These continental sediments are also of Middle Permian age. Slightly older Waterford Formation bedrocks crop out in the cores of east-west orientated megasynclinal structures towards the northern edge of the study area. The Early Jurassic **Karoo Dolerite Suite** (*c.* 182 Ma = million years old; Duncan & Marsh 2006) is represented by a few narrow dolerite dykes which are intruded into the Lower Beaufort Group country rocks along W-E to WNW-ESE fracture lines. These fractures are clearly visible on satellite images but Karoo dolerite itself was not encountered during the present field study. The Karoo dolerites are entirely unfossiliferous and will therefore not be treated in any detail in this report. The Palaeozoic and Mesozoic bedrocks in the study area are very extensively overlain by a wide spectrum of **Late Caenozoic superficial deposits**. They include scree and other slope deposits (colluvium and hillwash), river and stream alluvium (including coarse pediment gravels), down-

wasted surface gravels, calcretes and various soils. These geologically youthful sediments are generally of low palaeontological sensitivity and are also only briefly treated in this study.

All of these rock units, with the exception of the very minor Karoo dolerites, are potentially fossiliferous, although only two namely the Whitehill and Abrahamskraal Formations are considered to be of high palaeontological sensitivity.

7.1.15 Aesthetic Value - Identified Sensitive Visual Receptors

Within twenty kilometres of the WEF boundary, eighty (80) buildings were identified. These were identified using aerial imagery and were ground-truthed during the site visit. Thirty (30) of these were found to be the homesteads of surrounding farmers. The visual impact of the WEF on these homesteads is dependent on the number of turbines visible and their proximity to the turbines (i.e. their visual exposure to the development). The visual impact on these homesteads is discussed in the impacts section. Not all of these homesteads are necessarily sensitive to the proposed wind energy facility, as this depends on their perception of wind turbines: they may have a neutral or positive opinion towards them. Therefore, we consider tourist facilities and interested and affected parties (I&APs) that have stated that they are opposed to the wind energy facility to be particularly sensitive. In terms of tourist facilities, the Gatsrivier, Saaiplaas and Keurkloof guest farms have been identified as sensitive. During the scoping phase, an objection to the wind energy facility were received from nearby land owners. The objector is Mr Steve Swanepoel whose cottage on the farm "Keurkloof" is located 17.8km from the nearest wind turbine.

Two protected areas were identified within 50km of the WEF boundary:

- Anysberg Nature Reserve, Provincial Nature Reserve, 32km south of the WEF boundary;
- Touw Local Authority Nature Reserve, Local Nature Reserve, 46km south-west of the WEF boundary.

7.1.16 Socio-Economic Environment

Current and Proposed Land Uses and Other Developments in the Area

The project area consists of natural habitat, which has experienced some grazing, but is predominately untouched. The proposed project area is currently used for animal husbandry, game farming and agriculture. The predominant land use in the project area is for the farming and grazing of sheep, most suited to Western Cape region of the project area. There are a few Bed and Breakfast accommodation services (B&Bs) within the project area to accommodate those visiting the area and its surroundings.

There are various proposed and existing developments situated in the Great Karoo, impacting the financial, economic, ecological and social environments. Such developments include the South African Large Telescope (SALT), the Square Kilometre Array (SKA), proposed shale gas mining, existing and proposed electrical facilities such as WEFs, solar energy facilities and other grid infrastructure and various commercial and subsistence farming operations. The South African Large Telescope (SALT) is located approximately 50km north-west of the site. The renowned heritage resources and historical value associated with the Karoo are a few of the features contributing to tourism in the area, which promotes the use of the B&Bs.

The project area additionally overlaps with the area in which Technical Cooperation Permits (TCPs) are held by certain Oil and Gas companies. The project area (~225km2) is, however, relatively insignificant in comparison to the overall size of the TCP (~30 000km2).

These proposed developments are described below.

All of the existing land uses can continue should the WEF be authorised.

The Southern African Large Telescope (SALT)

The Southern African Large Telescope (SALT) is the largest single optical telescope in the southern hemisphere, located approximately 50km north-east of the proposed project area, near Sutherland. SALT is an international initiative, driven by a consortium of partners from Germany, Poland, the United Sates, the United Kingdom, New Zealand and South Africa. The development is located at the South African Astronomical Observatory (SAAO) field station, near Sutherland in the Northern Cape Province. The telescope, which has been operational since September 2011, comprises of a mirror array that spans across 11 meters in a hexagonal shape with 91 mirrors, each 1 m in length (Plate 7-9). SALT holds national importance in driving innovations in astronomy, science and technology in South Africa as well as forming international relations, boosting tourism and contributing to local education and improving technological skills.

The SALT development is sensitive to dust, light and other interferences that may visually obstruct viewing. Mitigation measures to reduce potential light and dust pollution during the construction and operational stages of the project will be included in the EMPr. SALT and the SAAO have been notified as I&APsregarding the proposed project and and will be invited to comment on the proposed development during the public participation period. Discussions will also be advanced (outside of the EIA process) with the SAAO/SALT, Civil Aviation Authority (CAA) in order to ensure that proposed mitigations accommodate the lighting requirements in accordance with the Civil Aviation Act 13 of 2009.

Plate 7-9: The Southern African Large Telescope (SALT) located near Sutherland.8

The Square Kilometre Array (SKA)

The Square Kilometre Array (SKA), an astronomy facility, is an international initiative driven by engineering, science, technology and research and development incentives to build the world's largest radio telescope within a one square kilometre. The facility is located in the Upper Karoo area. The nearest SKA station has been identified as SKA Station SKA-2379, approximately 75km from the proposed Brandvalley WEF project area. The SKA will comprise of collection or array of radio telescopes constructed in a unique configuration, allowing astronomers exceptionally detailed observation of the sky that is thousands of times faster than current technology.

8 Source: SALT (2015)

The SKA Organisation was established as a not-for-profit enterprise, inclusive of eleven (11) countries, namely Australia, Canada, China, Germany, India, Italy, New Zealand, South African, Sweden, the Netherlands and the United Kingdom. The project is located in the Great Karoo in South Africa and is currently in the construction phase. The Karoo Array Telescope (MeerKAT), a phase of SKA, is the world's first radio telescope array consisting of antenna structures. This phase is located near Carnarvon in the Karoo and is currently being commissioned. The MeerKAT comprises of seven (7) dishes arranged in a unique array (Plate 7-10). The first seven dishes are known as the KAT-7 and were completed in December of 2010. The SKA Phases 1 and 2 are in the pre-construction phase of the project but are predicted to be under construction from 2017 to 2024. The SKA is of importance to science, technology, astronomy and the economy of South Africa.

600 grants have been received through the SKA development for astronomy courses that are being offered in Kenya, Mozambique, Madagascar and Mauritius in order to drive skills and training for SKA as well as other engineering, science, astronomy and technology projects in Africa. The SKA further contributes to job creation, local skills development and tourism.

Plate 7-10: The MeerKAT of the Square Kilometre Array (SKA) development located near Carnarvon, Northern Cape.9

The MeerKAT and SKA development is sensitive to dust as well as man-made electronics and machines that emit radio waves that will interfere with the radio signals. The site is located at a specific height and in a dry area to ensure radio waves are not absorbed by the moisture in the surrounding environment.

SKA were notified of the proposed development as a potential Interested and Affected Party.

Proposed Shale Gas Exploration

9 Source: SKA (2015)

The Karoo Basin, covering 400,000m2, has been identified as an area with potential for shale gas extraction. Various entities propose to undertake shale gas mining (SGM) of the area to extract shale gas. SGM involves high-volume, horizontal, slick-water fracturing (i.e. fracking or hydraulic fracturing). Fracking is a process that involves pumping pressurised water, sand and chemicals into horizontal drilling wells. The hydraulic pressure causes the underground shale layers to fracture and the gas resources to be released.

There has been much investigation into the positive and negative impacts of fracking. Positive impacts may include economic benefits, such as employment generation and increased power generation. Adverse impacts could include environmental degradation, loss of vegetation, potential groundwater contamination, habitat loss and fragmentation, lack of adequate infrastructure and skills, inadequate policy and legislation and inability to ensure compliance to existing legislation, significant construction and operational costs and public health risks concerns.

There has been on-going debate in South Africa regarding the proposed fracking of shale gas in Great Karoo. Currently, the volume of gas, and thus the feasibility of SGM, in the Karoo is uncertain. The economic value will only be uncovered once seismic studies and hydraulically fracking takes place (Petroleum Agency SA, 2013).

Oil and Gas companies have been granted Technical Cooperation Permits (TCPs) in terms of 77(1) of the Mineral and Petroleum Resources Development Act (No. 28 of 2002), allowing these developers to undertake desktop studies in the Karoo area. These companies include Shell International (185,000km2), Sasol/Chesapeake/Statoil Joint Venture (JV) (88,000km2), Angola Coal (50,000km2), Falcon Oil and Gas (30,000km2) and Sunset Energy (initially applied for by Bundu) (4,610km2). Figure 7-21 provides a representative map of the approximate areas for which TCPs are issued to these Oil and Gas companies.

In order for these entities to explore shale gas potential, an exploration right in terms of the MPRDA has to be obtained. Currently, three entities, namely Bundu, Falcon Oil and Gas and Shell (Treasure the Karoo Action Group, 2015), have applied for exploration right but no decisions have been taken on these applications to date.

Relevant companies whose TCP areas overlap with the proposed WEF development will be included in the I&AP database, and will be invited to submit comments during the PPP.

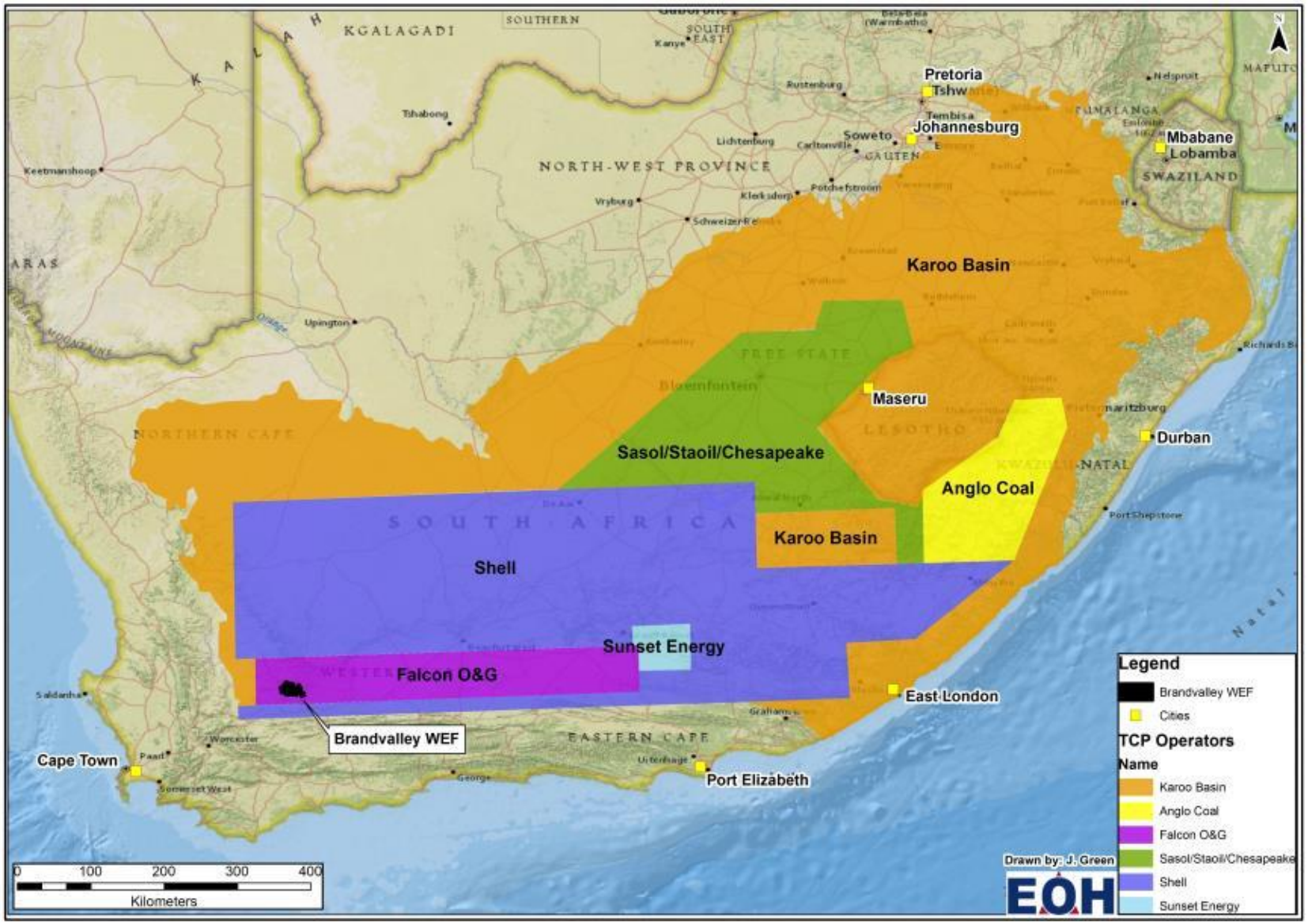


Figure 7-21: Technical Cooperation Permits (TCP) areas granted to Oil and Gas companies in the Karoo Basin (approximate areas)10.

10 The TCP area granted to Sunset Energy was initialy applied for by Bundu.

8. APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

According to Appendix 3(3) of the EIA Regulations (GN R.982 of 2014), *an Environmental Impact Report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include—*

(h) a full description of the process followed to reach the proposed preferred site including:
(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts:
(aa) can be reversed;
(bb) may cause irreplaceable loss of resources; and
(cc) can be avoided, managed or mitigated;
(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including-
(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and
(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;
(u) an indication of any deviation from the approved scoping report, including the plan of study, including-
(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and
(ii) a motivation for the deviation;

This Chapter of the report provides the approach to the EIA Phase of the proposed project with specific focus on the methodology applied in determining the significance of potential environmental, social and economic impacts.

8.1 General Impact Assessment

A preliminary general impact assessment was conducted in the Scoping Phase of the project based on a broad-based desktop study of the area, information obtained during site visits and project information relating to the construction and operation of the wind energy facility provided by Brandvalley Wind Farm. Based on the nature of the project, the project location and experience with similar developments, the following impacts were identified in the Scoping Phase:

- Impacts on topography and geology
- Change in land use from agricultural to power generation
- Removal of top soil resulting in soil erosion
- Impacts on surface and groundwater resources
- Disruption to terrestrial ecosystems
- Disruption to aquatic ecosystems
- Impacts on fauna (including birds and bats) and flora
- Health and safety
- Impacts on archaeological, paleontological and/or cultural sites
- Social disruptions
- Social benefits from the project including employment opportunities, social investment, training and skills development opportunities
- Traffic impacts
- Noise impacts
- Air quality impacts in the form of additional dust
- Alignment with planning instruments

- Impact on energy production
- Visual impacts
- Impacts to SALT, SKA and SAAO.

8.2 Specialist Impact Assessments

A series of specialist studies were conducted during the EIA Phase, the outcomes of which are provided in Chapter 9of this report. The team of specialists provided baseline information through desktop analyses and site visits; addressed relevant issues raised by I&APs; identified and assessed potential impacts associated with the proposed project activities within their field of expertise; and provided proposed mitigation measures for the impacts identified. The specialist reports were compiled in accordance with Appendix 6 of the 2014 EIA Regulations.

Table 8-1: Specialist Studies completed for the EIA Phase.

Specialist Field	Specialist		Peer reviewed
Archaeological Impact Assessment	Ms Celeste Booth	Booth Heritage Consulting	No
Agricultural Impact Assessment	Mr Roy de Kock	EOH CES	Yes
Aquatic Impact Assessment	Dr Brian Colloty	Scherman Colloty & Associates (SC&A)	No
Avifaunal Impact Assessment	Dr Tony Williams	African Insights	No
Bat Impact Assessment	Mr Werner Marais	Animalia Zoological & Ecological Consultation CC	No
Ecological Impact Assessment	Mr Simon Todd	Simon Todd Consulting	No
Heritage Screeners	Mr Nicholas Wiltshire	Cedar Tower Services	No
Heritage Impact Assessment	Ms Celeste Booth	Booth Heritage Consulting	No
Noise Impact Assessment	Dr Brett Williams	Safetech	No
Paleontological Impact Assessment	Dr John Almond	Naturaviva	No
Social Impact Assessment	Mr Tony Barbour	Independent Consultant	No
Visual Assessment Specialist	Mr Thomas King	EOH CES	Yes
Traffic Impact Assessment	Mr Hermanus Steyn	Aurecon South Africa	No

8.3 Methodology for Assessing the Duration and Significance of Impacts

To ensure a direct comparison between various specialist studies, a standard rating scale has been defined and will be used to assess and quantify the identified impacts. This is necessary since impacts have a number of parameters that need to be assessed. Four factors need to be considered when assessing the significance of impacts, namely:

1. Relationship of the impact to **temporal** scales - the temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact.
2. Relationship of the impact to **spatial** scales - the spatial scale defines the physical extent of the impact.
3. The severity of the impact - the **severity/beneficial** scale is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party. The severity of impacts can be evaluated with and without mitigation in order to demonstrate how serious the impact is when nothing is done about it. The word ‘mitigation’ means not just

'compensation', but also the ideas of containment and remedy. For beneficial impacts, optimization means anything that can enhance the benefits. However, mitigation or optimization must be practical, technically feasible and economically viable.

4. The **likelihood** of the impact occurring - the likelihood of impacts taking place as a result of project actions differs between potential impacts. 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. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance.

Each criterion is ranked with scores assigned as presented in Table 8-2 to determine the overall **significance** of an activity. The criterion is then considered in two categories, viz. effect of the activity and the likelihood of the impact. The total scores recorded for the effect and likelihood are then read off the matrix presented in Table 8-3, to determine the overall significance of the impact (Table 8-4). The overall significance is either negative or positive.

The ***environmental significance*** scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the person making the judgment. For this reason, impacts of especially a social nature need to reflect the values of the affected society.

Negative impacts that are ranked as being of "**VERY HIGH**" and "**HIGH**" significance will be investigated further to determine how the impact can be minimised or what alternative activities or mitigation measures can be implemented. These impacts may also assist decision makers i.e. lots of **HIGH** negative impacts may bring about a negative decision.

For impacts identified as having a negative impact of "**MODERATE**" significance, it is standard practice to investigate alternate activities and/or mitigation measures. The most effective and practical mitigations measures will then be proposed.
For impacts ranked as "**LOW**" significance, no investigations or alternatives will be considered. Possible management measures will be investigated to ensure that the impacts remain of low significance.

Table 8-2: Criterion used to rate the significance of an impact.

EFFECT	**Temporal scale**			**Score**
	Short term	Less than 5 years		**1**
	Medium term	Between 5 and 20 years		**2**
	Long term	Between 20 and 40 years (a generation) and from a human perspective almost permanent.		**3**
	Permanent	Over 40 years and resulting in a permanent and lasting change that will always be there		**4**
	Spatial Scale			
	Localised	At localised scale and a few hectares in extent		**1**
	Project area	The proposed site and its immediate environs		**2**
	Regional	District and Provincial level		**3**
	National	Country		**3**
	International	Internationally		**4**
	Severity		**Benefit**	
	Slight / Slightly Beneficial	Slight impacts on the affected system(s) or party (ies)	Slightly beneficial to the affected system(s) or party (ies)	**1**
	Moderate / Moderately Beneficial	Moderate impacts on the affected system(s) or party(ies)	An impact of real benefit to the affected system(s) or party (ies)	**2**
	Severe / Beneficial	Severe impacts on the affected system(s) or party (ies)	A substantial benefit to the affected system(s) or party (ies)	**4**
	Very Severe / Very Beneficial	Very severe change to the affected system(s) or party(ies)	A very substantial benefit to the affected system(s) or party (ies)	**8**
LIKELIHOOD	**Likelihood**			
	Unlikely	The likelihood of these impacts occurring is slight		**1**
	May Occur	The likelihood of these impacts occurring is possible		**2**

	Probable	The likelihood of these impacts occurring is probable	**3**
	Definite	The likelihood is that this impact will definitely occur	**4**

Table 8-3: The matrix that will be used for the impacts and their likelihood of occurrence

LIKELIHOOD	Effect													
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
1	4	5	6	7	8	9	10	11	12	13	14	15	16	17
2	5	6	7	8	9	10	11	12	13	14	15	16	17	18
3	6	7	8	9	10	11	12	13	14	15	16	17	18	19
4	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Table 8-4: The significance rating scale

Significance	Description
Low	Acceptable impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in either positive or negative medium to short term effects on the social and/or natural environment.
Moderate	An important impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in either a positive or negative medium to long-term effect on the social and/or natural environment.
High	A serious impact, if not mitigated, may prevent the implementation of the project (if it is a negative impact). These impacts would be considered by society as constituting a major and usually a long-term change to the (natural &/or social) environment and result in severe effects or beneficial effects.
Very High	A very serious impact which, if negative, may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are un-mitigable and usually result in very severe effects, or very beneficial effects.

8.4 Irreversible or irreplaceable impacts

Unless discussed or indicated in key project issues, findings and impacts (Chapter 9), irreversible or irreplaceable impacts are considered as not applicable to the study.

8.5 Deviation from Approved Plan of Study for EIA

In addition to the specialist assessments specified in the approved Plan of Study for EIA, a traffic impact assessment and palaeontology impact assessment was undertaken to investigate the associated impacts. The EIA report was not advertised during the EIA phase as all I&APs were notified in writing and the two rounds of advertisements placed to date are considered sufficient. The next round of advertisements will be placed to notify I&APs of DEA's decision.

There were no other deviations from the approved Plan of Study for EIA.

8.6 Cumulative Impacts

Project induced cumulative impacts should be considered, along with direct and indirect impacts, in order to better inform the applicant's decision making and project development process. The International Finance Corporation (IFC) Performance Standards (PS) (2012) defines cumulative impacts as those "*that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted*." Cumulative impacts result from incremental changes caused by other past, present or reasonably foreseeable actions acting in concert with the project. Individually minor impacts from different developments can interact in various ways over time to become collectively significant. Barbour (2007: 39), adapting work by Cooper, 2004, describes cumulative impacts as impacts which "may be:

- **Additive:** the simple sum of all the effects (e.g. the accumulation of ground water pollution from various developments over time leading to a decrease in the economic potential of the resource);
- **Synergistic:** effects interact to produce a total effect greater than the sum of individual effects. These effects often happen as habitats or resources approach capacity (e.g. the accumulation of water, air and land degradation over time leading to a decrease in the economic potential of an area);
- **Time crowding:** frequent, repetitive impacts on a particular resource at the same time (e.g. multiple boreholes decreasing the value of water resources);
- **Neutralizing:** where effects may counteract each other to reduce the overall effect (e.g. infilling of a wetland for road construction, and creation of new wetlands for water treatment); and,
- **Space crowding:** high spatial density of impacts on an ecosystem (e.g. rapid informal residential settlement)."

Cumulative impacts are, however, difficult to accurately and confidently assess, owing to the high degree of uncertainty, as well as it often being based on assumptions. It is therefore difficult to provide as detailed an assessment of cumulative impacts as is the case for direct and indirect project induced impacts. This is usually because of the absence of specific details and information related to cumulative impacts. In these situations, the EAP ensured that any assumptions made as part of the assessment are made clear. Accordingly, the EIA Phase includes an overview and analysis of cumulative impacts related to a variety of project actions, and does not provide a quantitative significance rating for these impacts, as was done for direct project induced impacts. The objective is to identify and focus on potentially significant cumulative impacts so these may be taken into consideration in the decision-making process. It is important to realise these constraints, and to recognise that the assessment will not, and indeed cannot, be perfect. The potential for cumulative impacts will, however, be considered, rather than omitted from the decision making-process and is therefore of value to the project and the environment.

The following assumptions guided the cumulative assessments:

- All projects within a 30km radius were considered.
- It was assumed that all projects proposed (both energy generation and electrical infrastructure projects) will be implemented as a worst case scenario.

Other wind and solar renewable energy projects surrounding the project area are shown in Figure 8.1 below. This was informed by the DEA database of other renewable energy developments (DEA, 2015).

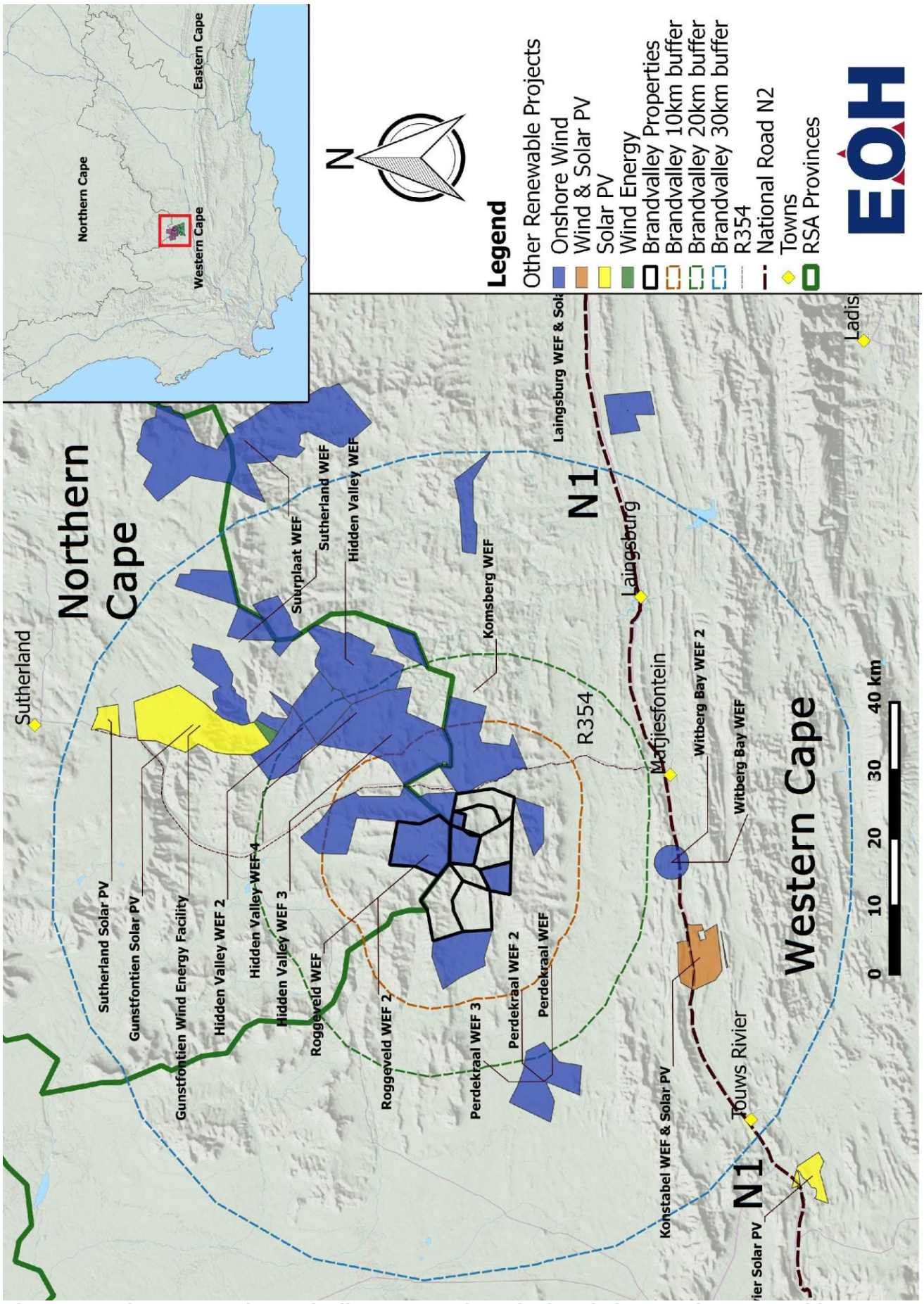


Figure 8-1: The proposed Brandvalley WEF project site in relation to other renewable energy projects solar and wind).

9. KEY PROJECT ISSUES, FINDINGS AND IMPACTS

According to Appendix 3(3) of the EIA Regulations (GN R.982 of 2014), *an Environmental Impact Report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include—*

(h) a full description of the process followed to reach the proposed preferred site including:
- (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on geographical, physical, biological, social, economic, heritage and cultural aspects;
- (viii) the possible mitigation measures that could be applied and level of residual risk;

(j) *an assessment of each identified potentially significant impact and risk, including—*
- (i) cumulative impacts;
- (ii) the nature, significance and consequences of the impact and risk;
- (iii) the extent and duration of the impact and risk;
- (iv) the probability of the impact and risk occurring;
- (v) the degree to which the impact and risk can be reversed;
- (vi) the degree to which the impact and risk may cause irreplaceable loss of resources;
- and
- (vii) the degree to which the impact and risk can be mitigated;

(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 of these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;

(m) based on the assessment and, where applicable, recommendations from specialist reports, the recording of proposed impact management objectives and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;

The specialist studies undertaken in the EIA Phase are provided in Section 8.2. The specialist studies include those that were identified as a requirement in the Scoping Phase of the proposed project in addition to a Paleontological Impact Assessment and Traffic Impact Assessment, as required by the authorities. The assessments have been conducted by qualified and experienced specialists in accordance with Appendix 6 of the 2014 EIA Regulations. This chapter provides a summary of the key findings, impact assessments and recommended mitigation measures identified by the specialists based on the layout provided by Brandvalley Wind Farm. The findings from the specialist assessments further informed the final layout which was amended accordingly as described in Chapter 7.

The detailed specialist studies are provided in the Specialist Studies Volume, attached to this EIR as Appendix H. Details and expertise of each specialist as well as a signed declaration of independence for each specialist are also included in the Specialist Studies Volume.

The below information is a summary of the specialist reporting findings.

9.1 Impacts on Terrestrial Flora

The impacts on ecology (flora and fauna) were assessed by Mr Simon Todd of Simon Todd Consulting (see Appendix G for the full report). The sections below discuss the key findings, impact assessments, mitigation measures and conclusions. This current sections focuses on flora, and on fauna for the next section.

9.1.1 Key findings

Fragmentation and transformation of habitats can lead to the loss of viable plant populations and/or species of conservation concern, especially for species with restricted ranges. In the case of the Brandvalley Wind Farm, apart from the direct loss of vegetation within the development footprint, listed and protected species are highly likely to be impacted. In addition, the disturbance created during construction would leave the site vulnerable to soil erosion, especially as many parts of the site are steep, and the infestation of alien plants. The Brandvalley site consists of a series of ridges and valleys mostly orientated in a north south direction. The majority of the site is considered medium-low sensitivity and consists of open veld with few species of conservation concern present (Figure 9-1).

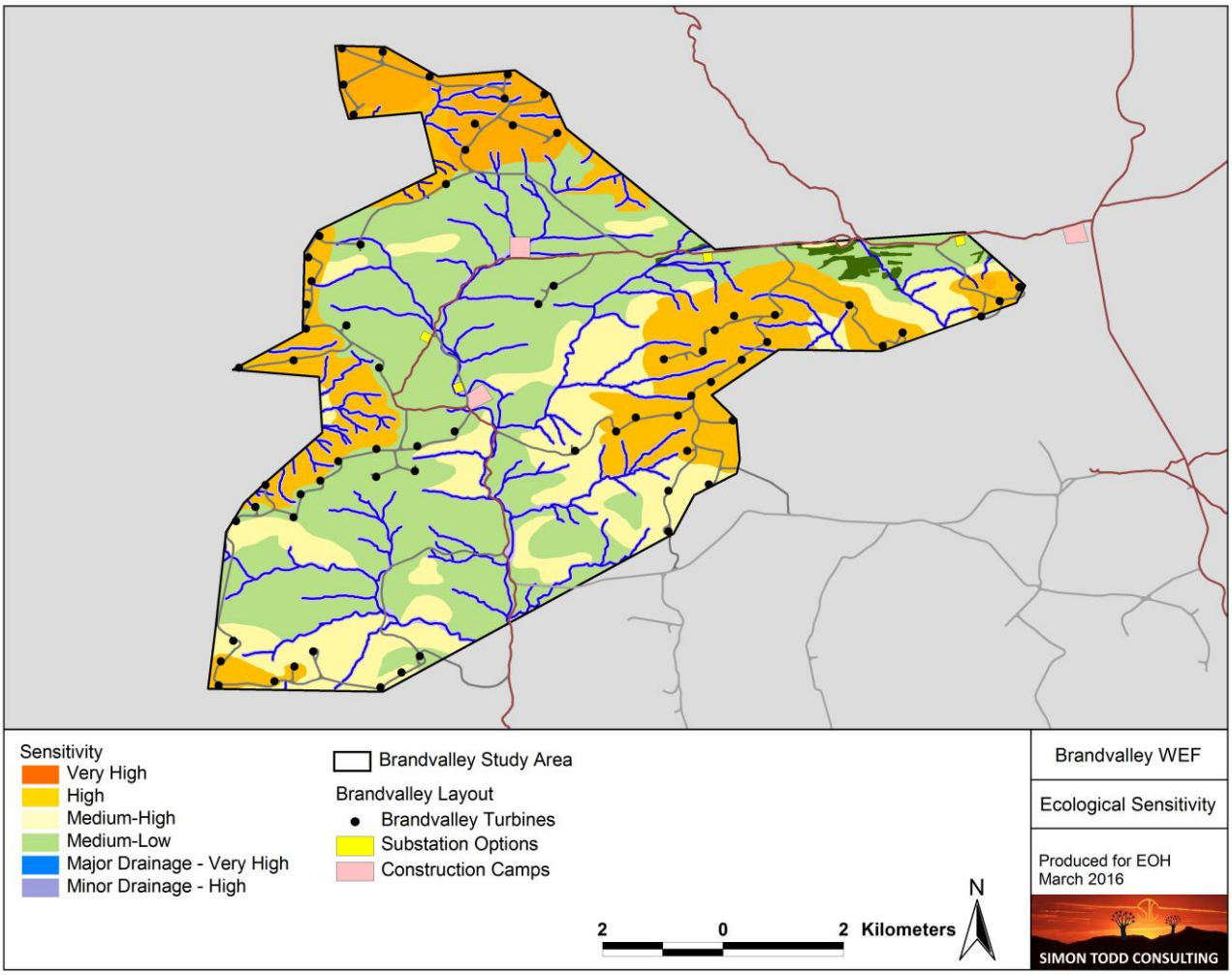


Figure 9-1: Ecological Sensitivity map of the Brandvalley WEF site, showing the distribution of turbines within the site.

The majority of turbines are located on the higher-lying ridges of the site which are considered to be somewhat higher sensitivity than the adjacent lowlands and most of the affected areas are considered to be of Medium-High sensitivity. There are some ridges which are considered higher sensitivity on account of the likely presence of species or habitats of concern. While development within some of these areas is considered acceptable, there are some areas where it is recommended that the turbines are relocated to a lower sensitivity area. There are only two turbines that are located within areas that are considered very high sensitivity and which should be relocated to less sensitive areas.

Mitigated layout

In response to these findings, the developer has reduced the footprint of the development within this area by dropping two turbines (38 and 42) from the layout and reducing the extent and size of access roads as indicated in Figure 9-2 below. The overall impact of this mitigation is to reduce the likely footprint of the development by 39% within the sensitive area. This is considered sufficient to reduce the impact of the development on flora to an acceptable level.

Please also note that all other specialists commented on the mitigated layout to assess whether the layout change would affect their impact rating (see Specialist Assessments included in Appendix xxx). Some specialists did not address the amended layout in their report and rather provided an addendum to their report in order to comment on the revised layout (see Appendix xxx for these addendums).

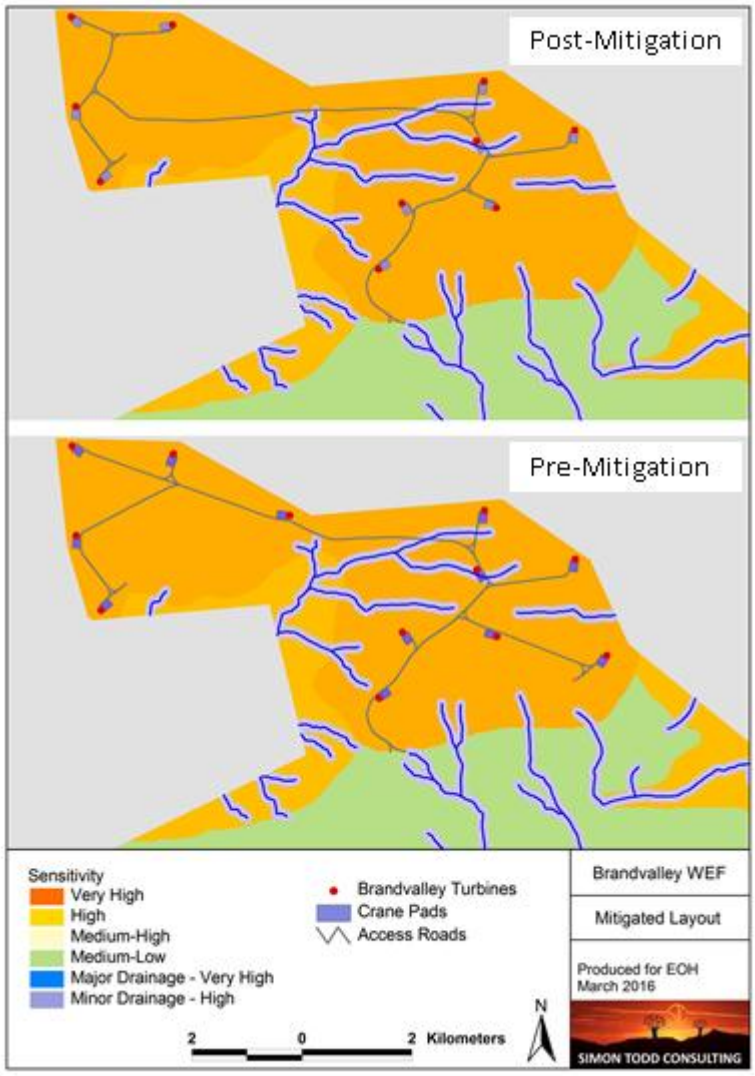


Figure 9-2. Pre and post-mitigation layout of the Snydersberg area, which is considered the most sensitive part of the site. Two turbines have been dropped from the layout and the overall footprint of the development decreased by 39% within the affected area.

Although there are a number of other turbines within areas considered High Sensitivity, these are not considered no go areas and provided that specific mitigation and avoidance startegies are implemented in these areas, then the impact would be reduced to an

acceptable level.
It is also important to note that while the direct extent of habitat loss resulting from the turbines would be about 25ha, the access roads would create up to 120ha of habitat transformation, indicating that the access roads are ultimately more of concern for the development than the turbines themselves.

However, provided that the development footprint and associated impact within the higher elevation northern ridges can be managed, then the major impact of the Brandvalley development would be on ecological processes (fragmentation) rather than on biodiversity pattern. Direct impacts on species and habitats can be mitigated to a moderate to low level through design and preconstruction walk-throughs to inform the final approved layout. The recommendations for impact mitigation and avoidance for the various turbines is detailed below.

9.1.2 Impacts during planning and construction phases and mitigation measures

Impacts

- Vegetation clearing for access roads, turbine pads, electrical trenches etc. is likely to impact listed plant species as well as high-biodiversity plant communities. Vegetation clearing will also lead to habitat loss for fauna and potentially the loss of sensitive faunal species, habitats and ecosystems.
- Presence and operation of construction machinery on site. This will create a physical impact as well as generate noise, dust, pollution and other forms of disturbance at the site.
- Increased human presence can lead to poaching, illegal plant harvesting and other forms of disturbance such as fire.
- There are confirmed listed and protected species present at the site and it is highly likely that some of these species would be impacted during construction activities and site clearing. Although a preconstruction walk-through can reduce this impact, there is still likely to be some unavoidable impact on vegetation and listed plant species. Overall, after mitigation, which includes relocating the two turbines out of the Very High sensitivity areas, the impact is likely to be of Moderate to Low significance.
- During and immediately after construction, the disturbed areas within the site will be highly vulnerable to erosion. It is a common misconception that erosion in semi-arid environments is a low risk factor, however, this is false as these areas are often exposed to high intensity rainfall events and the vegetation cover is low, leaving the soils exposed and vulnerable to erosion. Erosion results in soil loss and a decline in biodiversity and productive potential from the affected areas and may also result in the siltation and degradation of aquatic systems which receive the eroded soils. With the implementation of erosion control and avoidance measures, this impact can however be effectively reduced to a Low level of significance.

Mitigation Measures

- Development within the Very High Sensitivity areas should proceed with caution with specific attention to avoiding impact on plant species of conservation concern that may be present.
- Preconstruction walk-though of the approved development footprint to ensure that sensitive habitats and species are be avoided where possible.
- Ensure that lay-down and other temporary infrastructure is within low sensitivity areas, preferably previously transformed areas if possible.
- Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development.
- A large proportion of the impact of the development stems from the access roads and the number of roads should be reduced to the minimum possible and routes should also be adjusted to avoid areas of high sensitivity as far as possible, as informed by a

preconstruction walk-through survey.
- Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are understood and adhered to. This includes awareness and practices as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.
- Demarcate all areas to be cleared with construction tape or similar material. However, caution should be exercised to avoid using material that might entangle fauna.
- Runoff management and erosion control should be integrated into the project design and the EMPr.
- Development on steep slopes should be avoided as much as possible and specific additional mitigation may be required where this cannot be avoided.
- Dust suppression and erosion management should be an integrated component of the construction approach.
- Disturbance near to drainage lines should be avoided and sensitive drainage areas near to the construction activities should demarcated as no-go areas (as determined in the pre-construction walk through).
- Regular monitoring for erosion problems along the access roads and other cleared areas.
- Erosion problems should be rectified on a regular basis in accordance with the EMPr.
- Sediment traps may be necessary to prevent erosion and soil movement if there is topsoil or other waste heaps present during the wet season.
- A low cover of vegetation should be left wherever possible within the construction footprint to bind the soil, prevent erosion and promote post-disturbance recovery of indigenous ground cover.

9.1.3 Impacts during operational phase and mitigation measures

Impacts

- All areas disturbed during construction will remain vulnerable to disturbance for some time into the operational phase and will require regular maintenance to ensure that erosion is minimised. With mitigation, this impact can however be reduced to a Low level of significance.
- Disturbed areas are vulnerable to alien plant invasion and it is likely that road verges, crane pads and other cleared or disturbed areas will be foci for the infestation of alien plants. Uncontrolled infestation can result in invasion into the intact rangeland and where woody species are involved, this can result in loss of biodiversity and a decline in ecosystem services. With regular clearing and management, this impact can be reduced to a Low significance level.

Mitigation Measures

- Erosion management at the site should take place according to the Erosion and Rehabilitation Plan.
- All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.
- Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance.
- All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
- All cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.
- Wherever excavation is necessary, topsoil (approximately top 20cm) should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species.
- The recovery of the indigenous shrub layer should be encouraged through leaving some

areas intact through the construction phase to create a seed source for adjacent cleared areas.
- Due to the disturbance at the site as well as the increased runoff generated by the hard infrastructure, alien plant species are likely to be a long-term problem at the site and a long-term control plan will need to be implemented. Problem woody species such as *Prosopis* are already present in the area and are likely to increase rapidly if not controlled.
- Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the facility as there are also likely to be prone to invasion problems.
- Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.

9.1.4 Impacts during decomissioning phase and mitigation measures

Impacts

- Decommissioning will result in a lot of disturbance which will leave the site vulnerable to erosion. As a result, the site should be monitored for erosion problems for at least 2 years after decommissioning or until perennial cover is 60% of the undisturbed levels. With mitigation, this impact can be reduced to a Low significance
- Decommissioning will cause disturbance to the vegetation in the project area leaving the site vulnerable to the infestation of alien plant species if not managed properly. The site should be monitored and managed for alien plant species for at least two years following decommissioning or until an adequate cover of perennial plants has been established in disturbed areas. With mitigation, this impact can be reduced to a Low significance.

Mitigation Measures

- Any potentially dangerous fauna such snakes or fauna threatened by the decommissioning activities should be removed to a safe location.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.
- All above-ground infrastructure should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact.
- Any roads that will not be rehabilitated should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.
- There should be regular monitoring for erosion for at least 2 years after decommissioning by the applicant to ensure that no erosion problems develop as result of the disturbance, and if they do, to immediately implement erosion control measures.
- All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
- All disturbed and cleared areas should be revegetated with indigenous perennial shrubs and grasses from the local area.
- Wherever excavation is necessary for decommissioning, topsoil should be set aside and replaced after construction to encourage natural regeneration of the local indigenous species.
- Due to the disturbance at the site alien plant species are likely to be a long-term problem at the site following decommissioning and regular control will need to be implemented until a cover of indigenous species has returned.
- Regular monitoring for alien plants within the disturbed areas for at least two years after decommissioning.
- Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.

9.1.5 Cumulative impacts and mitigation measures

Impacts

- The cumulative loss of sensitive habitats may result in biodiversity loss and reduced future ability to meet conservation targets for these habitats.
- Transformation of intact habitat with CBAs could compromise the ecological functioning of the CBAs and would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations.

Cumulative impacts are a significant concern at the site due to the large amount of wind energy development proposed in the area. Furthermore, the development is within a CBA and the loss of habitat within the CBA may impact the ecological functioning of the CBA and result in increased habitat fragmentation and reduced landscape connectivity.

In order to reduce the cumulative impact of the development, the two turbines within the Very High sensitivity areas should be relocated and the footprint of the development should be kept as low as possible. Overall, the cumulative impact significance of the development is considered to be Medium after mitigation and cannot be reduced to a Low level as the impact results from the presence of the facility.

Mitigation Measures

- Development within the Very High sensitivity parts of the site should be kept as low as possible and no lay-down or other temporary use areas should be established in these areas.
- The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas.
- An Open Space Management plan should be developed for the site, which should include management of biodiversity within the affected areas, as well as that in the adjacent rangeland.
- Minimise impact to potential corridors such as the riparian corridors associated with the larger drainage lines within the facility area.

9.1.6 No-go alternative

The no-go alternative would result in the continuation of the current land use at the site which is extensive livestock grazing. When properly managed, this is a sustainable land use that can be used indefinitely. However, many parts of the site have been heavily grazed in the past, leading to some degradation of the site. The no-go alternative would maintain the current land use, resulting in some degradation due to overgrazing or alien invasion in parts of the site, but would also result in biodiversity maintenance across the majority of the site. Therefore, the impact of the no-go alternative on terrestrial biodiversity is considered to be a low negative impact. The development of the wind farm with associated grid connection considered here would not result in the cessation of farming activities and the development would be an additional impact to the prevailing low-level farming impact.

9.1.7 Reversibility and irreplaceability

The impact on vegetation and plant species of concern in the construction phase is an unavoidable outcome of the development and this cannot easily be reversed and some irreplaceable loss of rare habitats or species may occur.

The direct faunal impacts due to construction, operation and decommissioning phase activities, noise and physical disturbance will be reversible once the respective phase is complete if development is removed and disturbed areas are rehabilitated, although some impacts on habitat will be long term. Provided that impacts to sensitive habitats such as drainage lines are minimized, then no irreplaceable loss of resources is likely to occur due to this impact.

With appropriate mitigation measures the impact of soil erosion has be reversed, however there may be a loss of large amounts of topsoil, which would potentially be an irreplaceable loss of resources.

The cumulative impacts can be reversed once the lifetime of the development has ended (20-25 years) and the irreplaceable loss of resources is not expected.

9.1.8 Significance ratings

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Construction Phase Impacts					
Impact on vegetation and listed plant species due to transformation within the development footprint.					
Without Mitigation	Permanent	Study Area	Moderate	Definite	**Moderate -**
With Mitigation	Permanent	Localised	Slight	Probable	**Moderate to Low -**
Soil erosion risk as a result of clearing and disturbance within the development footprint and adjacent affected areas.					
Without Mitigation	Medium Term	Study Area	Severe	Definite	**Moderate-**
With Mitigation	Short Term	Localised	Moderate	Probable	**Low-**
Operational Phase Impacts					
Following construction, the site will be highly vulnerable to soil erosion					
Without Mitigation	Long Term	Study Area	Moderate	Definite	**Moderate-**
With Mitigation	Long Term	Localised	Moderate	Probable	**Low-**
Following construction, the site will be highly vulnerable to alien plant invasion					
Without Mitigation	Permanent	Study Area	Moderate	Probable	**Moderate-**
With Mitigation	Short Term	Study Area	Moderate	May Occur	**Low-**
Decommissioning Phase Impacts					
Soil Erosion Risk Following Decommissioning will be high					
Without Mitigation	Long Term	Study Area	Severe	Probable	**Moderate-**
With Mitigation	Medium Term	Localised	Slight	Probable	**Low-**

Alien plant invasion will be highly likely within disturbed areas following decommissioning					
Without Mitigation	Long Term	Study Area	Severe	Probable	**Moderate-**
With Mitigation	Medium Term	Localised	Slight	Probable	**Low-**
Cumulative Impacts					
Impact on CBAs and Broad-Scale Ecological Processes due habitat loss and the presence and operation of the facility					
Without Mitigation	Long Term	Regional	Severe	Probable	**High-**
With Mitigation	Long Term	Study Area	Moderate	Probable	**Moderate-**

9.2 Impacts on Terrestrial Fauna

9.2.1 Key findings

Mammals are likely to be most impacted on during the construction phase when a lot of noise and disturbance would be generated. There is little that can be done to avoid this impact as disturbance cannot be avoided at this time. In the longer term, the noise generated by the turbines would have a potential impact on species which use sound to find their prey or avoid their predators. This might include such species as the Bat-eared Fox which uses hearing to detect prey underground, golden moles which use minute vibrations in the soil to detect prey as well as rodents such as gerbils which have expanded auditory bullae and large ears to help them avoid predators such as owls at night.

Furthermore, studies have shown that in the face of increased background noise, fauna spend more time being vigilant and less time on foraging and other activities which ultimately represents habitat degradation for such species. This effect occurs over a much larger area than the direct footprint of the development and the affected area in the current context is likely to amount to several thousand hectares. Although the extent of this impact depends on wind conditions and type of turbine, as an indicative evaluation of this impact, there would be 3220ha of the site within 500m of a wind turbine and there would be a significant increase in background noise within this area when the turbines were operating. Although some fauna can adapt to this in various ways such as by changing the pitch of their calls, some aspects such as using sound to find prey or avoid predators will persist for the lifetime of the facility.

For reptiles, the major impact associated with the development would be habitat loss and fragmentation, with the potential for increased levels of predation being a secondary impact which may occur as a result of vegetation clearing for roads and turbine pads. There do not appear to be any reptiles which are specifically restricted to the higher-lying ridges of the site and which would be particularly vulnerable to impact as a result.

In general, the most important areas for amphibians at the site are the riparian areas, seeps and wetlands and the man-made earth dams which occur in the area. As these are widely recognized as sensitive habitats, impacts to these areas are avoided largely at the design phase of the development and a minimum amount of infrastructure has been located in the vicinity of these features. Consequently, direct impacts on amphibians at the site are likely to be fairly low. Amphibians are however highly sensitive to pollutants and the large amount of construction machinery and materials present at the site during the construction phase would pose a risk to amphibians should any spills occur.

9.2.2 Impacts during the planning and construction phase and mitigation

measures

Impacts

- The construction phase will involve a lot of disturbance at the site due to the operation of heavy machinery, human presence and noise from blasting. This will deter larger fauna from the area and smaller fauna may suffer direct habitat loss or be killed if they are unable or too slow to move away from construction activities. As the construction activities cannot be avoided, it is not possible to mitigate some of these impacts. They are however transient and disturbance levels will subside significantly in the operational phase. Construction phase faunal disturbance is considered to have a Moderate significance after mitigation.
    - The operation of the facility will generate noise and disturbance which may deter some fauna from the area.
    - The presence of the facility will disrupt the connectivity of the landscape for some usually smaller fauna species such as certain reptiles which will avoid traversing the cleared areas and may impact their ability to disperse or maintain gene flow between subpopulations.

Mitigation Measures

- Preconstruction walk-through of the facility to identify areas of faunal sensitivity.
- During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.
- The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden. Personnel should not be allowed to wander off the construction site.
- No fires should be allowed within the site as there is a risk of runaway veld fires.
- No fuelwood collection should be allowed on-site.
- No dogs or cats or any pets should be allowed on site apart from that of the landowners.
- If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs), which do not attract insects and which should be directed downwards.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- No unauthorized persons should be allowed onto the site and site access should be strictly controlled. Vehicles which need to roam around the site, outside of the areas demarcated for construction, should be accompanied by the ECO or security personnel.
- All construction vehicles should adhere to a low speed limit (40km/h for cars and 30km/h for trucks) to avoid collisions with susceptible species such as snakes and tortoises and rabbits or hares. Speed limits should apply within the facility as well as on the public gravel access roads to the site.
- All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition.

9.2.3 Impacts during the operational phase and mitigation measures

Impacts

- Although disturbance during the operational phase will be significantly lower than during the construction phase, it is also higher than the background pre-development levels of noise and this will impact some species, especially those that use sound to find their prey or avoid their predators. This includes species such as Bat-eared Fox, gerbils and golden moles and potentially other species such as owls and frogs. Although the severity of this impact is moderate, it cannot be well mitigated as the primary source of noise in the area would be from the turbines themselves. It is difficult to quantify the extent of this impact,

but it is likely to extend 500m or more from turbines depending on wind conditions. The overall significance of this impact is likely to be Medium.

Mitigation Measures

- Management of the site should take place within the context of an Open Space Management Plan.
- No unauthorized persons should be allowed onto the site.
- Any potentially dangerous fauna such snakes or fauna threatened by the maintenance and operational activities should allowed to move off on their own or removed to a safe location by the ECO or other suitable qualified person
- The illegal collection, hunting or harvesting of any plants or animals at the site should be strictly forbidden by anyone expect landowners with the appropriate permits where required.
- If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.
- If parts of the facility are to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside.

9.2.4 Impacts during the decomissioning phase and mitigation measures

Impacts

- Decommissioning will require the use of heavy machinery on-site and will generate a lot of noise and disturbance which would have a negative impact on fauna. This impact would however be relatively short-lived and would ultimately result in the removal of the development and rehabilitation of the site and as such the ultimate impact of decommissioning on fauna would be Low after mitigation.

Mitigation Measures

- Any potentially dangerous fauna such snakes or fauna threatened by the decommissioning activities should be removed to a safe location.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.
- All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as snakes and tortoises.
- All above-ground infrastructure that cannot be used by Eskom, the landowner or an IPP should be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact.

9.2.5 Cumulative and no-go

Please see Sections 9.1.5 and 9.1.6.

9.2.6 Significance ratings

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		

Construction Phase Impacts					
Direct faunal impacts due to the construction phase noise and physical disturbance					
Without Mitigation	Medium Term	Study Area	Severe	Definite	**Moderate -**
With Mitigation	Medium Term	Localised	Moderate	Probable	**Moderate -**
Operational Phase Impacts					
Faunal impacts due to operational activities of the wind farm such as noise, and human presence during maintenance activities.					
Without Mitigation	Long Term	Study Area	Moderate	Definite	**Moderate-**
With Mitigation	Long Term	Localised	Moderate	Probable	**Moderate to Low -**
Decommissioning Phase Impacts					
Faunal Impacts due to Decommissioning Phase activities such as noise and disturbance due to the presence of construction staff and the operation of heavy machinery					
Without Mitigation	Short Term	Study Area	Severe	Probable	**Moderate-**
With Mitigation	Short Term	Study Area	Moderate	May Occur	**Low-**

9.3 Impact on Rivers and Wetlands

The impacts on surface water features were assessed by Dr Brain Colloty from Scherman Colloty & Associates (SC&A) (see Appendix G for the full report) and the sections below for key findings, impact assessments, mitigation measures and conclusions.

9.3.1 Key findings

The construction and operation of the Brandvalley Wind Farm is likely to have direct and indirect impacts on the riparian areas and water courses located within the development area. The physical removal of the riparian zones and disturbance of any alluvial watercourses and wetlands by new road crossings or upgrades of existing roads are likely within the watercourses at the site. These disturbances will be the greatest during the construction and again in the decommissioning phases as the related disturbances could result in lost or damaged vegetation. In addition, increased surface water run-off could cause changes in downstream riparian form and function due to impacts to the hydrological regime such as alteration of surface run-off patterns.

Pollution of the sensitive riparian zones and wetlands from accidental spills of hazardous waste is a risk associated with the construction activities and to a limited degree the operation activities. Strict use and management of all hazardous materials used on site will be required to ensure that these systems are not inadervtantly polluted.

Figure 9-3 indicates the affected natural water courses / wetlands and those that would trigger the need for a Water Use License Application in terms of Section 21 c and i of the National Water Act (Act 36 of 1998) or potentially permitted in terms of the General Authorisation, should any construction that triggers the respective sections take place within 500m from wetlands. It should be noted that Figure 9-3 indicates the final delineations of all the natural wetlands as confirmed during the site visit and all the water course.

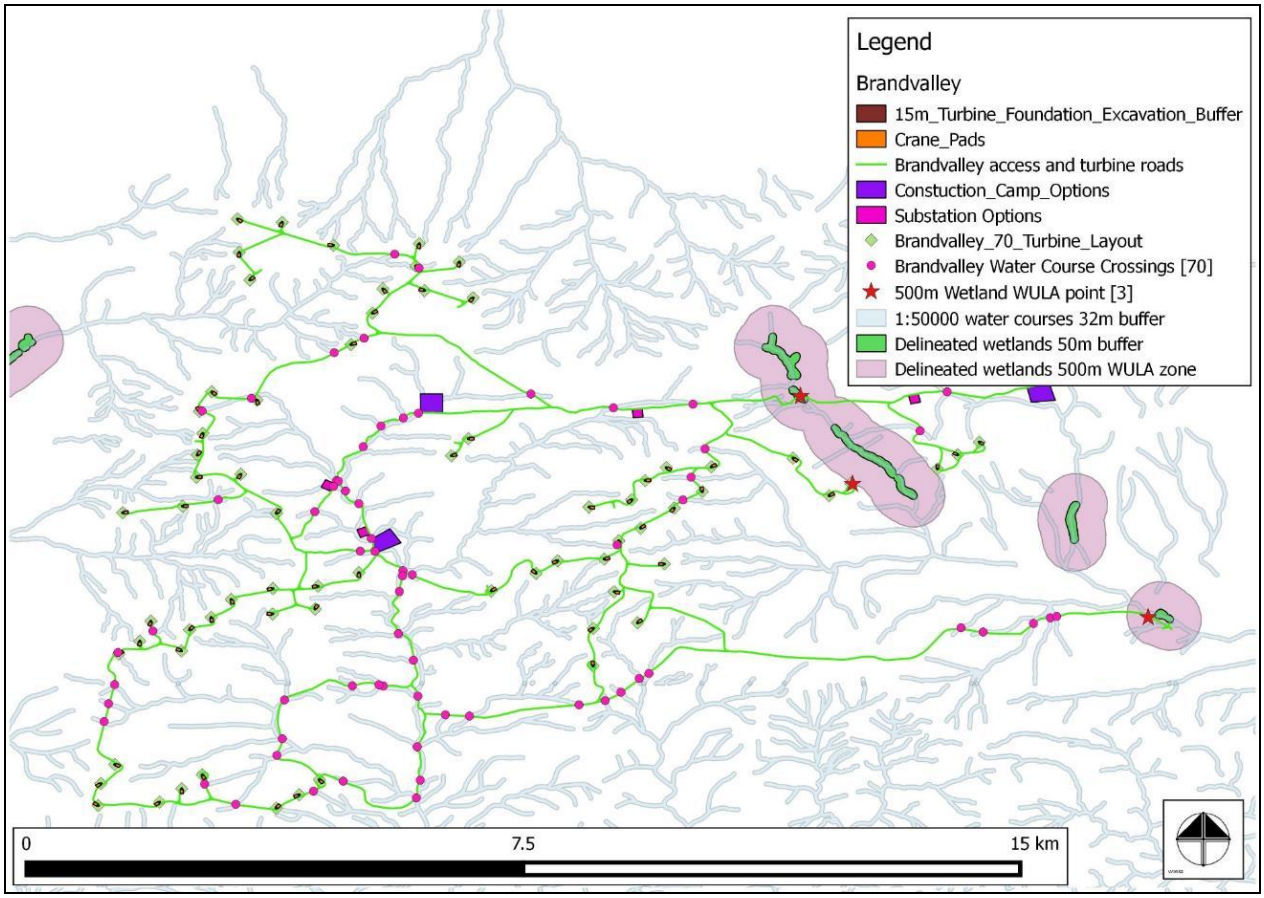


Figure 9-3: The project components in relation the respective Water Use License regulated zones i.e. the current layout illustrate 66 watercourse crossings and three crossings within the 500m wetland boundary.

9.3.2 Construction phase impacts and mitigation measures

Impacts

- The physical removal of the riparian zones and disturbance of any alluvial watercourses by new road crossings or upgrades of existing roads are likely within the watercourses within the site. These disturbances will be the greatest during the construction and again in the decommissioning phases as the related disturbances could result in lost or damaged vegetation.
- Impact on the possible loss of wetlands due to the potential need to upgrade the existing crossing through the most northern wetland. The southern-most structures are outside of the wetland boundary and the proposed 50m buffer, but located within 500m of the wetland boundaries. The potential impacts could occur during the construction and again in the decommissioning phase.
- Impacts to the hydrological regime such as alteration of surface run-off patterns could cause an increase in sedimentation and erosion within the development footprint during the construction, operational and decommissioning phases.
- During both preconstruction, construction and to a limited degree the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities could be washed downslope via the ephemeral systems.
- During the construction and to a limited degree the operational activities, hazardous substances mostly associated with the substations could be washed downslope via the ephemeral systems. This impact would be similar for all substation options.

Mitigation Measures

- Where new water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (reduce footprint as much as possible).
- Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't from additional steps / barriers.
- Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment.
- It is also advised that an ECO, with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas, using selected species detailed in this report.
- All alien plant re-growth must be monitored and should it occur these plants must be eradicated. The scale of the operation does not, however, warrant the use of a Landscape Architect and / or Landscape Contractor.
- Although the current wetlands are impacted upon by the present farming activities, dams and roads, the project could improve the situation by placing the upgraded structures within the crossing that won't impede the flows.
- All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination. Washing and cleaning of equipment should also be done in berms or bunds, in order to trap any cement and prevent excessive soil erosion. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any channel. It is therefore suggested that all construction camps, lay down areas, batching plants or areas and any stores should be more than 50m from any demarcated water courses.
- Any storm-water within the site must be handled in a suitable manner, i.e. trap sediments and reduce flow velocities.
- A storm water management plan that will reduce the surface water run-off must be designed and implemented.
- Strict use and management of all hazardous materials used on site.
- Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.).
- Containment of all contaminated water by means of careful run-off management on the development site.
- Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility.
- Strict control over the behaviour of construction workers.
- Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the EMPr for the project and strictly enforced.

9.3.3 Operation phase impacts and mitigation measures

Impacts

- Loss of riparian systems and disturbance to alluvial water courses.
- Impact on riparian systems through the possible increase in surface water runoff on riparian form and function.
- Increase in sedimentation and erosion.
- Storage of hazardous substances.
- Impacts on the hydrological regime such as a change of surface water run-off patterns due to the hard surfaces associated with hardstands and roads, could impact downstream riparian form and function during the operational and decommissioning phases.

Mitigation Measures

- Where new water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (reduce footprint as much as possible).
- During the operational and decommissioning phase, monitor culverts to see if erosion issues arise and if any erosion control is required.
- Where possible culvert bases must be placed as close as possible with natural levels in mind so that these don't from additional steps / barriers.
- Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment.
- It is also advised that an ECO, with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas, using selected species detailed in this report.
- All alien plant re-growth must be monitored and should it occur these plants should be eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor.
- Vegetation clearing should occur in in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment.
- Any storm-water within the site must be handled in a suitable manner, i.e. trap sediments, and reduce flow velocities.
- Strict use and management of all hazardous materials used on site.
- Strict management of potential sources of pollution.
- Containment of all contaminated water by means of careful run-off management on the development site.
- Working protocols incorporating pollution control measures (including approved method statements and emergency procedures by the contractor) should be clearly set out in the EMPr for the project and strictly enforced.

9.3.4 Decommissioning phase impacts and mitigation measures

In this instance, impacts associated with the decommissioning phase are similar to those for the construction phase and as such have not been repeated here.

9.3.5 Cumulative impacts

The increase in surface run-off velocities and the reduction in the potential for groundwater infiltration is likely to occur considering that the site is near the main drainage channels, however the annual rainfall figures are low and this impact is not anticipated if the mitigation measures listed under the construction phase are properly implemented. These are not anticipated due to the state of the current wetlands, lack of connectivity within the impact area and the nature of the development together with the proposed layout. Erosion and sedimentation of the downstream systems and farming operations could result in cumulative impacts. However due to low mean annual runoff within the region this is not anticipated due to the nature of the development together with the proposed layout.

9.3.6 No-Development Option

Impacts

Should the project not proceed the current conditions together with the present day impacts would prevail, leading to a slow deterioration of the aquatic systems that were classified as

"Largely Natural".

Mitigation Measures

- Improve the current stormwater and energy dissipation features not currently found along the tracks and roads within the region.
- Install properly sized culverts with erosion protection measures at the present road / track crossings.
- Manage grazing or exclude livestock from watercourses that are showing signs or erosion or bank instability.

9.3.7 Reversibility and irreplaceability

The reversibility of impacts on wetlands/ water courses is considered high and there are no expected irreplaceable loss of resources.

9.3.8 Significance statement

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Construction Phase Impacts					
Loss of riparian systems and disturbance to alluvial water courses					
Without Mitigation	Long-term	Local	Moderate	Probable	**Moderate -**
With Mitigation	Long-term	Local	Slight	Probable	**Low -**
Loss of wetlands and wetland function in the construction phase					
Without Mitigation	Long-term	Regional	Moderate	Probable	**Moderate -**
With Mitigation	Long-term	Local	Slight	Probable	**Low -**
Increase in sedimentation and erosion in the construction, operational and decommissioning phases					
Without Mitigation	Long-term	Local	Moderate	Probable	**Moderate -**
With Mitigation	Long-term	Local	Slight	Probable	**Low -**
Impact on localised surface water quality					
Without Mitigation	Long-term	Local	Moderate	Probable	**Moderate -**
With Mitigation	Long-term	Local	Slight	Probable	**Low -**
Impact on localised aquatic systems due to the storage of hazardous substances					
Without Mitigation	Long-term	Local	Moderate	Probable	**Moderate -**
With Mitigation	Long-term	Local	Slight	Probable	**Low -**
Operational Phase Impacts					
Impact on riparian systems through the possible increase in surface water runoff on riparian form and function during the operational and decommissioning phases					
Without Mitigation	Long-term	Local	Moderate	Probable	**Moderate -**
With Mitigation	Long-term	Local	Slight	Probable	**Low -**
Decommissioning Phase Impacts					
Loss of riparian systems and disturbance to alluvial water courses					
Without Mitigation	Long-term	Local	Moderate	Probable	**Moderate -**
With Mitigation	Long-term	Local	Slight	Probable	**Low -**
Increase in sedimentation and erosion in the construction, operational and decommissioning					

phases					
Without Mitigation	Long-term	Local	Moderate	Probable	**Moderate -**
With Mitigation	Long-term	Local	Slight	Probable	**Low -**
Impact on localised surface water quality					
Without Mitigation	Long-term	Local	Moderate	Probable	**Moderate -**
With Mitigation	Long-term	Local	Slight	Probable	**Low -**
Impact on riparian systems through the possible increase in surface water runoff on riparian form and function during the operational and decommissioning phases					
Without Mitigation	Long-term	Local	Moderate	Probable	**Moderate -**
With Mitigation	Long-term	Local	Slight	Probable	**Low -**
Cumulative					
Loss of riparian systems and disturbance to alluvial water courses					
				Insignificant if all mitigation measures for phases are implemented	
Loss of wetlands and wetland function in the construction phase					
				Insignificant if all mitigation measures for phases are implemented	
Increase in sedimentation and erosion in the construction, operational and decommissioning phases					
				Insignificant if all mitigation measures for phases are implemented	
No-Go option					
Without Mitigation	Long-Term	Local	Moderate	Probable	**Moderate -**
With Mitigation	Long-Term	Local	Slight	Probable	**Low -**

The proposed layout for the facility would seem to have limited impact on the aquatic environment as the proposed structures for the most part have either avoided the delineated watercourses and wetlands with the exception of a number of water course crossings. Use of any existing roads will further support this conclusion, particularly with regard the two wetland crossings, although the wetlands concerned are already impacted by the surrounding roads, dams and farming activities. Where any road upgrades are required it is understood that these current crossings may be upgraded by increasing the current size of the culverts and provide additional erosion protection, thus a possible net benefit to the local aquatic systems. The actual requirements and designs will be finalized in the detail design phase. The following conditions need be adhered to:

- No transmission line towers, substations and construction camps will be placed within the delineated water courses as well as their respective buffers without obtaining the required approvals.
- It is further recommended that a comprehensive rehabilitation plan be implemented from the project onset within these areas (inclusion of buffers) to ensure a net benefit to the aquatic environment. This should from part of the suggested walk down as part of the final EMPr preparation.

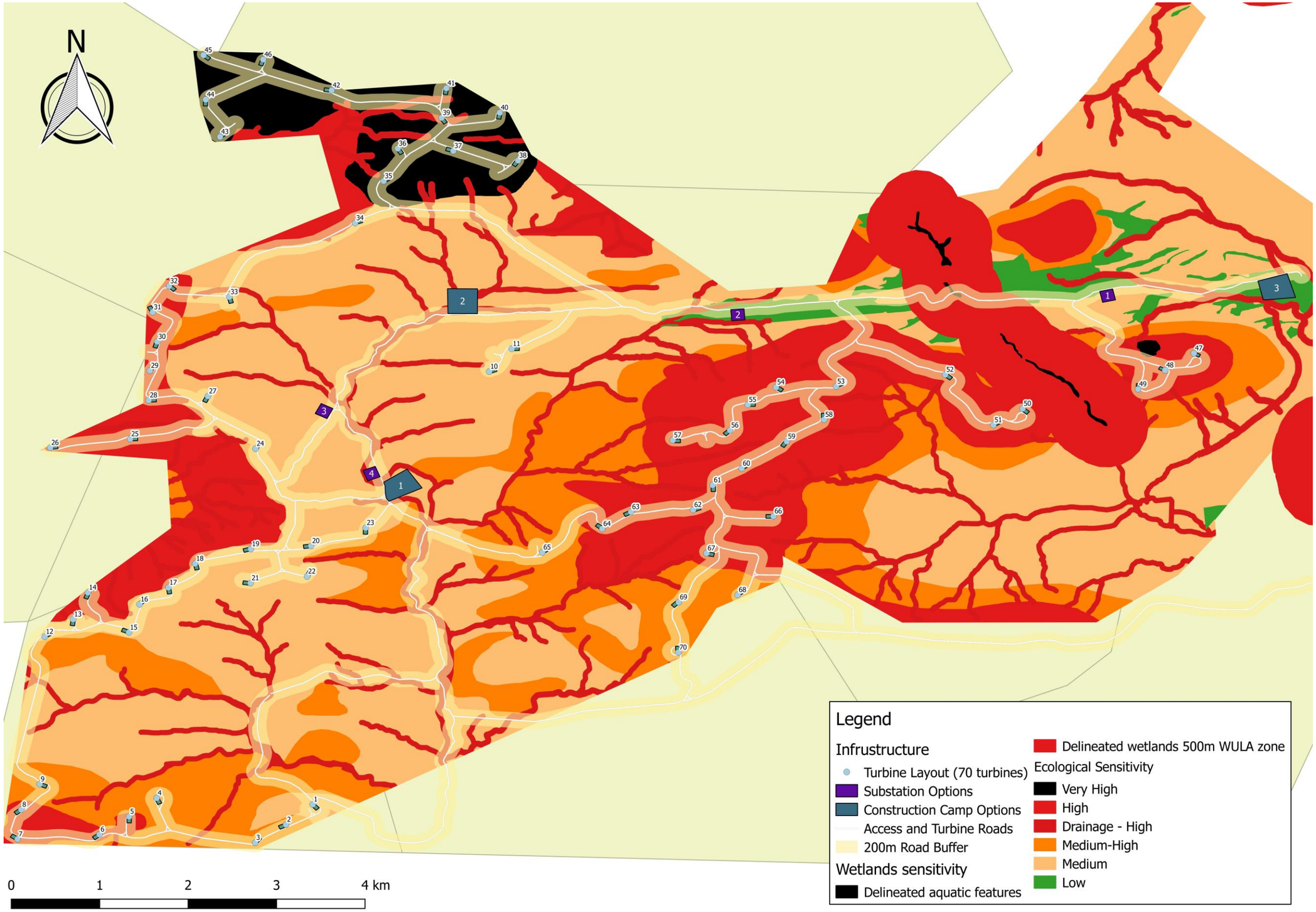


Figure 9-4: Combined Ecological and Aquatic senstitivities

9.4 Impact on Birds

The impacts on avifauna were assessed by Dr Tony Williams from African Insights (see Appendix G for the full report) and the sections below for key findings, impact assessments, mitigation measures and conclusions.

9.4.1 Key findings

Bird occurrence was monitored across 12-months in the Brandvalley project area, the monitoring was conducted for a total of 20 days across four seasons in the period April 2015 to January 2016 (representative of the full annual or seasonal cycle).

In the Brandvalley area three groups of birds are considered to be potentially at risk of collision with turbine blades and powerlines. These groups are: 1) large ground foraging species; 2) birds of prey; and 3) corvids as discussed in Section 7.1.7.

The assessment found that birds of many species often use saddles (the lowest areas along ridge sections) or cols (effectively short valleys across ridges) when crossing ridges, especially when this requires them to fly into headwinds. Saddles and cols are thus funnels for local bird movement. Obstructions (turbines or elevated powerlines) across the funnel features will increase the risk of bird collision mortalities.

The seasonal surveys showed that there are two localities in the Brandvalley area where the potential risk of collision mortalities is sufficient to warrant mitigation.

These two localities are

1) The saddle between the two Snydersberg plateaux and
2) The col in the ridge between the Ou Mure and Fortuin farm valleys (see Figure 9.5). This is a preferred flight path for waterbirds moving between the Fortuin dam and dams to the north. Waterbirds, which often fly low during localized movements and also fly in flocks, are likely to use this route at night when any obstructions, such as powerlines are detectable.

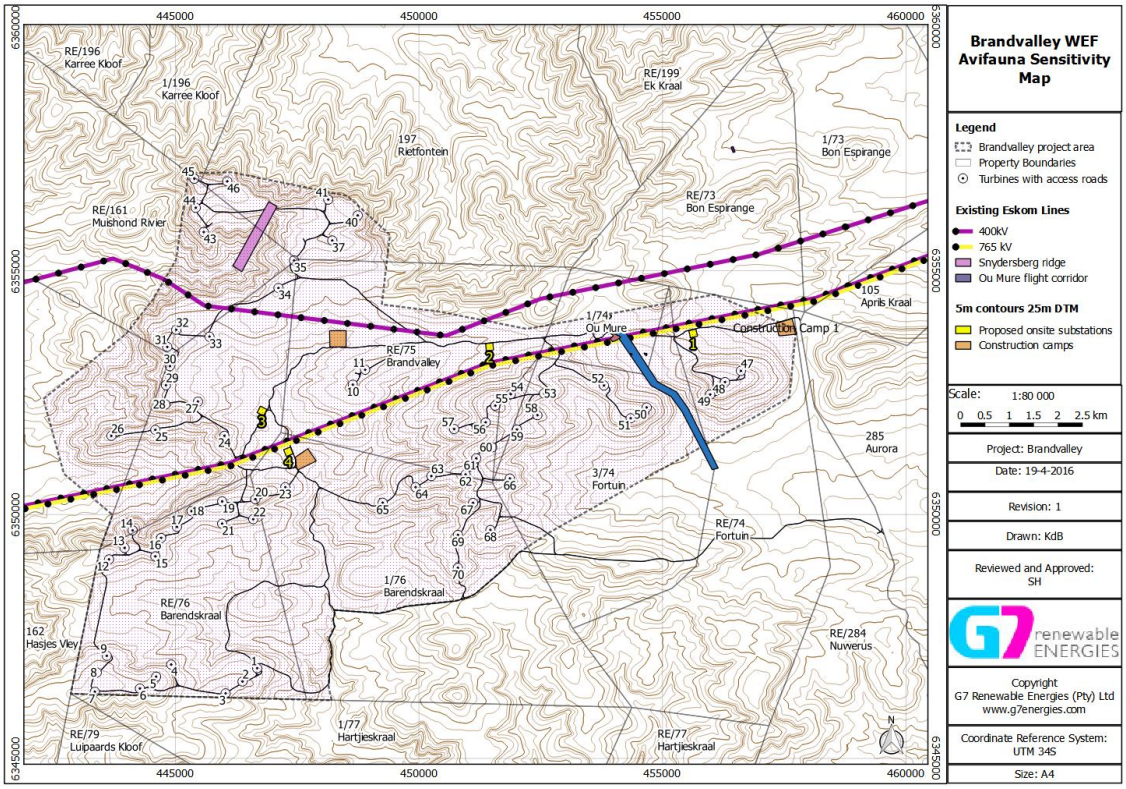


Figure 9.5: Avifauna sensitivities in relation to the project infrastructure

9.4.2 Impacts during planning and construction phases and mitigation measures

Development of the infrastructure footprints inevitably causes the loss of foraging and nesting habitat for most locally resident species of birds. Birds displaced by this loss of habitat must find alternative suitable habitat, which may be less favourable. The displaced birds must compete for resources with the established population of birds of the same or other species potentially to the detriment of both. The result is a reduction in the local population of most small-bodied bird species.

Habitat destruction is scarcely an issue for the proposed Brandvalley windfarm as a high proportion of the ground along the ridges is bare and or rock covered and so of limited attraction to birds. Nor is population displacement a major issue for most resident bird species since the population of birds using the ridges is very small (negligible in drought conditions) and all their needs can be reasonably fulfilled on adjacent slopes where most already breed. Development of access roads and powerlines on hill sides and in valleys will have a greater impact than turbines in terms of habitat destruction and bird displacement.

Construction period disturbance and subsequent maintenance and operation are also unlikely to have substantial negative effects on resident bird populations since the species will temporarily avoid the area largely by moving down the hillsides which are already their preferred habitat. Two years earlier than the present survey a new Eskom 400 kV powerline was constructed during bird monitoring for a proposed wind farm north of the Brandvalley WEF. Despite considerable vehicle and human activity, birds of prey were still often seen in the area.

Potential impacts

- During the construction phase, habitat will be lost through the construction of access roads, buildings and wind turbines.
- During the construction phase, the additional staff and vehicle movements and construction activities will disturb the local avifauna.

Mitigation Measures

- The risk of collision mortalities can be mitigated by leaving a 100 m gap between successive turbines across saddles and avoidance of elevated powerlines across saddles and cols where possible. If not avoidable all overhead 33 KV powerlines on these saddles and cols should have diverters at 5 m intervals on the lines.
- At these two localities shown in Figure 9.3 above a) no turbines should be erected within 100 m of the lowest point in the saddle/col and b) overhead lines in these two cols should have bird diverters of a type visible by day and night set at 2 m intervals along the line.
- Away from these two localities, where overhead powerlines cross valleys, bird flight diverters should be placed on the line at a spacing of 5m. It is accepted that diverters are likely to deteriorate across the operational life of the lines. The main aim is to alert bird to the lines in the immediate post-construction years when the lines will be a novel risk which locally resident birds will, over years, learn to compensate for.
- As far as possible construction activities should be kept to a minimum in terms of space and time.
- Appoint an ECO to see destruction of habitat is kept to a minimum, especially in valleys.
- Avoidance of construction of sub-stations during the main breeding season for local birds which is the period August to October inclusive, as far as possible.
- Keep blades as far off the ground as feasible.

9.4.3 Operational phase impacts and mitigation measures

A potentially negative issue is the effect turbine noise may have on birds accustomed to generally quiet habitats. Turbines create noise that can be heard by humans up to 1 km distant. Studies of birds along roads have shown that due to traffic noise some bird species are less common, or even absent, within 2-5 km of major roads (Forman & Deblinger 2000, Rheindt 2003). To date, there has been no assessment anywhere in the world on the effect

that turbine noise may have on local bird populations. Where, as in the Roggeveld, turbines are erected on ridges noise is considered to have little effect on the hillsides and may be beneficial in deterring bird use of the ridges and so keeping them away from the turbines.

The crucial issue of concern is mortality of birds through collision with either the turbine rotor blades or the powerlines associated with the development and the degree to which such mortality is acceptable for particular groups or species of birds. The risk of collision mortality varies in several general ways and these affect the manner in which collision mortality can be mitigated. Birds flying in daylight have a better chance of seeing and avoiding turbines and powerlines than those flying at night - hence the concern raised over the night moving transients by the bird specialist. Daylight fliers may have an increased risk of collision in periods of fog or mist when visibility is severely reduced. In the Roggeveld low clouds often cover the ridges in fog. It is unclear to what extent birds fly over the ridges in such conditions. The other factors that affect bird collision with turbines are: 1) the degree to which birds fly at heights equivalent to the turbine rotor blades – planned to be up to 20-190 m above ground level; 2) their ability to manoeuvre in flight – which is lower for larger and heavier bird species, and for most birds in headwinds; 3) the degree to which birds may be pre-occupied - i.e. through chasing prey or in courtship display – and so pay less attention to moving rotor blades; 4) familiarity with the location of turbines; 5) the frequency with which they place themselves at risk of collision; and 6) the angle of approach, since rotor blades are more conspicuous seen head on than from the side.

Potential impacts

- During the construction and operational phases, disturbances due to human activities and also the longer-term effect of intrusive structures could lead to long-term displacement of some bird species.
- During the operational phase, there is a risk of birds colliding with moving turbine blades.
- Powerlines are less visible than turbines and when placed where unanticipated by birds have a greater potential for collision mortality than hilltop turbines.

Mitigation Measures

- Undertake post-construction monitoring in line with the 2015 Best Practice Guidelines for Birds and Wind Energy Facilities[11] for a minimum of two years.

9.4.4 Decomissioning impacts and mitigation measures

Impacts

- Destruction of vegetation will reduce habitat available to birds

Mitigation measures

- Appoint an ECO to see destruction of habitat is kept to a minimum, especially in valleys

9.4.5 Cumulative impacts

There are several forms of cumulative effects relative to windfarm developments. One is when a bird species resident in a proposed windfarm is likely to be affected by not one but several impacts in that area. Another is the accumulative effect of impacts in the broader region within which the proposed wind farm is located. This may be from the development of other windfarms – as are proposed for areas immediately to the north and south of the Brandvalley WEF – or other significant land use changes. A third is when changes at some distance (even continentally) have the effect of changing the population of a bird species which is then potentially further impacted through loss of habitat or collision mortality at the proposed windfarm. All these effects can be subject to further cumulative effects over time.

Local effects

[11] Jenkins, A.R. *et al*. 2015. Birds and Wind Energy: Best Practice Guidelines. Third Edition

Local cumulative impacts may arise if a bird species is likely to be affected, to a considerable extent, by more than a single form of impact. The main perceived impacts of the proposed Brandvalley windfarm are habitat destruction, disturbance, displacement, noise, and injury or death through collision with either turbines or powerlines. It is likely that several locally resident bird species will be adversely affected by cumulative local impacts. However, in no case is this likely to be to an extent that raises conservation concern.

Regional effects

On a regional basis the only new developments likely to impact the avifauna are renewable energy projects – solar power plants and WEFs. The Roggeveld region, because of its persistent winds, has attracted major interest from developers of wind energy projects. Some ten or more such projects are proposed (some already authorised) in the Roggeveld and so close to, or abutting, the proposed Brandvalley project. The cumulative effect will inevitably be reduction in populations of regionally resident birds. As the region has extensive areas of similar terrain and vegetation the population reductions of most bird species will not be significant on a regional basis.

The greatest concern over cumulative impacts is for those larger-bodied and less numerous species already of conservation concern. Based on observations in the Brandvalley and immediately adjoining areas the key species are three Endangered species - Ludwig's Bustard, Black Harrier and Martial Eagle and two Near-threatened species - Verreaux's Eagle and Karoo Korhaan. From a national perspective the total number of individuals of these species in the Roggeveld area is very small and largely inconsequential. The likely number of breeding pairs, for those species which do breed in the region, is for each species probably fewer than ten pairs. This conclusion is based on pre-construction monitoring of birds in five proposed windfarms in the region and the confirmation across these five farms of only a single active breeding site of Verreaux's Eagles, and of no other species of special conservation concern. If, as climate scientists propose (as heard reported at workshops), the prognosis is that the Karoo will become increasingly arid as a consequence of global warming, then the regional number of birds of conservation concern will inevitably be reduced. This scenario is supported by comparison of bird numbers and diversity found during bird monitoring in three adjacent proposed WEFs during wetter conditions with two WEFS during the El Nino drought. Though not quantifiable, the strong impression of the four bird monitors was that the local populations of all bird species were substantially lower in the dry conditions of 2015-2016 than during monitoring in wetter years.

An unanticipated probable cumulative situation arose during the 2015-2016 surveys of the proposed Brandvalley and the immediately adjacent Rietkloof WEF. This was the likely displacement into the areas of these WEFs of large birds from mountains some distance to the south of the Roggeveld to the south during periods of persistent low cloud. The near absence of Verreaux's Eagle activity in the two WEF areas during the peak summer drought suggests that there may be a reciprocal situation in which raptors from the Brandvalley area move across country to southern mountains which receive more reliable rainfall and so offer a better availability of food. These indicated situations suggest that any negative impacts of the proposed WEFs (there are no beneficial ones) may have cumulative impacts across a wider area than normally anticipated.

Longer range effects

The majority of bird species in the Roggeveld are regionally resident. Few of the species that occur in the region are long distance migrants. Those migrants that occur in the region do so in only low numbers. Thus there is little likelihood that cumulative impacts on a wider international scale will have any substantial impact on the population of these migrant birds in the Roggeveld. Nor will developments in the Roggeveld have any serious cumulative effect on these species.

The overall cumulative situation

For several reasons cumulative effects on birds are not considered a serious impediment to authorisation of the proposed Brandvalley WEF. These reasons are:
1) Most of the bird species recorded are local residents with extensive ranges in similar habitats across a wide swathe of South Africa.
2) Other than the limited footprints of WEFs and solar power there are unlikely to be any other new major changes in regional land use that will overlap with the construction phases of the WEFs and have any serious effect on local bird distribution and numbers.
3) The forecast for the karoo in the medium term – equivalent to the predicted operational life, 20-30 years, of wind turbines - is of progressive drying. If this equates to the summer conditions in 2016 it will considerably reduce bird populations and so decrease the potential impacts on birds of wind farms in the Roggeveld.

Provided, as stringently required, appropriate mitigation measures are applied in all the proposed regional wind and solar projects, the cumulative impact must be considered acceptable from an avifaunal perspective. This is especially so relative to the situation in coastal lowland areas of the Western Cape where the number and diversity of birds at risk, especially those of conservation concern, is far greater than in the Roggeveld region. From an avifaunal perspective this semi-arid, low resourced region, is probably one of the areas in South Africa the development of WEFs will have the least negative impact on the avifauna.

Mitigation Measures
Pre and post construction monitoring to be undertaken for all WEFs in the study area.

9.4.6 No-go alternative

The no-go alternative refers to the status quo and not proceeding with the proposed development. The area is currently utilised predominantly for low density sheep grazing. Existing electrical infrastructure, including Eskom substations and powerlines, have little impact on the avifauna. The impacts caused by the combination of status quo activities plus the additional potential impacts associated from the proposed wind farm will be acceptable if mitigation measures are implemented.

9.4.7 Reversibility and irreplaceability

The irreplaceable loss of habitat is expected if mitigation measures are not implemented. These impacts are considered irreversible. The impacts of disturbances associated with construction activities are reversible and the irreplaceable loss of resources are not expected. The impacts of turbine and powerline collision mortality are irreversible and will cause irreplaceable resource loss.

9.4.8 Significance statement

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Construction Phase Impacts					
Destruction of vegetation during the construction phase will reduce habitat available to birds					
Without Mitigation	Medium term	Study Area	Slight	Probable	**Low -**
With Mitigation	Medium term	Localised	Slight	Probable	**Low -**
Human activity and noise that causes birds to leave area of preferred habitat					
Without Mitigation	Medium term	Study Area	Slight	Probable	**Low -**
With Mitigation	Medium term	Localised	Slight	Probable	**Low -**
Operational Phase Impacts					

Activities and/or presence of intrusive structures cause birds to permanently move away from infrastructure					
Without Mitigation	Medium term	Localised	Severe	Probable	**Moderate -**
With Mitigation	Medium term	Localised	Severe	Probable	**Moderate -**
Turbine collision mortality					
Without Mitigation	Medium term	Localised	Moderate	Probable	**Low -**
With Mitigation	Medium term	Localised	Moderate	Probable	**Low -**
Powerline collision mortality associated with the placement of 33kV Powerlines throughout the project site					
Without Mitigation	Medium term	Localised	Severe	Probable	**Moderate -**
With Mitigation	Medium term	Localised	Severe	Probable	**Moderate -**
Cumulative Impacts					
The combined impacts from other renewable energy developments within close proximity to the Rietkloof wind farm					
Without Mitigation	Medium Term	Regional	Severe	Probable	**Moderate-**
With Mitigation	Medium Term	Regional	Severe	Probable	**Moderate-**

9.5 Impact on Bats

9.5.1 Key findings

There is no preference to any of the location alternatives for the associated infrastructures namely: access road, construction camp and substation.

Figure 11 - 14 depicts the sensitive areas of the site, based on features identified to be important for foraging and roosting of bat species that are most probable to occur on site. Thus the sensitivity map is based on species ecology and habitat preferences. This map can be used as a pre-construction mitigation in terms of improving turbine placement with regards to bat preferred habitats on site.

Bat sensitivity maps were compiled by the bat specialist and are presented below in Figure 9.6. Areas not depicted as having a Moderate or High Bat Sensitivity is considered of a Low Bat Sensitivity category. A number of turbines occur within the moderate bat sensitivity buffer (Turbines 14, 28 – 31, 42 – 45).

High bat sensitivity area
High bat sensitivity buffer
Moderate bat sensitivity area
Moderate bat sensitivity buffer
Turbine specific high bat sensitivity buffer

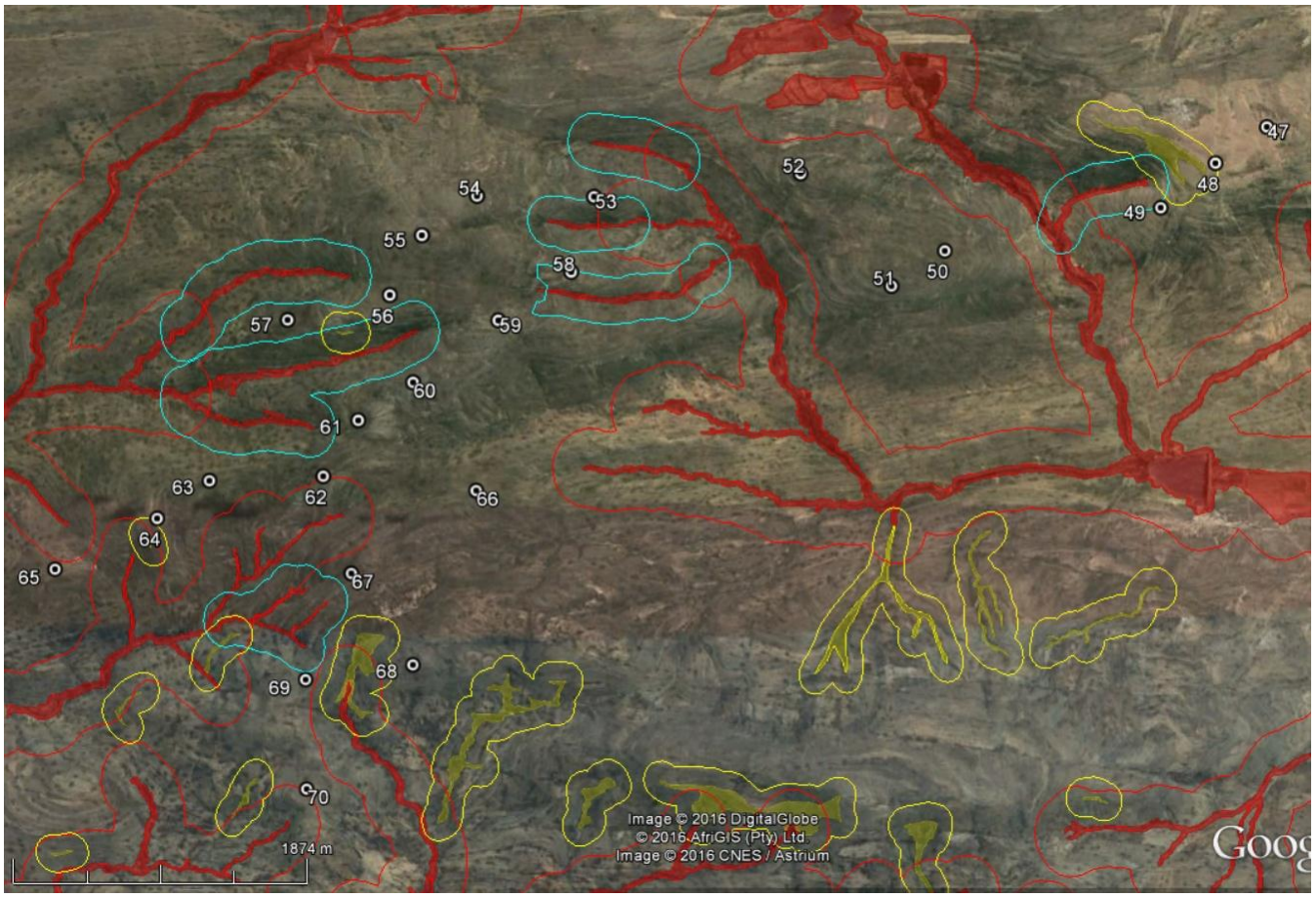


Figure 9-6A: Bat sensitivity map

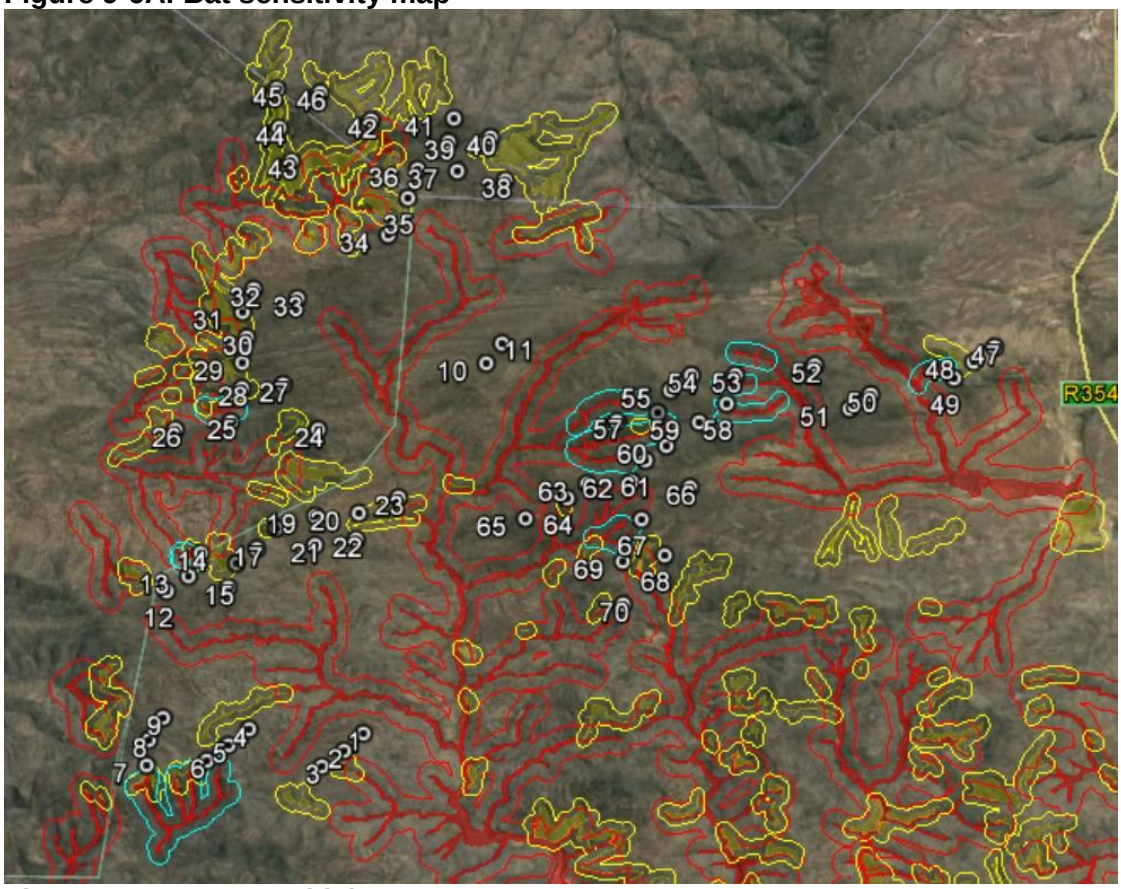


Figure 9-6B: Bat sensitivity map

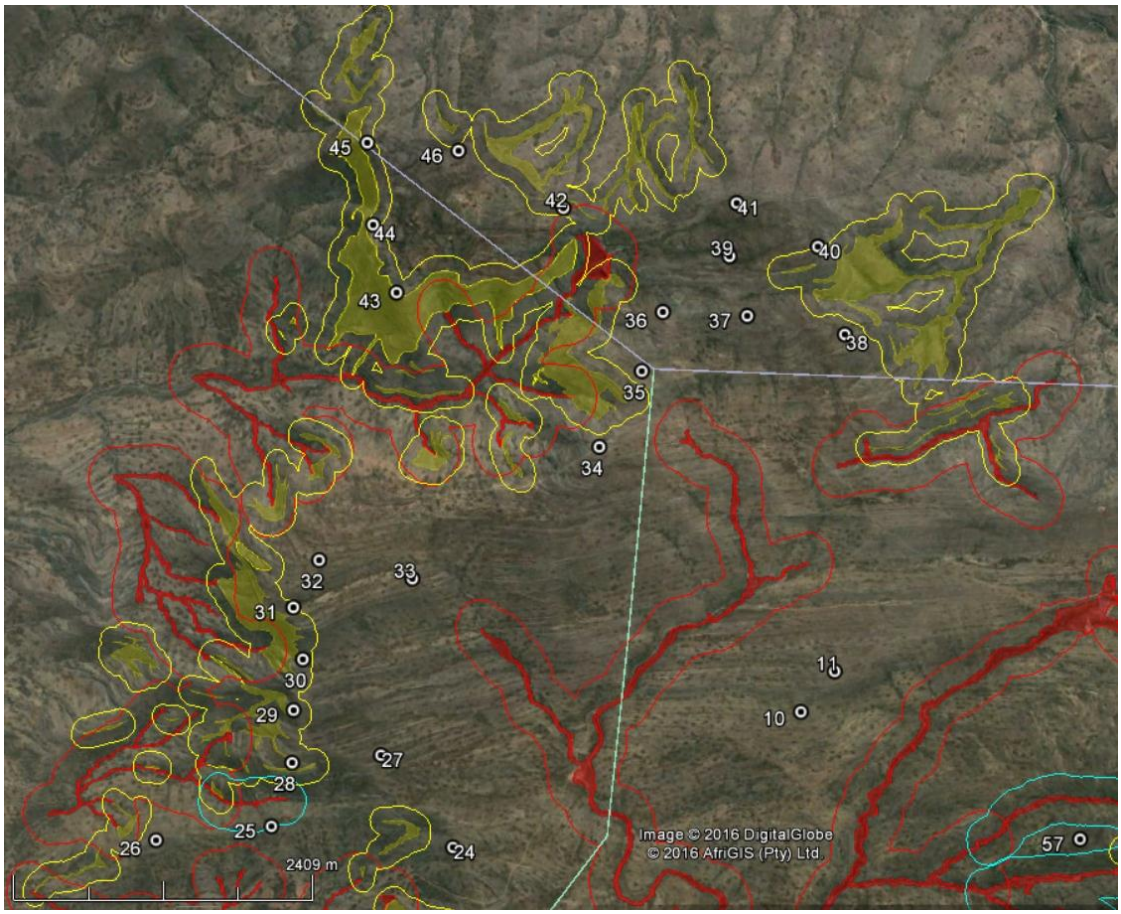


Figure 9-6C: Bat sensitivity map

9.5.2 Planning and construction phase impacts and mitigation measures

Impacts

During construction, the earthworks and especially blasting can damage bat roosts in rock crevices. Intense blasting close to a rock crevice roost, if undertaken, can cause mortality to the inhabitants of the roost. Some minimal foraging habitat will be permanently lost by construction of turbines and access roads. Temporary foraging habitat loss will occur during construction due to storage areas and movement of heavy vehicles.

Mitigation Measures

- Adhere to the sensitivity map during turbine placement.
- Blasting should be minimised and used only when necessary.
- Keep to designated areas when storing building materials, resources, turbine components and/or construction vehicles and keep to designated roads with all construction vehicles.
- Damaged areas not required after construction should be rehabilitated by an experienced vegetation succession specialist.

9.5.3 Operational phase impacts and mitigation measures

Impacts

The concerns for foraging bats in relation to wind turbines are discussed in Section 7.1.9. If the impact is too severe (e.g. in the case of no mitigation) local bat populations may not recover from mortalities.

During operation strong artificial lights that may be used at the turbine base or immediate surrounding infrastructure will attract insects and thereby also bats. This will significantly increase the likelihood of impact to bats foraging around such lights. Additionally, only certain species of bats will readily forage around strong lights, whereas others avoid such lights even if there is insect prey available, which can draw insect prey away from other natural areas and thereby artificially favour only certain species.

Mitigation Measures

- Undertake post-construction bat monitoring for a miminimum of two years according to the best practice guidelines.
- Adhere to the sensitivity maps, apply proposed mitigations to any further layout revisions, avoid areas of High bat sensitivity and their buffers as well as preferably avoid areas of Moderate bat sensitivity and their buffers.

Proposed initial mitigation measures

The tables below are based on the passive data collected. They infer mitigation be applied during the peak activity periods and times, and when the advised wind speed and temperature ranges are prevailing simultaneously (considering conditions in which 80% of bat activity occurred). Bat activity at 80m height is used in cases where elevated activity occurred at this height. In other cases bat activity at 10m were used, since bats are expected to move in an upwards fashion towards turbine blades (bat activity negatively correlated with height above ground).

The below turbines are linked to the passive systems below by means of proximity and/or similarities in habitat and terrain. The sensitivity map also influences which turbines may possibly require mitigation.

SM4	Turbines 28 – 31
Snydersberg	Turbines 42, 43, 44, 45
Barendskraal NW	Turbines 14

Table 9-1: The times of implementation of mitigation measures is preliminarily recommended (considering more than 80% bat activity, normalised data) as follows:

	Terms of mitigation implementation
Spring peak activity (times to implement curtailment/ mitigation)	Snydersberg: Month of October 21:00 – 02:00
Environmental conditions in which to implement curtailment/ mitigation	Below 5m/s measured at nacelle height Above 9°C
Autumn peak activity (times to implement curtailment/ mitigation)	SM4: 1 -15 March Sunset – 22:00
Environmental conditions in which to implement curtailment/ mitigation	Below 7m/s measured at nacelle height Above 17°C
Summer peak activity (times to implement curtailment/ mitigation)	Barendskraal NW: 1 December – 10 January 1 December – 15 January 20:00 – 01:00
Environmental conditions in which to implement curtailment/ mitigation	Below 9m/s measured at nacelle height Above 11°C

Where mitigation by location is not possible, other options that may be utilized include curtailment, blade feathering, blade lock, acoustic deterrents or light lures. The following terminology applies:

Curtailment:
Curtailment is defined as the act of limiting the supply of electricity to the grid during conditions when it would normally be supplied. This is usually accomplished by locking or feathering the turbine blades.

Cut-in speed:
The cut-in speed is the wind speed at which the generator is connected to the grid and producing electricity. For some turbines, their blades will spin at full or partial RPMs below cut-in speed when no electricity is being produced.

Feathering or Feathered:
Adjusting the angle of the rotor blade parallel to the wind, or turning the whole unit out of the wind, to slow or stop blade rotation. Normally operating turbine blades are angled almost perpendicular to the wind at all times.

Free-wheeling:
Free-wheeling occurs when the blades are allowed to rotate below the cut-in speed or even when fully feathered and parallel to the wind. In contrast, blades can be "locked" and cannot rotate, which is a mandatory situation when turbines are being accessed by operations personnel.

Increasing cut-in speed:
The turbine's computer system (referred to as the Supervisory Control and Data Acquisitions or SCADA system) is programmed to a cut-in speed higher than the manufacturer's set speed, and turbines are programmed to stay locked or feathered at 90° until the increased cut-in speed is reached over some average number of minutes (usually 5 – 10 min), thus triggering the turbine blades to pitch back "into the wind" and begin to spin normally and produce power.

Blade locking or feathering that renders blades motionless below the manufacturers cut in speed, and don't allow free rotation without the gearbox engaged, is more desirable for the conservation of bats than allowing free rotation below the manufacturer's cut in speed. This is because bats can still collide with rotating blades even when no electricity is being produced.

Acoustic deterrents are a developing technology and will need investigation closer to time of wind farm operation.

Light lures refer to the concept where strong lights are placed on the periphery (or only a few sides) of the wind farm to lure insects and therefore bats away from the turbines. However, the long term effects on bat populations and local ecology of this method is unknown.

Habitat modification, with the aim of augmenting bat habitat around the wind farm in an effort to lure bats away from turbines, is not recommended. Such a method can be adversely intrusive on other fauna and flora and the ecology of the areas being modified. Additionally it is unknown whether such a method may actually increase the bat numbers of the broader area, causing them to move into the wind farm site due to resource pressure.

Currently the most effective method of mitigation, after correct turbine placement, is alteration of blade speeds and cut-in speeds under environmental conditions favourable to bats.
A basic "6 levels of mitigation" (by blade manipulation or curtailment), from light to aggressive mitigation is structured as follows:

1. No curtailment (free-wheeling is unhindered below manufacturer's cut in speed so all momentum is retained, thus normal operation).

2. Partial feathering (45 degree angle) of blades below manufacturer's cut-in speed in order to allow the free-wheeling blades half the speed it would have had without feathering (some momentum is retained below the cut in speed).

3. Ninety degree feathering of blades below manufacturer's cut-in speed so it is exactly parallel to the wind direction as to minimize free-wheeling blade rotation as much as possible without locking the blades.

4. Ninety degree feathering of blades below manufacturer's cut-in speed, with partial feathering (45 degree angle) between the manufacturer's cut-in speed and mitigation cut-in conditions.

5. Ninety degree feathering of blades below mitigation cut in conditions.

6. Ninety degree feathering throughout the entire night.

It is recommended that curtailment be applied initially at the start of operation at Level 3 during the climatic conditions and time frames outlined in Table 9-1. However, actual impacts on bats will be monitored during the operational phase monitoring, and the recommended mitigation measures and levels of curtailment will be adjusted according to the results of the operational monitoring. This is an adaptive management approach, and it is crucial that any suggested changes to the initial proposed mitigation schedule be implemented within maximum 2 weeks from the date of the recommendation, unless the recommendation refers to a time period later in the future (e.g. the following similar season/climatic condition).

9.5.4 Decommissioning phase impacts and mitigation measures

Some minimal foraging habitat will be temporarily lost during decommissioning of turbines and access roads. Temporary foraging habitat loss will occur due to storage areas and movement of heavy vehicles.

Mitigation Measures

- Adhere to the sensitivity map. Keep to designated areas when storing building materials, resources, turbine components and/or heavy vehicles and keep to designated roads with all heavy vehicles.
- Damaged areas not required after construction should be rehabilitated by an experienced vegetation succession specialist.

9.5.5 Cumulative impacts and mitigation measures

Mortalities of bats due to wind turbines during foraging and migration can have significant ecological consequences as the bat species at risk are insectivorous and thereby contribute significantly to the control of flying insects at night. On a project specific level insect numbers in a certain habitat can increase if significant numbers of bats are killed off. But if such an impact is present on multiple projects in close vicinity of each other, insect numbers can increase regionally and possibly cause outbreaks of colonies of certain insect species.

Additionally, if migrating bats are killed off it can have detrimental effects on the cave ecology of the caves that a specific colony utilises. This is due to the fact that bat guano is the primary form of energy input into a cave ecology system, given that no sunshine that allows photosynthesis exists in cave ecosystems.

Mitigation Measures

- The High sensitivity valley areas can serve as commuting corridors for bats in the larger area, potentially lowering the cumulative effects of several WEF's in an area. Also adhere to recommended mitigation measures for this project during operation. It is essential that project specific mitigations be applied and adhered to for each project, as overarching regional mitigation measures are more complex and less feasible due to habitat and ecological differences between project sites. Adhere to the sensitivity map during any further turbine layout revisions, and preferably attempt to avoid placement of turbines in Moderate sensitivity areas, where possible.

9.5.6 Significance statement

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Construction Phase Impacts					
Destruction of bat roosts due to earthworks and blasting					
Without Mitigation	Short term	Localised	Severe	Probable	Moderate -
With Mitigation	Short term	Localised	Moderate	May Occur	Low -
Loss of foraging habitat					
Without Mitigation	Permanent	Localised	Slight	Probable	Moderate -
With Mitigation	Permanent	Localised	Slight	May Occur	Low -

Operational Phase Impacts					
Bat mortalities due to direct blade impact or barotrauma during foraging activities (not migration)					
Without Mitigation	Long term	Study area	Severe	Definite	High -
With Mitigation	Long term	Study area	Slight	May Occur	Low -
Decommissioning Impacts					
Loss of foraging habitat					
Without Mitigation	Long term	Regional	Severe	Probable	Low -
With Mitigation	Long term	Regional	Moderate	May Occur	Low -
Cumulative Impacts					
Cumulative bat mortalities due to direct blade impact or barotrauma during foraging (resident and migrating bats affected).					
Without Mitigation	Long term	Study area	Severe	Definite	High -
With Mitigation	Long term	Study area	Slight	May Occur	Moderate -

9.6 Noise impacts

The noise impacts were assessed by Dr Brett Williams from Safetech (see Appendix G for the full report) and the sections below for key findings, impact assessments, mitigation measures and conclusions.

9.6.1 Key findings

Noise pollution will be generated during the construction phase as well as the operational phase. The decommissioning noise impacts will be the same as for the construction phase.

The construction phase could generate noise during different activities such as:

- Site preparation and earthworks to gain access using bulldozers, trucks etc.
- Foundation construction using mobile equipment, cranes, concrete mixing and pile driving equipment (if needed).
- Limited blasting.
- Heavy vehicle use to deliver construction material and the turbines.
- Operating of a batching plant

The ability to hear a wind turbine in a given installation depends on the ambient sound level. When the background sounds and wind turbine sounds are of the same magnitude, the wind turbine sound gets lost in the background. Both the wind turbine sound power level and the ambient sound pressure level will be functions of wind speed. Thus whether a wind turbine exceeds the background sound level will depend on how each of these varies with wind speed.
The most likely sources of wind-generated sounds are interactions between wind and vegetation. A number of factors affect the sound generated by wind flowing over vegetation. For example, the total magnitude of wind-generated sound depends more on the size of the windward surface of the vegetation than the foliage density or volume.

The results of the noise impact assessment indicate that the 24-hour 45 dB(A) limit for **day/night** operations will not be exceeded at any of the noise sensitive areas.

The results indicate that the 35 dB(A) limit for **night** operations will be exceeded at NSA 1. It is highly likely that the wind noise will provide a masking effect at NSA 1 as the rating limit is only exceeded at 6m/s. The WTG noise emissions are thus unlikely to impact the receptors at NSA 1.

9.6.2 Construction phase impacts and mitigation measures

During construction if the ambient noise level is at 45dB(A) during the day, the construction noise will be similar to the ambient level at approximately 1280m from the noise source, if the noise

characteristics are similar. Beyond this distance, the noise level will be below the ambient noise and will therefore have little impact. The above only applies to the construction noise and light wind conditions. High wind conditions will have a masking effect on the construction noise. In all likelihood, the construction noise will have little impact on the surrounding community as it will most likely occur during the day when the ambient noise is louder and there are unstable atmospheric conditions.

Furthermore, none of the turbines are located closer than 1200m from the receptors. The construction of the access roads is a linear activity and will be of a short duration at each receptor. The construction of the roads is thus not significant as it is conducted mostly with mobile plant and equipment.

Mitigation Measures

- Construction operations should occur during daylight hours as far as possible.
- No construction piling should occur at night where possible. Piling should only occur during the day to take advantage of unstable atmospheric conditions.
- Construction staff should receive "noise sensitivity" training such as switching off vehicles when not in use, location of NSA's etc.
- One ambient noise survey should be conducted at the noise sensitive receptors during the construction phase

9.6.3 Operational phase impacts and mitigation measures

The sources of sounds emitted from operating wind turbines can be divided into two categories, firstly mechanical sounds, from the interaction of turbine components, and secondly aerodynamic sounds, produced by the flow of air over the blades. The ability to hear a wind turbine in a given installation depends on the ambient sound level. When the background sounds and wind turbine sounds are of the same magnitude, the wind turbine sound gets lost in the background. Both the wind turbine sound power level and the ambient sound pressure level will be functions of wind speed. Thus whether a wind turbine exceeds the background sound level will depend on how each of these varies with wind speed.

Sound levels from large modern wind turbines during constant speed operation tend to increase more slowly with increasing wind speed than ambient wind generated sound. As a result, wind turbine noise is more commonly a concern at lower wind speeds and it is often difficult to measure sound from modern wind turbines above wind speeds of 8 m/s because the background wind-generated sound generally masks the wind turbine sound above 8 m/s.

The potential effects of low frequency noise generated by turbines on humans include sleep disturbance, nausea, vertigo etc. However, these effects are unlikely to impact upon residents at the Brandvalley site due to the distance between the turbines and the nearest communities. In addition, other sources of low frequency noise in the area include wind noise and vehicular traffic, which are all sources that currently also impact on the receptors.

The turbines proposed for use will be between 1.5MW and 4MW. The noise impact assessment was done at a conservative measure of a 3.6MW turbine (1075.5dB power curve). Each turbine type (Vestas, Acciona and Siemens) each have their own predicted noise level during operation.

Twenty-nine Noise Sensitive Areas (NSA) were identified in the vicinity where the 70 Brandvalley WEF turbines (excl. turbine 38 & 42) have been proposed to be erected. Noise modelling was done to assess the noise impact of turbines on each NSA.

The results indicate that the 24 hour 45 dB(A) limit for **day/night** operations will not be exceeded at any of the noise sensitive areas.

The 35 dB(A) limit for **night** operations will be exceeded at Noise Sensitive Area 1 for all turbines at wind speeds

The South African guideline limit for noise is **45 dB(A) (day/night limit)** and **35 dB(A) (night limit)** for rural districts.

Table 9-2: Sensitive noise receptors exposure to the operational phase of the WEF

Predicted noise levels during the operational phase				
Turbine type	**Wind speed**	**Noise sensitive Receptor exceeding 35 dB(A)**	**Predicted noise level dB(A) ***	**Turbine 52 & 53 Removed**
Vestas V117	6m/s >	NSA 1	35.5-36.8	
Vestas V126	6m/s >		35.0-35.8	33.6-34.4
Acciona	3m/s >		37.2-36.8	
Siemens	6m/s >		35.0-35.8	

* SANS10103:2008 Night Limit = 35dB(A)

- It is highly likely that the wind noise will provide a masking effect and thus the impact is likely to be very low.
- If two turbines are removed (WTG 52 & 53), the SANS 10103:2008 night limit will not be exceeded (based on the Vestas V126 turbine). Once the turbine model are confirmed, these two turbines would need to be remodeled on finalisation of the turbine model to ensure that their noise emissions do not exceed the night limit.

Mitigation Measures

- The noise impact from the wind turbine generators should be measured during the operational phase, to ensure that the impact is within the required legal limit.
- Wind turbine generators should be maintained to ensure the noise emissions are within the legal and design specifications.
- An ambient noise survey should be conducted at the noise sensitive receptors closest to the turbines during the operational phase.
- Re-modelling of the noise impacts will need to be conducted on the final layout (when the final turbine is selected should the layout change).

9.6.4 Cumulative impacts

The cumulative effect of developing both the Brandvalley and Rietkloof Wind Energy Projects was modelled using the Vestas V117 turbine. The 35 dB(A) **night** guideline limit will be exceeded at NSA 18 and NSA 28 if both the Brandvalley and Rietkloof Wind Energy Farms are developed.

Table 9-3: Sensitive noise receptors to cumulative exposure to the Brandvalley and Rietkloof WEFs

Cumulative Effect Brandvalley and Rietkloof			
Turbine type	**Wind speed**	**Noise sensitive Receptor exceeding 35dB(A)**	**Predicted noise level**
Vestas V117	8m/s >	NSA 18	35.0
	7m/s >	NSA 28	35.1-35.5

- It is highly likely that the wind noise will provide a masking effect at:
  - NSA 18 as the rating limit is only exceeded at 8m/s and
  - NSA 28 as the rating limit is only exceeded at 7m/s
  - The WTG noise emissions are thus unlikely to impact the receptors at NSA 18 and 28 beyond 8m/s and 7m/s respectively.

Mitigation Measures

If a noise impact survey during operations indicates that a noise disturbance is present i.e. (the turbine noise exceeds the actual ambient (residual) noise by more than 7dB(A), then the turbines can be placed in a lower operational noise mode, when the surface wind speeds are low and the hub height wind speed has reached the cut-in speed (3m/s).

9.6.5 Significance statement

Impact	Overall Significance	
	Without Mitigation	With Mitigation
Construction		
Impact of construction increase in ambient noise levels	Low -	Low -
Operation		
Impact of the operational noise on the surrounding environment	Low -	Low -
Decommissioning		
Impact of decommissioning increase in ambient noise levels	Low -	Low -
Cumulative		
Noise increase due to the development of multiple WEF in the same area	Low -	Low -

Based on the information the turbine locations, access road alternatives, construction camp alternatives and substation alternatives can proceed as the facility as a whole will result in low (-) noise impacts throughout the project lifecycle regardless of where infrastructure is located.

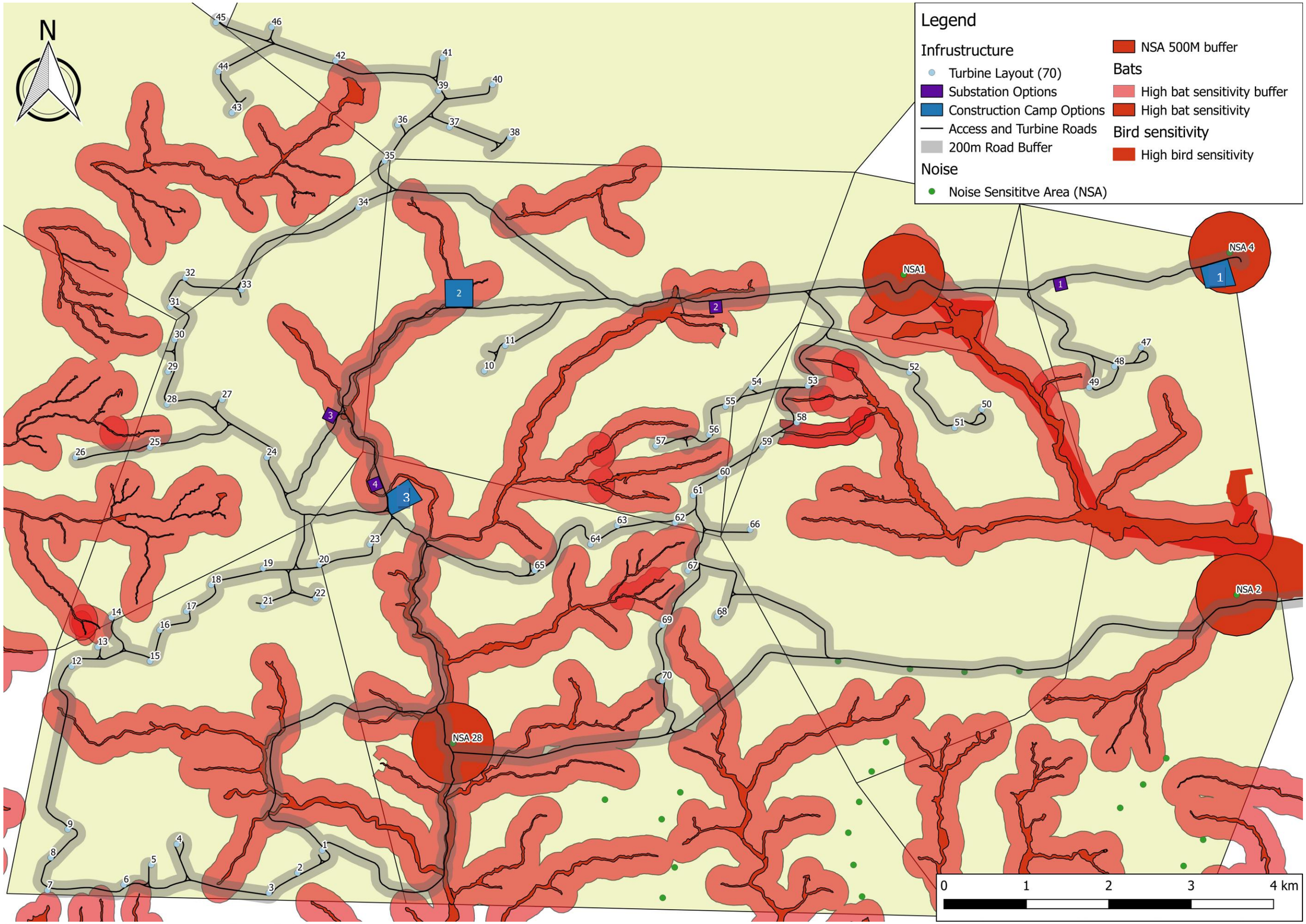


Figure 9.7: Combined specialist map for Birds, Bat and Noise sensitivities

9.7 Visual impacts

The impacts on the visual landscape was assessed by Mr Thomas King from EOH CES and peer reviewed by Henry Holland (see Appendix G for the full report) and the sections below for key findings, impact assessments, mitigation measures and conclusions.

9.7.1 Key findings

Wind turbines, with a hub height of up to 120m, and the rotor diameter up to 140m can be considered visually intrusive by neighbouring properties and key stakeholders. The overall aim of a Visual Impact Assessment (VIA) is to determine the current landscape quality (scenic views, visual sensitivity) and the visual impact of the proposed development. The site and its surroundings are not highly developed. The site is remote and the sense of place is typically Karoo. A large 765kV Eskom transmission line, and a 400kV Eskom transmission line are the only features which currently detract from the otherwise high scenic quality of the area.

Within twenty kilometres of the Brandvalley WEF boundary, eighty (80) buildings were identified. These were identified using aerial imagery and were ground-truthed during the site visit. Thirty (30) of these were found to be the homesteads of surrounding farmers. The visual impact of the WEF on these homesteads is dependent on the number of turbines visible and their proximity to the turbines (i.e. their visual exposure to the development). Not all of these homesteads are necessarily sensitive to the proposed wind energy facility, as this depends on their perception of wind turbines: they may have a neutral or positive opinion towards them. Therefore, we consider tourist facilities and interested and affected parties that have stated that they are opposed to the wind energy facility to be particularly sensitive. In terms of tourist facilities, the Gatsrivier and Saaiplaas guest farms have been identified as sensitive. Two protected areas were identified within 50km of the WEF boundary, these will not impact on these reserves due the distances:

- Anysberg Nature Reserve, Provincial Nature Reserve, 32km south of the WEF boundary;
- Touw Local Authority Nature Reserve, Local Nature Reserve, 46km south-west of the WEF boundary.

The visual impact assessment found the following homesteads and guest houses to be visually senstivie the the Brandvalley WEF, the sensitivity is based on their visual exposure (Table 9-1). The homesteads/guest houses which are closer to the turbines are likely to see fewer turbines but more of the turbine itself (if not the entire turbine), i.e. they will be closer and larger, whereas the guesthouses/homesteads further away (>10km) will see a greater number of turbines but only a portion of each turbine i.e. since they are viewed at a distance they will appear further away and small.

Table 9-1: Summary of the sensitive visual receptors exposure to the WEF

Sensitive Visual Receptors	# Turbines Visible (distance in km to nearest turbine)	Visual Exposure
Within 5 km		
Gatsrivier Guest House	11-15 (8.6)	Wind turbines will dominate views from these distances and visual receptors will be highly exposed to the development.
Aurora farm homestead (Gielie Hanekom)	11-15 (5.9)	
Bona Esperance farm homestead (P.J. Conradie)	6-10 (4.9)	
Swartland Homestead (T.J. Calldo)	1-5 (5.3)	
Within 5 to 10 km		
Brandenburg farm Homestead (Mr A.J. Du Plessis)	21-25 (11.8)	At these distances the wind turbines will not be dominant in views but they will be clearly recognisable by visual receptors (their visual exposure to the wind turbines will be moderate).
Saaiplaas Guest House/ homestead	Farms are planned to host wind turbines associated with different projects, they are not considered to be sensitive receptors.	
Ekkraal farm homestead (Mr Kosie Steenkamp)		
Within 10 to 15 km		
Kareerivier farm homestead	21-25 (18)	The wind turbines will be recognisable to

Bantamsfontein farm homestead (Mr Jan du Toit)	16-20 (20.3)	these visual receptors and their visual exposure to the development will be moderate.
Smitskraal farm homestead	6-10 (14.5)	
Patatsrivier farm homestead	1-5 (15)	
Within 15 to 20 km		
Zeekoegat farm homestead (Mr Warren Petterson)	6-10 (17)	At a distance of 17km and 17.5km respectively from the nearest turbine (Wind Turbine 3), the wind turbines will not be easily noticeable during the day, at night, the red light on the turbine hub that blinks approximately every two seconds will be noticeable.
Keurkloof farm guesthouse (Mr Steve Swanepoel)	6-10 (17.8)	

Objections to the wind energy facility have been received from two nearby land owners during the scoping public participation process. The first objector is Mr Warren Petterson whose farm "Zeekoegat" is located to the south of the proposed WEF site. The homestead on the farm is 17km from the nearest turbine (Wind Turbine 3). The mountain hut that he is refurbishing is 21km from the nearest turbine (Wind Turbine 3).

The second objector is Mr Steve Swanepoel whose cottage on the farm "Keurkloof" is located 17.5km from the nearest wind turbine (Wind Turbine 3). Photomontages were done at visual vantage points to depict what Mr Petterson and Mr Swanepoel views of Brandvalley WEF could be should the proposed project be approved.

Photomontages were prepared to provide some indication as to what the wind farm will look like from the three sensitive areas namely:

- Viewpoint from Bantamsfontein (Figure 9.8a)
- Viewpoint close to Saaiplaas Guesthouse (Figure 9.8b)

The visual impacts during the construction phase of a wind farm are considered less significant than the impacts during the operations phase, due to the fact that:

- The construction phase has a much shorter duration than the operations phase,

The size of the viewshed is much smaller, due to the fact that the construction equipment is much shorter than the erected wind turbines.

Figure 9-8a: Viewpoint from east of Saaiplaas.

Viewpoint name:	Viewpoint 05 - Just east of Saaiplaas
X-coordinate:	467550 (UTM34S)
Y-coordinate:	6360758 (UTM34S)
Orientation:	Facing south-east
Distance to nearest turbine:	13.5km

Figure 9-8b: Viewpoint from Bantamsfontein.

Viewpoint name:	Viewpoint 11 - Bantamsfontein
X-coordinate:	422926 (UTM34S)
Y-coordinate:	6352060 (UTM34S)
Orientation:	Facing east
Distance to nearest turbine:	20.8km

9.7.2 Construction phase impacts and mitigation measures

Impacts

There are various construction activities which will have impacts on sensitive visual receptors:

- Large areas of vegetation will need to be cleared to make way for digging of the turbine foundations, hardstand areas, substation footprints, access roads, laydown areas, workshops and storage yards.
- Construction of wind turbines will potentially draw attention if they are exposed above the skyline.
- There will be a large increase in the movement of vehicles in the area: large trucks delivering supplies and construction material; graders, excavators and bulldozers; light vehicle movement around site; large trucks hauling rubble and construction waste, etc.
- Soil stockpiles and heaps of vegetation debris.
- Dust emissions from construction activity
- The footprint of the construction camp alternatives are largely similar, but the viewsheds differ quite significantly based on their location in the landscape. The Brandvalley construction camp alternative 1 has the smallest viewshed, and is visually the preferred option.

Mitigation Measures

- The construction contractor should clearly demarcate construction areas so as to minimise site disturbance.
- Treat roads to reduce dust emissions.
- The site should be kept neat and tidy. Littering should be fined and the ECO should organise rubbish clean-ups on a regular basis.
- Construction camp alternative 1 should be the preferred alternative due to it having the smallest viewshed.

9.7.3 Operational phase impacts and mitigation measures

Impacts

Turbines

There are no structures similar in size and type to the proposed wind turbines in existing views and the turbines are likely to change these views to a considerable extent. The sense of place of the region is remote rural in many parts of the study area and wind turbines will, for some visual receptors, alter the remoteness of the region. Visual intrusion of the proposed development is therefore rated as high (although it should be noted that this will not be the case for all visual receptors in the region since the aesthetic appeal of wind turbines differ significantly among viewers). It should also be noted that wind turbines have to be fitted with red lights that flash intermittently. These will be highly visible at night, especially at this particular site due to the almost total absence of other non-natural light emitters.

Access roads

The access roads (excluding the alternatives considered above) will have a total length of 88,280.2m. Based on a width of 12m, these will have a footprint of approximately 120ha. This road network will be visible from an area of 23,595ha, limited to within 5km of the road network. A part of this road network will be visible to Gielie Hanekom at his homestead on the farm “Aurora”. The viewshed of access road alternative 1 is approximately 2470ha less than viewshed 2.

Substation

The visual impact of four substation options were assessed and substation alternative 1 was found to have the smallest viewshed (418ha) half that of alternative 2 and a third of alternative 3 and 4. There are no visual receptors.

Shadow flicker

Shadow flicker results from the shade cast by a wind turbine and its rotating blades. The shade cast by the blades “flicker” from the point of view of a stationary observer as the blades rotate.

The visual specialist assessment did not perform detailed modelling of the shadow flicker effect, but assessed this impact based on the rule of thumb that shadow flicker is potentially a problem if a turbine is located within 800 metres of an occupied building i.e. if a turbine is within 800m of an occupied building, the particular building and turbine and the topography of the area between them should be assessed to determine whether shadow flicker may be a problem. This can be analysed using basic trigonometry.

The visual specialist assessed the potential for shadow flicker impact on buildings located within the project area i.e. buildings on the farms hosting the wind turbines. It was found that none of the turbines were within 800m of an existing dwelling, as indicated in the figure below.

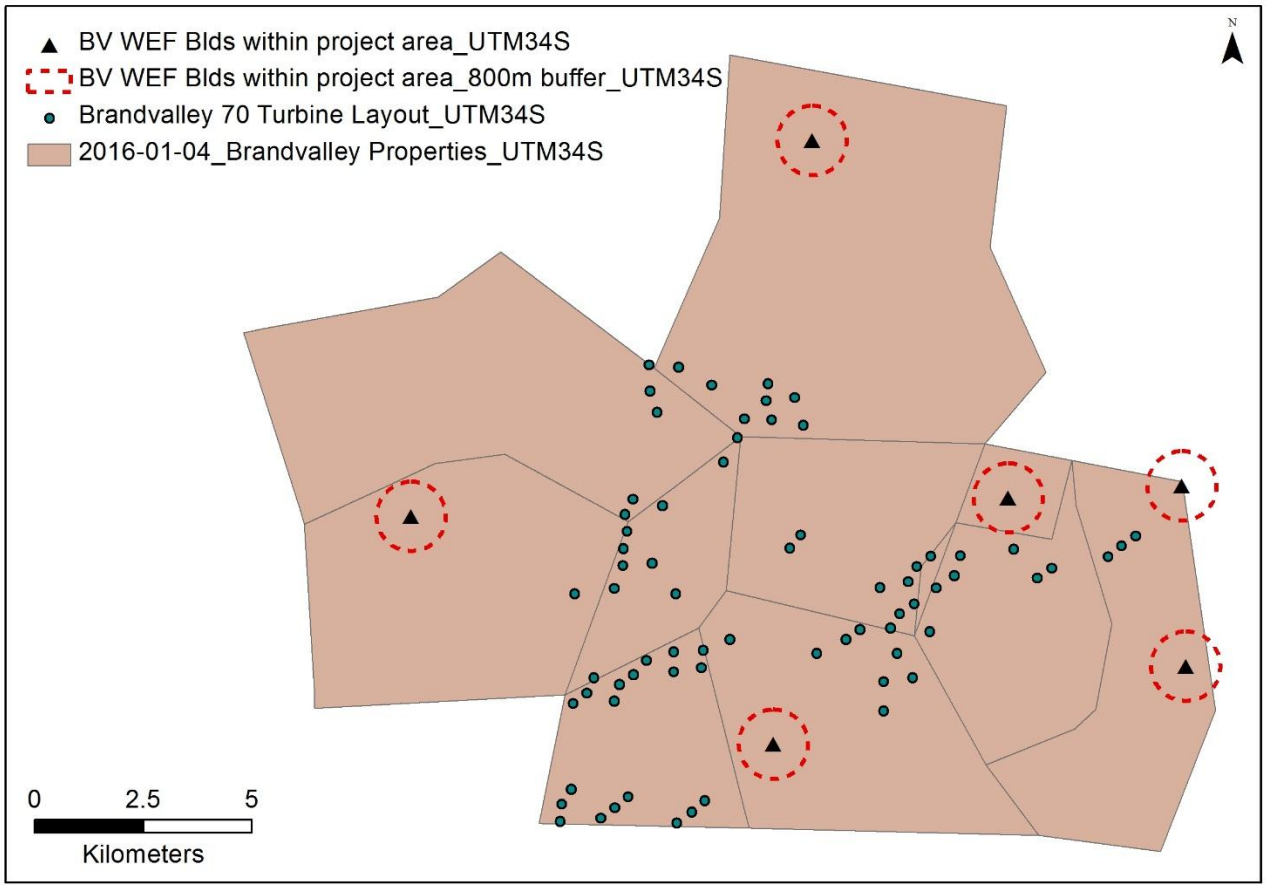


Figure 9-9: Shadow flicker

Mitigation Measures

- Other than avoiding the site completely there are no mitigation measures that will reduce the visual intrusion of the wind turbines due to their size/height and visibility, and the lack of screening opportunities in the landscape.
- Due to access road 1 having a smaller footprint and viewshed, it should be the preferred option.
- Substation alternative 1 should be the preferred alternative due to it having the smallest viewshed. However, they are all four rated equally using the assessment methodology and therefore the other three locations can also be constructed if substation 1 is not technically feasible.
- We recommend that if the turbine layout is adjusted and if it is found that an occupied building is located within 800m of a wind turbine, then the potential for shadow flicker should be assessed. A building should not be affected for more than 30 hours per year, or for longer than 30 minutes in a day.

9.7.4 Decommissioning phase impacts and mitigation measures

Wind farms are typically designed for a 25 year life. After 25 years, the proposed Brandvalley Wind

Farm may either be refurbished (re-powered) or decommissioned. If it is decommissioned, the impacts during the decommissioning phase will be very similar to those identified in the construction phase, specifically the visual impact of construction activities. The mitigation measures applicable to the construction phase are applicable to decommissioning as well.

9.7.5 Cumulative impacts

The wind energy facilities listed below are within 30km of the Brandvalley WEF and are seeking environmental authorisation or have received environmental authorisation.

- Konstabel Solar Project
- Roggeveld Wind Project
- Perdekraal Wind Project
- Witberg Wind Project
- Sutherland Wind and Solar Project
- Hidden Valley Wind Project
- PV Solar Project, south of Sutherland
- Suurplaat Wind Project
- Gunstfontein Wind Project
- Komsberg Substation
- Rietkloof Wind Project

In addition to the renewable energy projects, transmission line infrastructure adds to the altered visual landscape and character of the area. The recently built 765kV line runs from the Gamma substation near Victoria West past the Kappa substation near Touwsriver (southwest of the project site) to connect to the Omega substation near Koeberg. This is part of Eskom's grid strengthening project for power transmission and distribution in South Africa. The Komsberg capacitor station located southeast of the project site has two 400 kV lines running through its capacitor banks from the Droerivier substation to the Bacchus and Muldersvlei substations, respectively, via the Kappa substation. The approved renewable energy projects located in the vicinity are intended to be connected to the Komsberg station where new substation infrastructure will be built. These powerline infrastrucuture can be seen as part of the cumulative visual impact experienced as part of the developments proposed and/or approved in the vicinity of the Brandvalley WEF site.

Although it makes sense from a business and engineering perspective to concentrate facilities in this way, there is no escaping the fact that the development of multiple wind energy facilities, at this scale, will change the character of this remote area significantly. However, it should also be noted that the area is located within a Renewable Energy Development Zone - "Komsberg Wind" - as identified in the Strategic Environmental Assessment undertaken by the Council for Scientific and Industrial Research (CSIR) and the Department of Environmental Affairs. The planning instruments therefore support the concentration of renewable energy development within this area. The impact of the wind farm on its own, and when considered cumulatively with other wind farms in the region, will have a high negative visual impact for the following reasons:

- The screening effect of vegetation in this arid environment is non-existent;
- The construction of infrastructure of this type in this region will contract strongly with the sense of place of the region.

Mitigation and management

There are no feasible mitigation measures to reduce the cumulative visual impact of the wind farms. If each wind farm implements the mitigation measures suggested in their individual Visual Impact Assessments and Environmental Management Programmes, this will serve to reduce the cumulative impact.

9.7.6 No-go development

The low rainfall of the region has created the Karoo. It has defined the settlement patterns and the land use. The sense of place of the Karoo, including this region, is of vast open skies, long and straight roads, very few people, hot days and cold nights, creaky wind mills drawing what little water they can from underground aquifers, krantzs, isolated farms, imposing hills forming the horizon. The status quo of described would remain if the Brandvalley WEF is not developed, but is likely to be limited to the immediate locality as there are approved projects in the region.

9.7.7 Significance statement

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Construction Phase Impacts					
Visual impact of construction activity					
Without Mitigation	Short-term	Regional	Moderate	Definite	**Moderate -**
With Mitigation	Short-term	Regional	Slight	Definite	**Moderate -**
Visual impact of the construction camp alternatives 1, 2 and 3					
Without Mitigation	Short-term	Localised	Slight	Definite	**Low -**
With Mitigation	Short-term	Localised	Slight	Definite	**Low -**
Operational Phase Impacts					
Impact of wind turbines on the sensitive visual receptors					
Without Mitigation	Permanent	Study Area	Severe	Definite	**High -**
With Mitigation	Permanent	Study Area	Severe	Definite	**High -**
Visual impact of the access roads, including alternatives 1 and 2					
Without Mitigation	Permanent	Localised	Slight	Definite	**Moderate -**
With Mitigation	Permanent	Localised	Slight	Definite	**Moderate -**
Visual impact of the on-site substation					
Without Mitigation	Permanent	Localised	Slight	Definite	**Moderate -**
With Mitigation	Permanent	Localised	Slight	Probable	**Moderate -**
Shadow flicker					
				No impact	
Decommissioning Cumulative Impacts					
Visual impact of decommissioning activity					
Without Mitigation	Short term	Study area	Moderate	Definite	**Moderate -**
With Mitigation	Short term	Study area	Slight	Definite	**Moderate -**
Cumulative Impacts					
Without Mitigation	Permanent	Regional	Moderate	Definite	**High -**
With Mitigation	Permanent	Regional	Moderate	Definite	**High -**
No-Go option					
Impact on the Karoo's sense of place and its value to residents and visitors					
Without Mitigation	Permanent	Regional	Moderate	Definite	**Moderate +**
With Mitigation	N/A	N/A	N/A	N/A	N/A

9.8 Impact on Agricultural Potential and Soils

The impacts on agricultural activities were assessed by Mr Roy de Kock from EOH CES and the report was peer reviewed by Mr Johann Lanz. Please see Appendix G for the full reports and the sections below for key findings, impact assessments, mitigation measures and conclusions.

9.8.1 Key findings

Grazing onsite is not utilised to its fullest potential capacity, but this is as a result of water availability. Soils within the Brandvalley Wind Farm may be considered as optimum for a wide variety of crops under minimal soil management. However, due to the limiting factor being water

availability and soil depth, such crops can only be grown under irrigation in deeper alluviums next to river systems. The Brandvalley wind farm only receives about 61mm of rainfall per year, and therefore dryland cropping is not viable. Irrigation is intensively practiced in small areas along dry riverbeds where irrigation dams can be erected and soils are suitable. Various cash crops and winterfeed are produced under irrigation, but are restricted to small areas along dry riverbeds. The area supports some hunting practices and livestock farming.

An agricultural sensitivity map was developed based on the results from the field survey (Figure 9.10).

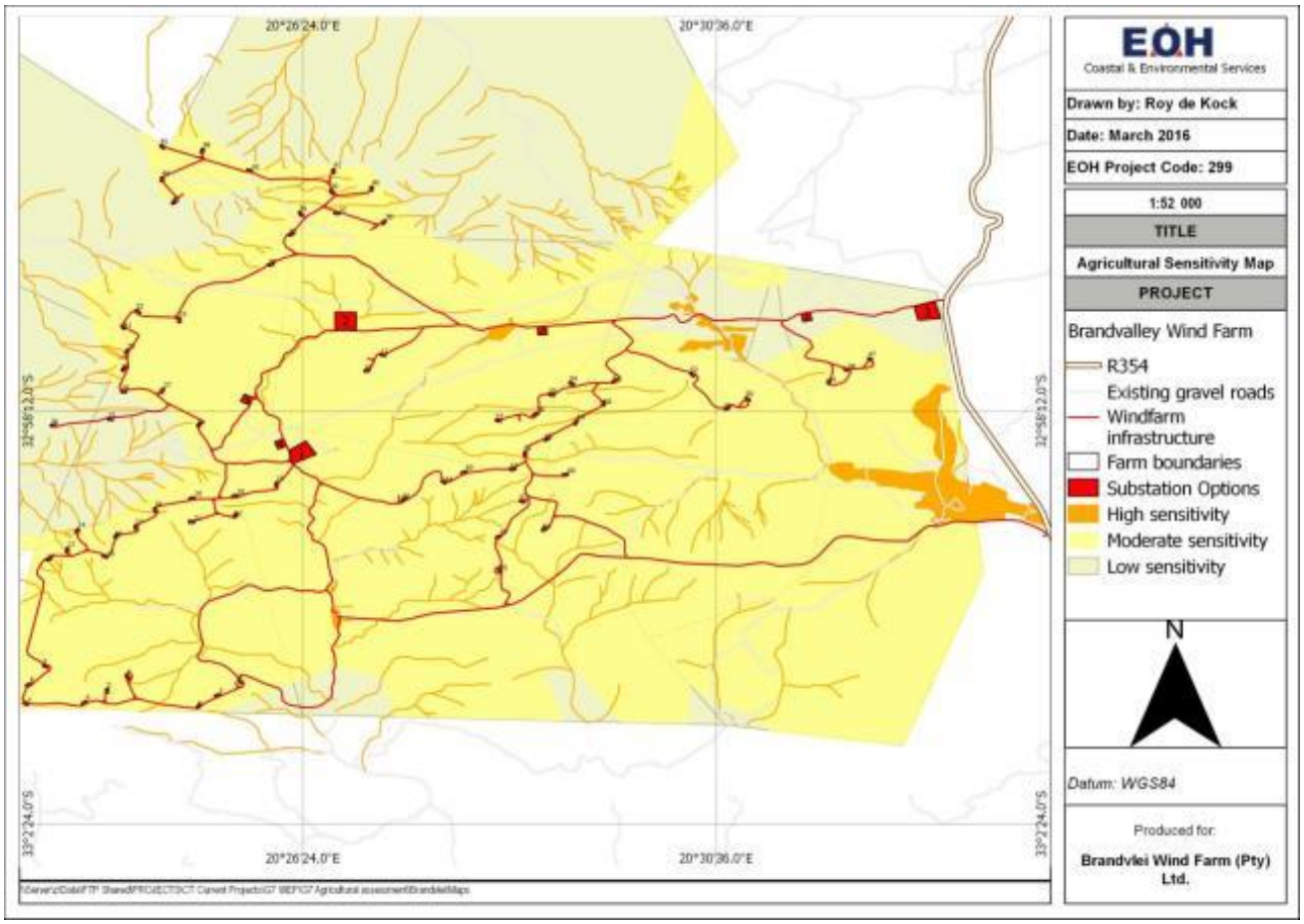


Figure 9.10: Agricultural sensitivity map of the Brandvalley Wind farm area

The following sensitive areas were identified and mapped in Figure 9-2 above:

Area type	Sensitivity allocation
Crop areas under irrigation	High
Water bodies	High
Drainage systems	High
Shallow soils on sloped areas	Moderate

All the identified impacts on agriculture are considered to have high reversibility because the land will be able to be returned to agriculture after closure, with very little change in agricultural potential. Impacts on agriculture are also considered to have low irreplaceability of resource loss because:

1. of the small area of land involved,
2. low suitability for crops outside small areas along dry riverbeds that are under irrigation,
3. it is highly unlikely to be irreplaceably lost to agriculture,
4. of a low agricultural potential for livestock, and

5. the proportion of surface area likely to be affected is minimal and therefore the overall impact on the carrying capacity/agricultural potential of the site will be minimal.

9.8.2 Planning and Design Phase Impacts and Mitigation Measures

Impacts

- During the planning and design phase inappropriate storm water design may lead to an increase in surface soil erosion
- During the planning and design phase the increase in renewable energy development in the local area will result in a gradual reduction of available agricultural land over time.

Mitigation Measures

- Appropriate stormwater structures must be designed and implemented for all new infrastructure (e.g. roads, turbine bases etc.).
- All roads situated on slopes must incorporate stormwater diversions.
- Avoid developing on high potential agricultural land (like irrigated areas, croplands, etc.).
- If unavoidable, ensure that all development footprints are kept at a minimum.

9.8.3 Construction phase impacts and mitigation measures

Impacts

- During the construction phase hazardous chemical spills and leakages could lead to soil contamination and a loss of fertile soils if not managed appropriately.
- During construction phase fires originating from the construction site could lead to the loss of grazing and game.
- During the construction phase incorrect stockpiling of soil could result in a decrease of agricultural viability/potential.
- During the construction phase excavations for the construction of the turbines and associated infrastructure will disturb the soil profile. If topsoil becomes buried, or subsoil rock, that is less suitable for root growth, remains at the surface, the agricultural suitability of the soil, that will become available for agriculture again after decommissioning of the WEF, will be reduced.
- During the construction phase the WEF infrastructure (permanent and temporary) will result in the loss of low agricultural land.
- During the construction phase the increase in impacted areas and hard surfaces will increase run-off and potentially lead to soil erosion.

Mitigation Measures

- Machinery must be properly maintained to keep oil leaks in check.
- If a spill occurs on a permeable surface (e.g. Soil), a spill kit must be used to immediately reduce the potential spread of the spill.
- If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained.
- Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of hazardous chemicals to the environment, and stored in adequate containers until appropriate disposal in a licenced landfill site.
- Ensure that all personnel are aware of the fire risk and the need to extinguish cigarettes before disposal, in appropriate waste disposal containers.
- Smoking will only be allowed in demarcated areas with easy access to firefighting equipment.
- Welding and other construction activities requiring open flames shall be done in a designated area containing firefighting equipment.
- The risk of fire is highest in the late summer and autumn months, during high wind velocities and dry periods. To avoid and manage fire risk the following steps should be implemented:
- Have on site fire-fighting equipment and ensure that all personnel are educated how to use it and procedures to be followed in the event of a fire.
- Identify the relevant authorities and structures responsible for fighting fires in the area and shall liaise with them regarding procedures should a fire commence.
- Ensure that all the necessary telephone numbers (including local Farmers Association Fire Marshall) to use in a case of an emergency are displayed at conspicuous and relevant locations.

- No open fires shall be allowed on site for the purpose of cooking or warmth. Cooking fires must only be lit in designated cooking areas.
- The contractor shall take all reasonable steps to prevent the accidental occurrence or spread of fire.
- The contractor shall appoint a fire officer who shall be responsible for ensuring immediate and appropriate action in the event of a fire.
- The contractor shall ensure that all site personnel are aware of the procedure to be followed in the event of a fire. The appointed fire officer shall notify the Fire and Emergency Services in the event of a fire and shall not delay doing so until such time as the fire is beyond his / her control.
- The contractor shall ensure that there is basic fire-fighting equipment on site at all times. This equipment shall include fire extinguishers and beaters.
- Any work that requires the use of fire may only take place within designated areas. Fire-fighting equipment shall be available in these areas.
- Develop and implement a Rehabilitation and Monitoring Plan to monitor rehabilitated areas.
- Ensure that topsoil does not get buried by subsoil during stockpiling. Failure to comply may result in topsoil sterilisation.
- Implement measures such as wind-breaks, swales and watering as required aiding the initial grown of primary vegetation.
- Fertile topsoil must not be stockpiled for periods exceeding 12 months or exceeding 2m in height to avoid topsoil sterilization. If unavoidable, the appointed ECO must monitor topsoil stockpile fertility to avoid sterility of soils.
- Topsoil may be supplemented with an indigenous seed mix.
- The upper 15-20 cm of top soil must be stripped and stockpiled as topsoil where possible. It should be retained for re-spreading over disturbed surfaces during rehabilitation.
- All other soil excavated will be stockpiled separately from topsoil as subsoil.
- Ensure that topsoil does not get buried by subsoil during backfilling. Failure to comply may result in topsoil sterilisation.
- An ECO must monitor all excavations to ensure backfilling with subsoil first and then topsoil afterwards takes place.
- An ECO must monitor depth and cover of topsoil spreading during rehabilitation to ensure a 20cm depth in valleys. Rocky areas do not require topsoil but must be monitored by the ECO during rehabilitation.
- Topsoil allocated for rehabilitation must not be mixed with other materials, such as building rubble, rock, subsoil, etc.
- Topsoil stockpiles are to be handled only twice – once during clearing and stockpiling and once during rehabilitation/backfilling unless input is required as advised by the ECO.
- Construction activities must only occur within the demarcated construction footprint.
- The construction footprint must be approved by the landowner/occupier prior to commencement of construction activities.
- All run-off water from hard surface areas (e.g. roads, hardstands etc.) and construction impacted areas must be collected, channelled and disposed of in an appropriate manner to prevent erosion. Anti-erosion features must be installed where required.
- Ensure that all cleared and impacted land is rehabilitated and re-vegetated.

9.8.4 Operational phase impacts and mitigation measures

Impacts

- During the operational phase an increase in hard surfaces (hardstands and roads) will increase run-off and potentially lead to soil erosion.
- During the operational phase the WEF infrastructure will result in the loss of low agricultural land
- During the operational phase the new access roads will allow for an easier access to farm areas previously inaccessible or difficult to access.

Mitigation Measures

- All run-off water from hard surface areas (e.g. roads, hardstands etc.) must be collected, channelled and disposed of in an appropriate manner.
- Anti-erosion features must be installed where required.

- Ensure that all cleared and impacted land is rehabilitated and re-vegetated.
- Fencing of WEF infrastructure should be limited as far as possible to allow for maximum grazing and movement of livestock and game within the site.

9.8.5 Decommissioning phase impacts and mitigation measures

Impacts

During the decommissioning phase the decrease in renewable energy development in the local area will result in an increase of available agricultural land.

Mitigation Measures

- All impacted agricultural land should be rehabilitated for future agricultural use.

9.8.6 Cumulative impacts and mitigation measures

All impacts listed above can contribute to cumulative impacts associatyed with other renewable energy developments in the area. However, the agricultural specialist concluded that because the impacts associated with the Brandvalley WEF are fairly low and deemed to be acceptable with mitigation, the development can proceed.

9.8.7 No-Go alternative

The No-Go option will not impact on any agricultural land but construction of new access roads to turbines located in currently inaccessible farm areas will result in easy/easier access by the farmer into these areas. Not constructing the WEF will result in these areas remaining inaccessible to the farmer.

9.8.8 Reversibility and irreplaceability

All identified impacts on agriculture are considered to have high reversibility because the land will be able to be returned to agriculture after closure, with very little change in agricultural potential. Impacts on agriculture are also considered to have low irreplaceability of resource loss because:

6. of the small area of land involved,
7. low suitability for crops outside small areas along dry riverbeds that are under irrigation,
8. it is highly unlikely to be irreplaceably lost to agriculture,
9. of a low agricultural potential for livestock, and
10. the proportion of surface area likely to be affected is minimal and therefore the overall impact on the carrying capacity/agricultural potential of the site will be minimal.

9.8.9 Significance ratings

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Planning and Design Phase Impacts					
Increase in erosion potential					
Without Mitigation	Medium-term	Localised	Moderate	Probable	**Moderate -**
With Mitigation	Medium-term	Localised	Moderate	Probable	**Low -**
Construction Phase Impacts					
Management of hazardous chemicals					
Without Mitigation	Long-term	Study Area	Moderate	Probable	**Low-**
With Mitigation	Long-term	Study Area	Moderate	Probable	**Low-**
Increased risk of fires from construction activities					
Without Mitigation	Long-term	Regional	Very severe	Probable	**Moderate-**
With Mitigation	Long-term	Regional	Severe	Probable	**Low-**

Loss of agricultural potential due to poor management of the soil stockpile					
Without Mitigation	Medium-term	Localised	Moderate	Probable	**Moderate -**
With Mitigation	Medium-term	Localised	Moderate	Probable	**Low -**
Soil profile disturbance and resultant decrease in soil agricultural capability					
Without Mitigation	Permanent	Study Area	Very severe	Definite	**Moderate -**
With Mitigation	Permanent	Study Area	Severe	Definite	**Low -**
Establishment of renewable energy infrastructure on agricultural land					
Without Mitigation	Medium-term	Study Area	Slight	Definite	**Moderate -**
With Mitigation	Medium-term	Study Area	Slight	Definite	**Low -**
Increase in erosion potential					
Without Mitigation	Long-term	Study Area	Severe	Definite	**Moderate -**
With Mitigation	Long-term	Study Area	Severe	Definite	**Low -**
Operational Phase Impacts					
Increase in erosion potential					
Without Mitigation	Long-term	Study Area	Severe	Definite	**Moderate -**
With Mitigation	Long-term	Study Area	Severe	Definite	**Low -**
Establishment of renewable energy infrastructure on agricultural land					
Without Mitigation	Long-term	Localised	Slight	Definite	**Moderate -**
With Mitigation	Long-term	Localised	Slight	Definite	**Low -**
Establishment of new access roads					
Without Mitigation	Long-term	Study Area	Beneficial	Definite	**High +**
With Mitigation	Long-term	Study Area	Beneficial	Definite	**High +**
Decommissioning Impacts					
Decommissioning and removal of renewable energy infrastructure on agricultural land					
Without Mitigation	Long-term	Regional	Beneficial	Probable	Beneficial
With Mitigation	Long-term	Regional	Beneficial	Probable	Beneficial
No-Go option					
Without Mitigation	Permanent	Study Area	Moderate	Definite	Beneficial
With Mitigation	Permanent	Study Area	Moderate	Definite	Beneficial

9.9 Palaeontological impacts

The impacts on palaeontology features was assessed by Dr John Almond from Naturaviva (see Appendix G for the full report) and the sections below for key findings, impact assessments, mitigation measures and conclusions.

9.9.1 Key findings

The Brandvalley WEF study area is underlain by Palaeozoic to Late Caenozoic sedimentary rocks that contain legally-protected fossil heritage. The construction phase of the proposed wind energy facility will entail substantial surface clearance (e.g. for access roads, wind turbine placements) as well as excavations into the superficial sediment cover (soils, surface gravels etc) and the underlying bedrock. The latter include excavations for the wind turbine foundations and transmission line pylon footings, underground cables, new internal access roads, construction camps and foundations for associated infrastructure such as the on-site substation and any control / storage buildings. In addition, sizeable areas of potentially fossiliferous bedrock may be sealed-in or sterilized by infrastructure such as hard standing areas for each wind turbine, lay down areas and access roads. All these developments may adversely affect fossils exposed at the surface or preserved underground within the development footprint. Fossil material here may be damaged, destroyed, disturbed from its original geological context or permanently sealed- in and is then no longer available for scientific research or other public good. Significant impacts are likely to be limited to very small portions of the development footprint since scientifically-important fossils are very scarce within the project area.

Residual negative impacts from inevitable loss of fossil heritage would be partially offset by an improved palaeontological database as a direct result of appropriate mitigation. This is a positive outcome because any new, well-recorded and suitably curated fossil material from this paleontologically under-recorded region of the Great Karoo would constitute a useful addition to our scientific understanding of the fossil heritage here.

The great majority of the Brandvalley WEF study area is assessed as being of low palaeontological sensitivity due to the scarcity of significant fossil vertebrate, plant and other remains here. Sensitive no-go areas within the proposed development footprint itself have not been identified in this study. The occurrence of very rare tetrapod (*i.e.* terrestrial vertebrate) burrows and associated skeletal remains within the Abrahamskraal Formation along the Kabeltou Pass (Muishond Rivier 161) is a notable exception (see green area on Figure 9-11 below). This highly sensitive area, which lies within the Western Cape and *outside* the WEF development footprint, should *not* be disturbed. Highly sensitive “no-go” areas within the proposed development footprint itself have not been identified in this study. Pending the potential discovery of substantial new fossil remains during construction, specialist palaeontological mitigation is not recommended for the Brandvalley WEF project.

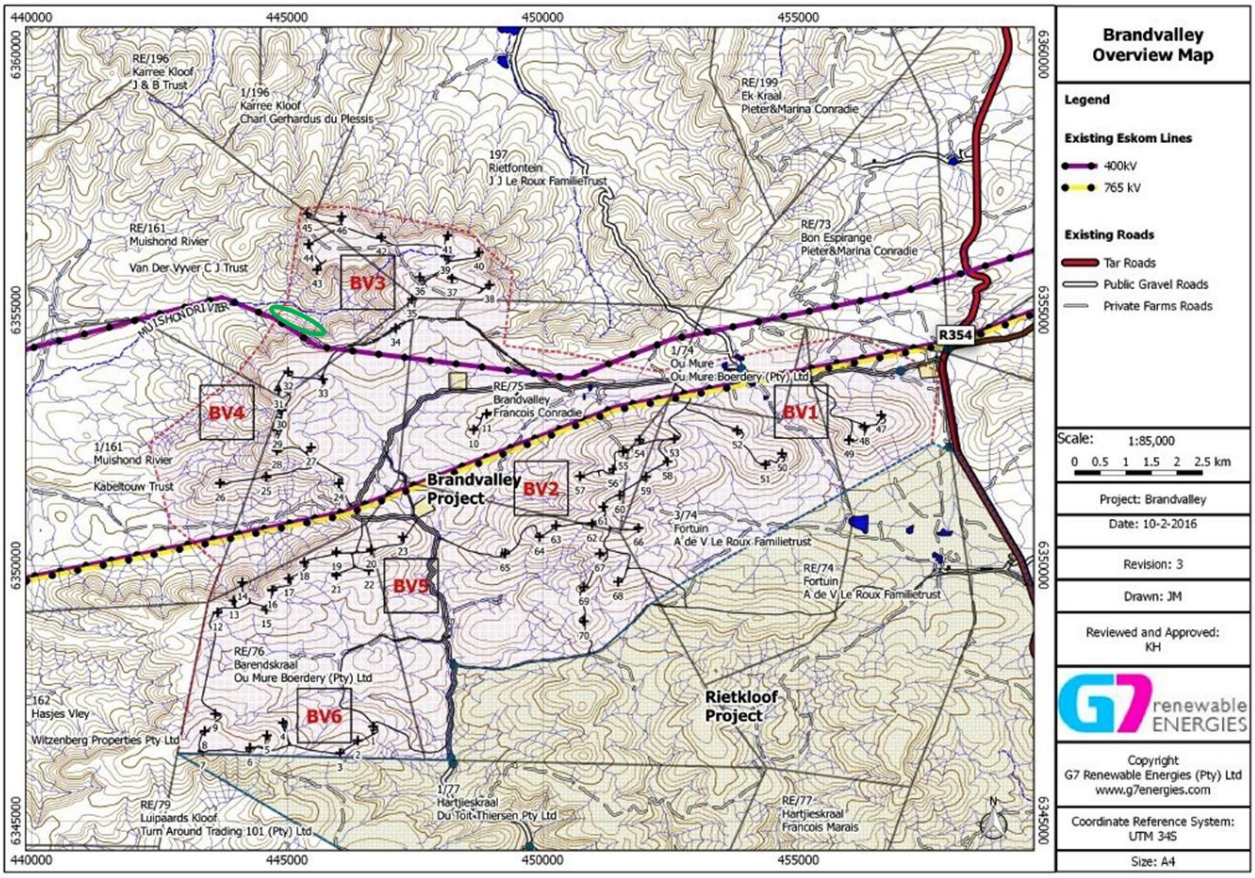


Figure 9-11: Palaeontology Sensitive findings (Green outline)

9.9.2 Construction phase impacts and mitigation measures

Impacts

The destruction, damage or disturbance out of context of legally-protected fossils preserved at the ground surface or below ground that may occur during construction of the WEF entail direct *negative* impacts to palaeontological heritage resources that are confined to the development footprint (*localised*). These impacts can often be mitigated but cannot be fully rectified (*i.e.* they are *permanent*). All of the sedimentary formations represented within the study area contain fossils of some sort, so impacts on fossil heritage are *definite*. Most (but *not* all) of the fossils concerned are probably of widespread occurrence within the outcrop areas of the formations concerned, however; the likelihood of loss of *unique or rare* fossil heritage is therefore low. Because of the generally sparse occurrence of scientifically important, well-preserved, unique or rare fossil material within the bedrock formations concerned here - notably those underlying the proposed wind turbine sites and access roads - as well as within the overlying superficial sediments (soil, alluvium, colluvium *etc*), the severity of these impacts is conservatively rated as *slight*.

As a consequence of (1) the paucity of irreplaceable, unique or rare fossil remains within the development footprint, as well as (2) the extensive superficial sediment cover overlying most potentially-fossiliferous bedrocks within the Brandvalley WEF study area, the overall impact significance of the construction phase of the proposed wind energy project is assessed as Low (negative). This assessment applies to the wind turbines, laydown areas, access roads (both alternatives), substations (the four alternatives), construction camps (the three alternatives) and associated infrastructure within the WEF study area. A comparable low impact significance is inferred for all project infrastructure alternatives and layout options under consideration that are outlined in Section 3, including different options for routing of access roads, turbine layouts and siting of construction camps and substations. There are therefore no preferences on palaeontological heritage grounds for any particular layout among the various options under consideration.

No significant further impacts on fossil heritage are anticipated during the planning, operational and decommissioning phases of the WEF.

Mitigation Measures

- The ECO responsible for the WEF development should be made aware of the potential occurrence of scientifically-important fossil remains within the development footprint. During the construction phase all major clearance operations (e.g. for new access roads, turbine placements) and deeper (> 1 m) excavations should be monitored for fossil remains on an on-going basis by the ECO.
- Should substantial fossil remains - such as vertebrate bones and teeth, or petrified logs of fossil wood - be encountered at surface or exposed during construction, the ECO should safeguard these, preferably in situ.
- The ECO should then alert the relevant provincial heritage management authority as soon as possible - i.e. Heritage Western Cape for the Western Cape (Contact details: Protea Assurance Building, Green Market Square, Cape Town 8000. Private Bag X9067, Cape Town 8001. Tel: 086-142 142. Fax: 021-483 9842. Email: hwc@pgwc.gov.za) and SAHRA for the Northern Cape (Contact details: Mrs Colette Scheermeyer, P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: cscheermeyer@sahra.org.za). This is to ensure that appropriate action (i.e. recording, sampling or collection of fossils, recording of relevant geological data) can be taken by a professional palaeontologist at the applicant's expense.
- The palaeontologist concerned with mitigation work will need a valid fossil collection permit from Heritage Western Cape (sites in the Western Cape) or SAHRA (sites in the Northern Cape) and any material collected would have to be curated in an approved depository (e.g. museum or university collection).
- All palaeontological specialist work would have to conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies developed by SAHRA (2013).

9.9.3 Operational phase impacts

Significant impacts on fossil heritage are not anticipated during the operational phases of the development.

9.9.4 Decommissioning phase impacts

Significant impacts on fossil heritage are not anticipated during the decommissioning phases of the development.

9.9.5 No-go alternative

The no-go alternative (*i.e.* no WEF development) will have a neutral impact on palaeontological heritage.

9.9.6 Cumulative impacts

A considerable number of alternative energy developments have been proposed or authorised in the broader south-western Karoo region within which the Brandvalley WEF study area is situated. Several of these projects entail impacts on fossil heritage resources preserved within the same rock units of the Karoo Supergroup and overlying superficial sediments that are represented within the present study area. It is noted that this region also falls within the shale gas prospecting area of Falcon Oil and Gas Ltd as well as the broader study area for the on-going Strategic Environmental Assessment for shale gas exploitation in the Karoo (fracking) that is being co-ordinated by the CSIR. Desktop- and field-based assessments for a major proportion of these projects have been carried out by the author and colleagues (e.g. Miller 2011). For example, field assessments of the Rietkloof WEF and Kareebosch WEF (Roggeveld Phase 2) project areas situated immediately south and north of, as well as overlapping with, the Brandvalley WEF study area have recently been completed (Almond 2014, Almond, 2016b).

In all cases it was concluded by the author that, despite the undoubted occurrence of scientifically-important fossil remains (notably fossil vertebrates, vertebrate trackways and burrows, petrified wood), the overall impact significance of the proposed developments was low because the probability of significant impacts on unique or rare fossils was slight. Provided that the proposed monitoring and mitigation recommendations made for these various projects are followed through, their cumulative impact on palaeontological heritage resources - including impacts envisaged for the Brandvalley WEF project – is predicted to be low (negative). On the other hand, unavoidable residual negative impacts may be partially counterbalanced by an improved understanding of Karoo palaeontology resulting from appropriate professional mitigation for these projects. This is regarded as a significant positive impact for Karoo palaeontological heritage.

9.9.7 Significance statement

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Construction Phase Impacts					
Disturbance, damage or destruction of fossil heritage within development footprint during the construction phase					
Without Mitigation	Short-term	Local	Moderate	Probable	Low -
With Mitigation	Short-term	Local	Moderate	Probable	Low -
Unavoidable residual negative impacts may be partially offset by the improved understanding of Karoo palaeontology resulting from appropriate professional mitigation. This is regarded as a significant positive impact for Karoo palaeontological heritage.					
Operational Phase Impacts					
				No impact	
Decommissioning Cumulative Impacts					
				No impact	
Cumulative Impacts					
Impact of the operational noise on the surrounding environment					
Without Mitigation	Short-term	Local	Moderate	Probable	Low -
With Mitigation	Short-term	Local	Moderate	Probable	Low -

9.10 Archaeology and Heritage impacts

The archaeological and heritage impacts were assessed by Ms Celeste Booth of Celeste Booth Consulting (see Appendix G for the full report) and the sections below for key findings, impact assessments, mitigation measures and conclusions.

9.10.1 Key findings

The area held several of historical features (stone walling kraals and cottages) some with associated historical artefacts situated along the access roads in the valleys and associated with

the homestead settlements. The area, however, also held evidence of both Middle and Later Stone Age stone artefacts alongside water courses and on the flat floodplains. The heritage resources encountered are explained in detail in the specialist report and includes:

- Precolonial / Stone Age material
- Stone Walling Features
- Historical Artefact Scatters
- Built Environment Structures
- Burial Grounds and Graves (formal and informal burials)
- Homesteads / Farmhouse Complexes

Only one Later Stone Age stone artefacts was documented within areas proposed for the turbines this likely due to the inaccessibility of area comprising of steep hills and high elevations ranging between 1 100 m and 1 400 m above sea level. Surface scatters of Middle Stone Age and Later Stone Age stone artefacts were recorded in some low lying areas within exposed surface and disturbed donga areas. It is unlikely that the stone artefact surface scatters that occur on the exposed surface areas are positioned in situ; however, stone artefacts may occur between 50 – 80cm below the surface.

Several stone walling features were identified as described in Section 7. These features include historical stone packed dwellings / cottages as well as kraals and pens. Historical artefacts were also located within the vicinity of some of the stone packed dwellings and kraals. The historical artefacts scatters include fragments of glass, ceramics and metal material probably dating to the late 19th century. These scatters are mainly identified to be associated with within the vicinity of stone packed dwellings / cottages and/or stone packed kraals.

9.10.2 Construction phase impacts and mitigation measures

Impacts

- Precolonial / archaeological heritage remains occur on the flat floodplains and along water courses within the proposed Brandvalley WEF area. The existing internal roads run through these areas and close to water courses. On such areas, artefacts have been found to become exposed within the internal gravel farm roads. Therefore, it is likely that more stone artefacts and possibly other material and organic material may be uncovered during the construction of infrastructure and upgrade of the roads situated with these areas. The stone artefacts are considered as being irreplaceable heritage resources, once the artefact or the sire has been destroyed so has the information for interpretation.
- Several stone walling features and associated historical artefacts scatters occur on the flat floodplains and along water courses within the proposed Brandvalley WEF area. The existing internal roads run through these areas and close to water courses and artefacts have found to become exposed within the internal gravel farm roads. These features may be damaged by the construction of infrastructure and roads if not mitigated appropriately. Some of these features occur very close to existing roads proposed for upgrading resulting in a serious loss of the cultural landscape.
- One of the two areas with graves / burials encountered are within close proximity to the development activities. These family graves are mostly older than 60 years protected and should be respected.
- Six homesteads / farm complexes were identified within the proposed Brandvalley WEF area. The homesteads are situated either adjacent to the proposed access roads or in some cases the proposed internal access roads are expected to go through the homesteads. These homesteads include the farm house and associated staff accommodation, outbuildings and stone walling features and built environment structures.
- It has been stipulated by Heritage Western Cape (HWC) that the impact on the cultural landscape is necessary. The construction of these immense wind turbines and associated infrastructure required completely changes the character of the landscape and hence impacts on the sense of place and aesthetic value negatively as well as impedes and threatens untouched heritage resources.

Mitigation Measures

- Once the final layout of the Brandvalley WEF has been established a more intensive survey of these areas should be conducted and further recommendations and further migratory be made.
- No development should occur within 20 m – 30 m of the stone walling features and associated historical artefacts. The features should be clearly demarcated before any development activities begin to avoid any negative impact. The layout of any infrastructure should be reconsidered to preserve these heritage resources.
- The graveyard is already fenced off, however, the area should be clearly demarcated and the upgrade of the road be to the west or the road be diverted further away to avoid any possible negative impact to the graveyard
- Six homesteads / farm complexes were identified within the proposed Brandvalley WEF area. It is strongly recommended that any proposed access roads avoid using these homesteads as a thoroughfare for the proposed wind energy facility.
- Effective rehabilitation of the landscape after decommissioning.
- Recommendations for the establishment of 20 m – 30 m buffer zones that are clearly demarcated and in some instances the possible rerouting of the proposed road to avoid negative impact and promote the implementation of precautionary measures be adopted for heritage resources occurring along the route (stone and historical artefact scatters, stone walling features, graveyards, etc.) have been detailed in the specialist report and are repeated below:
  - Upgrading of the internal farm roads must be limited to <12m and should adhere to buffer requirements around identified archaeological significance.
  - If any of the old farm buildings are to intended for rehabilitation or re-use or demolition a qualified and experienced professional (historical archaeologist / historical architect) must be consulted.
  - No turbines are to be located on Tafelkop or Spitskop.
  - An archaeological heritage walk-through survey must be conducted if any changes to the positions of the wind turbines, associated infrastructure and roads outside the scope of this study are made for the final layout and further recommendations and mitigation measures be suggested if necessary.
  - If concentrations of historical and pre-colonial archaeological heritage material and/or human remains (including burials and graves) are uncovered during construction, all work within close vicinity of the find must cease immediately and be reported the South African Heritage Resources Agency (SAHRA) (021 462 4502) or Heritage Western Cape (HWC) (021 483 5959) so that systematic and professional investigation/excavation can be undertaken. Phase 2 mitigation in the form of test-pitting/sampling or systematic excavations and collections of the pre-colonial shell middens and associated artefacts will then be conducted to establish the contextual status of the sites and possibly remove the archaeological deposit before development activities within the specific area can continue.
  - Construction managers/foremen and/or the ECO should be informed before construction starts on the possible types of heritage sites and cultural material they may encounter and the procedures to follow when they find sites.

9.10.3 Operational phase impacts and mitigation measures

Significant impacts are not anticipated during the operational phases of the development.

9.10.4 Decommissioning phase impacts and mitigation measures

Significant impacts are not anticipated during the decommissioning phases of the development.

9.10.5 Significance statement

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Construction Phase Impacts					

Destruction of precolonial / stone age material					
Without Mitigation					Very High -
With Mitigation					Moderate -
Destruction of Stone Walling Features (BV_SW1 - BV_SW17) and associated Historical Artefact Scatters (BV_Hist1 – BV_Hist3)					
Without Mitigation					Very High -
With Mitigation					Moderate -
Destruction of Graves (formal and informal burials) (HV_G1 – BV_G2)					
Without Mitigation					Very High -
With Mitigation					Moderate -
The Destruction of Homesteads / Farmhouse Complexes (BV_HS1 – BV_HS6)					
Without Mitigation					Very High -
With Mitigation					Moderate -
Operational Phase Impacts					
None					
Decommissioning and Cumulative Impacts					
None					

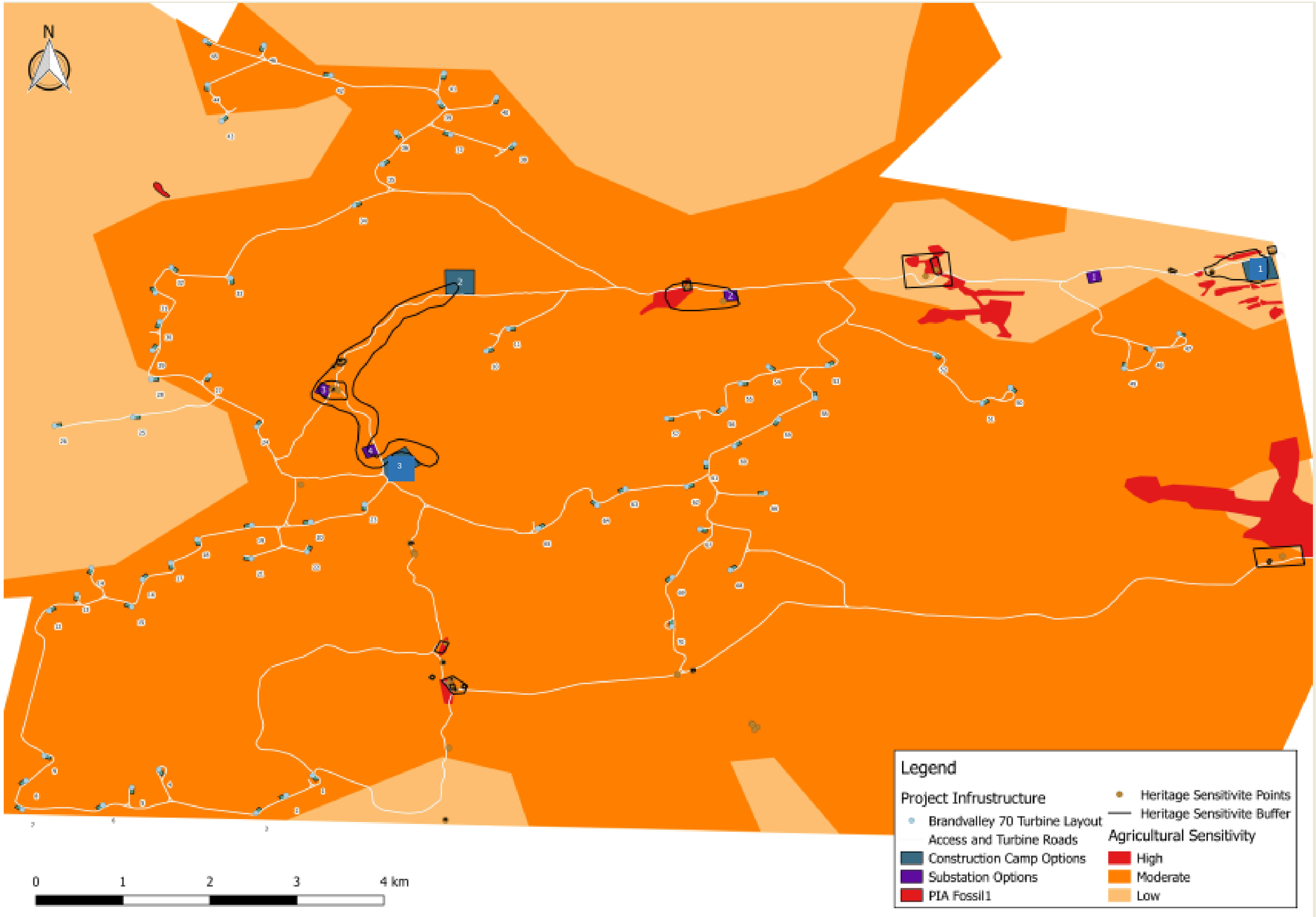


Figure 9.12: Combined specialist map for Paleontological, Heritage and Agricultural sensitivities

9.11 Socio-economic impacts

The impacts on the socio-economic environment was assessed by Mr Tony Barbour (see Appendix xx for the full report) and the sections below for key findings, impact assessments, mitigation measures and conclusions.

9.11.1 Key findings

The legislative and policy context plays an important role in identifying and assessing the potential social impacts associated with a proposed development. In this regard a key component of the SIA process was to assess the proposed development in terms of its fit with key planning and policy documents. The findings of the review of policy and planning tools indicated that renewable energy is strongly supported at a national, provincial and local level. The proposed project site is located within the Komsberg Renewable Energy Zone as identified in the Strategic Environmental Assessment (SEA) for Wind and Solar PV energy in South Africa (CSIR, 2015) and therefore the area has been identified as suitable for the establishment of a WEF. The WEF will create much needed employment opportunities during the construction and operational phases. The findings of the SIA indicated that the potential negative impact is Low Negative with mitigation and can therefore be effectively mitigated if the recommendations of the specialist are implemented.

9.11.2 Construction phase impacts and mitigation measures

Based on the information from other WEF projects the construction phase for a 140 MW WEF is expected to extend over a period of 20-24 months and create approximately 250 (full-time equivalent) employment opportunities during peak construction. The work associated with the construction phase will be undertaken by contractors and will include the establishment of the WEF and the associated components, including, access roads, substation, services and power line. It is anticipated that approximately 55% (136) of the employment opportunities will be available to low skilled workers (construction labourers, security staff etc.), 30% (76) to semi-skilled workers (drivers, equipment operators etc.) and 15% (38) for skilled personnel (engineers, land surveyors, project managers etc.).

Members from the local community in the area are likely to be in a position to qualify for the majority of the low skilled and a proportion of the semi-skilled employment opportunities. The majority of these employment opportunities are also likely to accrue to Historically Disadvantaged (HD) members from the local KHLM and LLM community. A small number of employment opportunities may also be created in the WLM. As indicated above, the levels of unemployment in the KHLM, LLM and WLM are relatively high. The creation of potential employment opportunities, even temporary employment, will represent a significant, if localised, social benefit. However, in the absence of specific commitments from the applicant to maximise local employment targets the potential opportunities for local employment will be limited. Locals were employed as unskilled labour, and remained such after SALT was constructed. The majority of the skilled employment opportunities are likely to be associated with the contactors appointed to construct the WEF and associated infrastructure.

While the current pool of suitably qualified local community members in Laingsburg, Sutherland and the LLM may be limited the construction of three of renewable energy projects in the area which are planned to commence in 2016 will create opportunities to develop the required skills prior to the commencement of the construction phase for the proposed Brandvalley WEF. It is estimated that these projects will be employing 50-70% of their workers locally and where training is required it will be carried out in order to comply with commitments for local employment made to the Department of Energy. In addition, the implementation of a training and skills development programme prior to the commencement of construction would also increase the potential to employ local community members. The number of low skilled and semi-skilled positions taken up by members from the local community will depend on the effective implementation of these enhancement measures by the applicant in consultation with the KHLM, LLM and potentially the Department of Labour.

The capital expenditure associated with the construction of a 140 MW WEF will be in the region of R 2.5 billion (2016 Rand value). A percentage of the capital expenditure associated with the

construction phase has the potential to benefit local companies and communities. However, the opportunities for companies in Sutherland and Laingsburg are likely to be limited. In this regard the benefits are likely to accrue to companies based in towns based further afield, such as Worcester and Cape Town. Implementing the enhancement measures listed below can enhance these opportunities.

The total wage bill for the 20-24 month construction phase of a 140 MW WEF will be in the region of R 69 million (2016 Rand value). However, based on the findings of the site visit there is not sufficient accommodation in Laingsburg and Sutherland and surrounds to accommodate the ~ 250 workers associated with the construction phase, unless these workers are sourced locally. The local farmers in the area have also indicated that they do not support the establishment of a construction camp on the site to house workers. The issue of accommodation therefore represents a key challenge and will need to addressed in consultation with the KHLM, LLM, community representatives and local farmers from the area should the project proceed.

The hospitality industry in the area is also likely to benefit from the provision of accommodation and meals for professionals (engineers, quantity surveyors, project managers, product representatives etc.) and other (non-construction) personnel involved on the project. Experience from other renewable energy projects indicates that the potential opportunities are not limited to on-site construction workers but also to consultants and product representatives associated with the project.

The potential impact on tourism during the construction phase is likely to be largely linked to the movement of construction related vehicles along the R354. As indicated above, the winter months are of key importance to Sutherland tourism (snow and star-gazing). This should be taken into account when planning the construction phase. Construction related traffic on the R345 over winter weekends or school holidays has the potential to impact on visitors travelling to and from Sutherland. The construction phase will also create opportunities for tourist facilities in the area linked to the accommodation of staff as discussed and assessed in Section 7. This would represent a positive impact.

Mitigation Measures

The following enhancement measures are recommended in order to enhance local employment and business opportunities associated with the construction phase:

- An accredited training and skills development programme aimed at maximising the opportunities for local workers to be employed in the low and semi-skilled positions should be initiated prior to the initiation of the construction phase. In this regard the programme should be aimed at community members from Laingsburg and Sutherland. The programme should be developed in consultation with the KHLM and LLM and possibly the Department of Labour. The recommended targets of 50% and 30% of low and semi-skilled positions respectively should be taken up by local community members. Due to the low skills levels in the area, the majority of semi-skilled and skilled posts are likely to be filled by people from outside the area;
- The recruitment selection process for the training and skills development programme should seek to promote gender equality and the employment of women wherever possible;
- Before the construction phase commences the applicant should meet with representatives from the KHLM, LLM and WLM to establish the existence of a skills database for the area. If such a database exists, it should be made available to the contractors appointed for the construction phase;
- The local authorities and relevant community representatives should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the applicant intends following for the construction phase of the project;
- Where reasonable and practical the applicant should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria;
- The contractor should liaise with the KHLM, LLM and WLM with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service

providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work;

- Where possible, the applicant should assist local BBBEE companies to complete and submit the required tender forms and associated information.
- The KHLM, LLM and WLM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.
- Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.
- The applicant in consultation with the contractor should investigate the option of holding a workshop/s with local farmers and representatives from KHLM, LLM and WLM to discuss options for installing small-scale wind energy facilities and the technology and costs involved.
- The applicant and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation;
- The applicant and contractor (s) should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;
- The contractor should provide transport to and from the site on a daily basis for low and semi-skilled construction workers. This will enable the contractor to effectively manage and monitor the movement of construction workers on and off the site;
- Where feasible, the contractors should make the necessary arrangements to transport workers from other local towns in the area, such as Worcester and Paarl, home over weekends. This will reduce the risk posed to local family structures and social networks in Laingsburg and Sutherland;
- No construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.
- The applicant should implement a “locals first” policy, specifically with regard to unskilled and low skilled opportunities. This locals first policy needs to be communicated widely when employment opportunities are advertised;
- The applicant should implement a policy that no employment will be available at the gate and or in Sutherland and Laingsburg (except for local residents).
- The applicant should enter into an agreement with the landowners on whose property the WEF is located, whereby damages to farm property etc. during the construction phase that are proven to be associated with the construction activities for the WEF will be compensated for. The agreement should be signed before the construction phase commences;
- The movement of construction workers on the site should be confined to regulated areas;
- All landowners on and in the immediate vicinity of the site should be contacted to discuss timing of construction related activities in the vicinity for his cropping areas;
- Contractors appointed by the applicant should provide daily transport for workers to and from the site. This would reduce the potential risk of trespassing onto adjacent properties;
- Movement of vehicles should be confined to designated roads and construction workers must be informed of the need to keep farm gates closed;
- The relevant owners should be consulted prior to the commencement of the construction phase to identify the location of the irrigation infrastructure so as to ensure that it is not damaged during the construction phase;
- Damage to irrigation infrastructure caused by construction related activities should be repaired within 24 hours by the contractor;
- The applicant should consider the option of establishing a MF that includes local farmers and develop a Code of Conduct for construction workers. This committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by the applicant and the contractors before the contractors move onto site;
- The applicant should hold contractors liable for compensating farmers in full for any stock

losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the applicant, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below);

- The Environmental Management Programme (EMPr) should outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested;
- Contractors appointed by the applicant must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
- Contractors appointed by the applicant must ensure that construction workers who are found guilty of trespassing, stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation;
- No construction staff, with the exception of security staff, to be accommodated on site overnight.
- The applicant should enter into an agreement with the local farmers who potentially stand to be impacted by the proposed project, including WEF landowners and adjacent property owners, whereby damages to farm property etc. during the construction phase proven to be associated with the construction activities for the WEF will be compensated for. The agreement should be signed before the construction phase commences;
- Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas;
- Contractor should ensure that construction related activities that pose a potential fire risk, such as welding, are properly managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy summer months;
- Contractor to provide adequate firefighting equipment on-site;
- Contractor to provide fire-fighting training to selected construction staff;
- No construction staff, with the exception of security staff, to be accommodated on site overnight;
- As per the conditions of the Code of Conduct, in the event of a fire proven to be caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the firefighting costs borne by farmers and local authorities.
- As far as possible, the transport of components to the site along the N1, R354 and R356, should be planned to avoid weekends and holiday periods;
- Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis, adhering to speed limits and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers;
- Steps must be taken to minimise the potential impact of dust generated by construction vehicles on the vegetable seed cropping operations on Fortuin. These include regular wetting of the section of road adjacent to the seed cropping area and strict enforcement of speed limits. The timing of the movement of construction vehicles should be discussed with Mr le Roux, the owner of Fortuin;
- All workers should receive training/ briefing on the reasons for and importance of closing farm gates and driving slowly;
- The contractor must ensure that damage caused by construction related traffic to local farm roads is repaired on a regular basis throughout the construction phase. The costs associated with the repair must be borne by the contractor;
- All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits;
- The Contractor should ensure that workers are informed that no waste can be thrown out of the windows while being transported to and from the site. Workers who throw waste out windows should be fined;

- The Contractor should be required to collect waste/litter along access roads to the site from the R354 on a needs be basis;
- Waste generated during the construction phase should be transported to the local landfill site if it cannot be reused or recycled.
- EMPr measures (and penalties) should be implemented to ensure farm gates are closed at all times or as agreed with landowners;
- EMPr measures (and penalties) should be implemented to ensure speed limits are adhered to at all times.
- The location of wind turbines, access roads, laydown areas etc. should be informed by the findings of a soil study. In this regard high potential grazing and seed cropping areas should be avoided;
- The location of wind turbines, access roads, laydown areas etc. should be discussed with the locally affected landowner;
- The footprint areas for the establishment of individual wind turbines should be clearly demarcated prior to commencement of construction activities. All construction related activities should be confined to the demarcated areas and minimised where possible;
- An ECO should be appointed to monitor the establishment phase of the construction phase;
- All areas disturbed by construction related activities for temporary infrastructure, such as temporary access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase. The rehabilitation plan should be informed by input from a botanist with experience in arid regions;
- The final placement of wind turbines associated with the Brandvalley WEF should be discussed with the affected landowners;
- The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. The specifications for the rehabilitation programme should be drawn up by a suitably qualified ecologist;
- The implementation of the Rehabilitation Programme should be monitored by the ECO;
- All workers should receive training/ briefing on the reasons for and importance of not driving in undesignated areas;
- EMPr measures (and penalties) should be implemented to strictly limit all vehicle traffic to designated roads and construction areas. Under no circumstances should vehicles be allowed to drive into the veld;
- Disturbance footprints should be reduced to the minimum.
- The recommendations associated with managing the impacts associated with construction related traffic, specifically heavy, abnormal loads, should be implemented.

9.11.3 Operational phase impacts and mitigation measures

Creation of employment and business opportunities and support for local economic development

Based on information from other wind projects the establishment of a 140 MW WEF would create ~ 20 employment opportunities for over a 20 year period. Of this total approximately 4 will be low skilled, 10 semi-skilled and 6 high skilled positions. The annual wage bill for the operational phase would be ~ R 2 million. The majority of employment opportunities associated with the operational phase is likely to benefit HD members of the community.

It will also be possible to increase the number of local employment opportunities through the implementation of a skills development and training programme linked to the operational phase. Such a programme would support the strategic goals of promoting employment and skills development contained in the HKLM and LLM.

Given the location of the proposed facility the majority of permanent staff is likely to reside in Sutherland and or Laingsburg. In terms of accommodation options, a percentage of the non-local permanent employees may purchase houses in one of these towns, while others may decide to rent. Both options would represent a positive economic benefit for the region. In addition, a percentage of the monthly wage bill earned by permanent staff would be spent in the regional and local economy, which will benefit local businesses in these towns. The benefits to the local economy will extend over the 20 year operational lifespan of the project. The local hospitality

industry in Sutherland and Laingsburg is also likely to benefit from the operational phase. These benefits are associated with site visits by company staff members and other professionals (engineers, technicians etc.) who are involved in the company and the project but who are not linked to the day-to-day operations.

Income generation of farmers

The bona fide farmers in the study area, which make up the bulk of the relevant landowners, currently face a number of significant challenges, which all impact on the economic viability of their farming operations. These include increasing wage bills, progressive price hikes by Eskom (affecting irrigated cropping operations), and the weakening of the Rand (more expensive agri-inputs). These cost increases in combination with low stocking levels has resulted in the size of commercially viable farms in the study area increasing to around 10 000 ha and more. Land owners with smaller properties are finding it increasing difficult to farm productively. Added to this the area is affected by periodic droughts and is anticipated to become progressively more drought-prone as a result of long-term climate change. Stock losses to black backed jackal, baboons, caracal and African wild cats are described as epidemic in scale, with cumulative losses described as crippling. This is largely linked to the sparse and intermittent human presence, the broken nature of the terrain, and the fact that nightly kraaling has largely disappeared on commercial farms.

Against this background, most of farm owners interviewed indicated that the steady income from wind turbines on their properties would make a significant contribution towards keeping their farming operations viable and productive. This would also assist to reduce and or prevent job losses in the farming sector area.

Establishment of a Community Trust

In terms of the Request for Proposal document prepared by the Department of Energy all bidders for operating licences for renewable energy projects must demonstrate how the proposed development will benefit the local community. This can be achieved by establishing a Community Trust which is funded by revenue generated from the sale for energy. Community Trusts and other socio-economic investments provide an opportunity to generate a steady revenue stream that is guaranteed for a 20 year period. This revenue can be used to fund development initiatives in the area and support the local community. The long term duration of the revenue stream also allows local municipalities and communities to undertake long term planning for the area. In terms of the requirement the minimum ownership percentage for local community is 2.5 %. However, projects could exceed this figure in order to increase the competitiveness of the project. The revenue for the Community Trusts could be via dividend pay-outs once the wind farm is fully operational and revenue generating. The revenue from the proposed community trust can be used to support a number of social and economic initiatives in the area, including but not limited to:

- Creation of jobs;
- Education;
- Support for and provision of basic services;
- School feeding schemes;
- Training and skills development; and
- Support for SMME's.

Based on the findings of the site visit there are limited economic and associated employment opportunities in Laingsburg and Sutherland. There is a high dependency on social grants, including child support grants. Given these conditions the benefits associated with the establishment of a Community Trust funded by revenue from the proposed WEF represents a significant positive socio-economic opportunity for Laingsburg and Sutherland. Mr Wilhelm Theron, the mayor of Laingsburg, also anticipated that the project would generate development capital for a cash-strapped Laingsburg LM via the Community Trust (Theron, pers. Comm. 2016).

In addition, the establishment of the WEF is not likely to have a significant impact on the current agricultural land uses that underpin the local economic activities in the area. The loss of this

relatively small area will not impact on the current and future farming activities. Experience has however also shown that Community Trusts can be mismanaged. This issue will need to be addressed in order to maximise the potential benefits associated with the establishment of a Community Trust.

Development of infrastructure for the generation of clean, renewable energy

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result, South Africa is the nineteenth largest per capita producer of carbon emissions in the world, and Eskom, as an energy utility, has been identified as the world's second largest single producer of carbon emissions. The overall contribution associated with the proposed WEF to South Africa's total energy requirements is relatively small. However, the development of a single 140 MW produced will help to offset the total carbon emissions associated with energy generation in South Africa. Given South Africa's reliance on Eskom as a power utility the benefits associated with an IPP based on renewable energy are regarded as an important contribution.

Sense of place and rural character of the landscape

The components associated with the proposed facility will have a visual impact and, in so doing, impact on the landscape and rural sense of the place of the area. A Visual Impact Assessment (VIA) has been undertaken as part of the EIA. Based on the findings of the VIA the significance of the visual impact was rated as High Negative. While the SIA does not dispute the findings of the VIA, the potential visual impacts associated with the proposed WEF were not raised as a key concern during the interviews with the affected landowners in the area and local municipal officials. It should however be borne in mind that the local landowners stand to benefit from the proposed WEF. However, this also applies to other landowners in the vicinity of the site on whose properties other proposed WEFs are located. As indicated below, visual impact and the significance thereof will vary from individual to individual and is not simply linked to visibility.

Based on the findings of the SIA the site is relatively isolated. While some wind turbines will be visible from the R 354 and properties in the vicinity of the site, the issue of visual impact is a complex issue and is not simply linked to visibility, but also to individual perceptions. It is unlikely that any turbines will be visible from the N1 to the south. While some may view the turbines as a negative impact on the existing landscape, others may perceive them as a positive addition to the landscape. The authors experience in this regard is that a number of people have commented positively on a number of wind energy facilities that have been established in the last 12-24 months, such as the facilities located near Vredenburg, Caledon and Humansdorp in the Western and Eastern Cape respectively. These facilities are clearly visible from the N2 and local roads in the area. A number of people that the authors have spoken to indicated that they did not feel that the turbines had a negative impact on the visual quality of the landscape. The visual impact and the significance thereof associated with the proposed Brandvalley WEF on the areas sense of place is therefore likely to vary from individual to individual. The potential visual impact on the areas sense of place should also be viewed within the context of the area being identified as a Renewable Energy Development Zone by the Strategic Environmental Assessment (SEA) for Wind and Solar PV energy in South Africa undertaken by the CSIR (2015). The area has therefore been identified as an area where renewable energy should be concentrated. In this regard in the region of 12-14 renewable energy projects, including ~ 12 WEFs, area located in the study area.

The findings of the SIA also indicate that all of the affected landowners have been consulted by the applicant with regard to the location of wind turbines on their properties and are satisfied that is reflected in the proposed layout. The turbines are largely proposed on higher-lying terrain in more inaccessible portions of the relevant properties. No turbines or substations are proposed in close proximity to any permanently inhabited farmsteads. As such, none of the landowners raised any concerns regarding the location of turbines or substations. The owner of Fortuin, Mr Andries le Roux, has however indicated that he would prefer the construction camp proposed on his property (Alternative 3, on Kruispad, near the intersection of the R354 and the Ou Mure road) to also be used to accommodate construction activities proposed for the adjacent Rietkloof WEF project.

A number of interviewees also indicated that they would only allow supporting for the

establishment of infrastructure on their properties, such as access roads and borrow pits, if turbines are in fact developed on their properties. This is motivated by the perception that the impact on the areas sense of place would be off-set by the revenue generated from wind turbines on their farms.

Tourism

The N1 is an important tourism route linking Cape Town with Gauteng. However the area is not a tourism destination in itself and none of the turbine structures will be visible from the N1 due to the distance of the site from the N1 (~ 40km). Based on the findings of the SIA there appear to be no major tourism activities and or destinations in the immediate vicinity of the site that would potentially be impacted by the proposed WEF, such as holiday cottages or game lodges etc. The impact on tourism in the area is therefore likely to be limited.

Careful placing would reduce the overall visual impact of the proposed WEF on the area's sense of place. However, this is unlikely to change the significance rating in terms of impact on tourism. The proposed WEF may also attract visitors to the area. However, the significance of this positive impact is also likely to be minor.

Assessment of Access Roads and Construction Camps

Two access road alternatives have been identified, namely access road Alternative 1 and 2, and three construction camp alternatives, namely construction camp 1, 2 and 3. While the social impacts associated with the proposed access roads and construction camp is limited the preferred alternatives are Alternative 1 for the access road and Alternative 1 for the construction camp. Access Road Alternative 1 supports the establishment of Substation Alternative 1. Construction Camp Alterative 1 is located on Fortuin owned by Mr Andries le Roux, who indicated that Alternative 1 (on Kruispad, near the intersection of the R354 and the Ou Mure road) could also be used to accommodate the construction activities associated with the proposed Rietkloof WEF project. The disturbance associated with the establishment of a construction camp for the proposed Brandvalley and Rietkloof WEFs projects would therefore be confined to a single area. In addition, the location of Alternative 1 close to the R354 reduces the movement of traffic and construction workers into relatively remote areas.

Mitigation Measures

- Construction phase business opportunities to enhance local employment also apply to the operational phase.
- The applicant should implement a training and skills development programme for locals during the first five years of the operational phase. The aim of the programme should be to maximise the number of South African's and locals employed during the operational phase of the project;
- The applicant, in consultation with the KHLM, LLM and WLM, should investigate the options for the establishment of a Community Development Trust.
- The local landowners have entered into agreements with the applicant regarding revenue streams generated from wind turbines located on their properties
- The KHLM, LLM and WLM should be consulted as to the structure and identification of potential trustees to sit on the Trust. The key departments in the KHLM, LLM and WLM that should be consulted include the Municipal Managers Office, IDP Manager and LED Manager.
- Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community;
- Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the WEF.
- Use the project to promote and increase the contribution of renewable energy to the national energy supply;
- The recommendations of the VIA should be implemented.
- The preferred alternatives are Alternative 1 for the access road and Alternative 3 for the construction camp. The final selection should also be informed by the other specialist studies.

9.11.4 Decommissioning phase impacts and mitigation measures

Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. After 20-25 years of operations, the WEF would either be decommissioned and the area rehabilitated or the structures would be replaced with more modern technology (referred to as refurbishment or re-powering). Both options would create temporary employment opportunities. In the case of refurbishment the permanent jobs would be retained. There would therefore be no job losses. In the case of decommissioning the 20 permanent jobs associated with the operational phase would be lost. The potential impacts associated with the decommissioning phase can however be effectively managed with the implementation of a retrenchment and downscaling programme.

Mitigation Measures

- The applicant should ensure that all retrenchments conform with South African Labour Law legislation, including provision of retrenchment packages where applicable, when the WEF is decommissioned;
- All structures and infrastructure associated with the proposed facility that can no longer be used by farmers or Eskom/ other IPPs should be dismantled and transported off-site on decommissioning;
- The applicant should investigate the option of establishing an Environmental Rehabilitation fund to cover the costs of decommissioning and rehabilitation of disturbed areas. The fund could be funded by a percentage of the revenue generated from the sale of energy to the national grid over the 20 year operational life of the facility. The rationale for the establishment of a Rehabilitation Trust Fund is linked to the experiences with the mining sector in South Africa and failure of many mining companies to allocate sufficient funds during the operational phase to cover the costs of rehabilitation and closure. Alternatively, the funds from the sale of the WEF as scrap metal should be allocated to the rehabilitation of the site.

9.11.5 Cumulative impacts

Sense of Place

As indicated in Figure 4.1 there are 18 renewable energy projects, including 14 WEFs and associated power lines, located in the Komsberg REDZ area. These include the proposed Komsberg East and West WEF with a combined capacity of 280 MW that are located immediately to the east of the proposed Brandvalley WEF. The potential for cumulative impacts associated with combined visibility (whether two or more wind facilities will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more renewable energy facilities along a single journey, e.g. road or walking trail) is therefore high. However, this should be viewed within the context of the identification of the area as a Renewable Energy Development Zone by the CSIR as part of the DEAs SEA process. The area has therefore been identified as an area where renewable energy should be concentrated.

In addition, due to the proximity of the different sites the various WEFs and associated power lines could potentially be viewed as a single large WEF as opposed to a number of separate WEFs. While viewing these WEFs as a single large facility, as opposed to separate facilities, does not reduce the overall visual impact on the scenic character of the area, it does reduce the potential cumulative impact on the landscape. Viewing each of the proposed WEFs as a single, large WEF may, to some extent, reduce the cumulative impacts associated with combined visibility (whether two or more wind farms will be visible from one location) and sequential visibility (e.g. the effect of seeing two or more wind farms along a single journey, e.g. road or walking trail). The proximity of the WEFs also has the benefit of concentrating the visual impacts on the areas sense of place in to one area as opposed to impacting on a number of more spread out areas.

However, the potential impact of wind energy facilities on the landscape is an issue that does need to be considered, specifically given South African's strong attachment to the land and the growing number of wind facility applications. With regard to the area, a number of WEFs have been proposed in the Western Cape Province. The Environmental Authorities should therefore be aware of the potential cumulative impacts when evaluating applications. However, as indicated above, the

proposed site falls within a Renewable Energy Development Zone (CSIR, 2015) and has therefore been identified as suitable for the establishment of WEFs.

Local Services and Accommodation

The establishment of the proposed 140 MW Brandvalley WEF and the other renewable energy facilities in the Komsberg REDZ will place pressure on local services, specifically medical, education and accommodation. This pressure will be associated with the influx of workers to the area associated with the construction and operational phases of renewable energy projects proposed in the area, including the proposed Brandvalley WEF. The potential impact on local services can be mitigated by employing local community members. However, due to the low education and skills levels in the area there is likely to be a need to implement a training and skills development programme to ensure that local employment opportunities are maximised. The presence of non-local workers during both the construction and operation phase will also place pressure on property prices and rentals. As a result, local residents, such as government officials, such as municipal workers, school teachers, and the police, may no longer be able to buy or afford to rent accommodation in towns such as Sutherland and Laingsburg. However, as indicated below, this impact should also be viewed within the context of the potential positive cumulative impacts for the local economy associated with the establishment of a renewable energy hub in the area. These benefits will create opportunities for investment in Laingsburg and Sutherland, including the opportunity to up-grade and expand existing services and the construction of new houses. In this regard the establishment of a renewable energy hub will create a unique opportunity for these towns to develop.

The Community Trusts associated with each project will generate revenue that can be used by the KHLM and LLM in consultation with the Northern and Western Cape Provincial Government, to invest in up-grading local services where required (see below). In should also be noted that it is the function of national, provincial and local government to address the needs created by development and provide the required services. The additional demand for services and accommodation created by the establishment of development renewable energy projects in the Komsberg REDZ should therefore be addressed in the Integrated Development Planning process undertaken by the KHLM and LLM.

Impacts on Local Economy

In addition to the potential negative impacts, the establishment of the proposed 140 MW Brandvalley WEF and the other renewable energy facilities in the area has the potential to result in significant positive cumulative socio-economic opportunities for the region, which, in turn, will result in a positive social benefit. As indicated above, there are 18 renewable energy projects proposed in the study area. The positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream business opportunities. The Community Trusts associated with each project will also create significant socio-economic benefits. These benefits should also be viewed within the context of the limited socio-economic opportunities in the area.

Mitigation Measures

- The findings of the VIA should be implemented.
- The Western and Northern Cape Provincial Governments, in consultation with the KHLM, LLM and WLM and the applicants involved in the development renewable energy projects in the Komsberg REDZ, should consider establishing a Development Forum to co-ordinate and manage the development and operation of renewable energy projects in the Komsberg REDZ, with the specific aim of mitigating potential negative impacts and enhancing opportunities. This would include identifying key needs, including capacity of existing services, accommodation and housing and the implementation of an accredited training and skills development programmes aimed at maximising the opportunities for local workers to be employed during the construction and operational phases of the various proposed projects. These issues should be addressed in the Integrated Development Planning process undertaken by the KHLM and LLM.
- The proposed establishment of suitably sited renewable energy facilities within the KHLM, LLM and WLM should be supported.

9.11.6 No-Go alternative

South Africa currently relies on coal-powered energy to meet more than 90% of its energy needs. As a result, South Africa is one of the highest per capita producers of carbon emissions in the world and Eskom, as an energy utility, has been identified as the world's second largest producer carbon emissions. The no-go option would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a negative social cost. However, at a provincial and national level, it should be noted that the proposed WEF development is not unique. In this regard, a significant number of other renewable energy developments are currently proposed in the Western Cape and other parts of South Africa. Foregoing the proposed establishment of WEFs would therefore not necessarily compromise the development of renewable energy facilities in the Western and Northern Cape Provinces and or South Africa. However, the socio-economic benefits for local communities in the KHLM, LLM and WLM would be forfeited. This loss should also be viewed within the context of the limited socio-economic opportunities in the area.

- There is no impact as the current status quo would be maintained.
- The potential positive benefit for local farmers and the municipality in terms of potential future energy savings would however be lost.
- The benefits associated with up-grading local farm roads and improving access for local farmers to sections of their properties will however be forgone.
- The potential employment and economic benefits associated with the construction of the proposed WEF would however be forgone.
- The potential employment and economic benefits associated with the construction of the proposed WEF would however be forgone.
- The potential opportunity costs in terms of the loss of employment and skills and development training would be lost which would represent a negative impact.
- the potential alternative income generation for local farmers would be lost which would represent a negative impact.
- the potential opportunity costs in terms of the supporting the social and economic development in the area would be lost. This would also represent a negative impact.
- The No-Development option would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. This would represent a negative opportunity cost.
- This would represent a lost socio-economic opportunity for the KHLM, LLM and WLM.

Mitigation Measures

The proposed WEF should be developed and the mitigation and enhancement measures identified in the SIA and other specialist studies should be implemented. However, the impact of large WEFs on the sense of place and landscape are issues that need to be addressed in the location, design and layout of the proposed facility.

9.11.7 Significance statement

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Planning and Design Phase Impacts					
Increase in renewable energy development in the local area					
Without Mitigation	Long-term	Regional	Moderate	Probable	**Low -**
With Mitigation	Long-term	Regional	Moderate	Probable	**Low -**
Construction Phase Impacts					
Creation of local employment, training, and business opportunities					
Without Mitigation/ Enhancement	Short Term	Regional	Slight Beneficial	Probable	**Low (+)**

With Mitigation/ Enhancement	Short Term	Regional	Moderately Beneficial	Definite	**Moderate (+)**
Technical advice for local farmers and municipalities					
Without Mitigation/ Enhancement	N/A as represents current status quo				**N/A**
With Mitigation/ Enhancement	Long Term	Regional	Slightly beneficial	Positive	**Moderate (+)**
Potential impacts on family structures and social networks associated with the presence of construction workers					
Without Mitigation/ Enhancement	Short Term	Regional	Moderate	Probable	**Moderate (-)**
With Mitigation/ Enhancement	Short Term	Regional	Slight	Probable	**Low (-)**
Potential impacts on family structures, social networks and community services associated with the influx of job seekers					
Without Mitigation/ Enhancement	Short Term	Regional	Slight	Probable	Low (-)
With Mitigation/ Enhancement	Short Term	Regional	Slight	Probable	Low (-)
Risk to safety, livestock and farm infrastructure					
Without Mitigation/ Enhancement	Short Term	Study Area	Moderate	Probable	**Moderate (-)**
With Mitigation/ Enhancement	Short Term	Study Area	Slight	Probable	**Low (-)**
Increased risk of grass fires					
Without Mitigation/ Enhancement	Short Term	Study Area	Moderate	Probable	**Moderate (-)**
With Mitigation/ Enhancement	Short Term	Study Area	Slight	Probable	**Low (-)**
Impacts associated with construction vehicles					
Without Mitigation/ Enhancement	Short Term	Study Area	Moderate	Probable	**Moderate (-)**
With Mitigation/ Enhancement	Short Term	Study Area	Slight	Probable	**Low (-)**
Impacts associated with loss of farmland					
Without Mitigation/ Enhancement	Short Term	Study Area	Moderate	Probable	**Moderate (-)**
With Mitigation/ Enhancement	Short Term	Study Area	Slight	Probable	**Low (-)**
Potential impact on tourism					
Without Mitigation/ Enhancement	Short Term	Study Area	Slight	Probable	**Low (-)**
With Mitigation/ Enhancement	Short Term	Study Area	Slight	Probable	**Low (-)**
Operational Phase Impacts					
Creation of employment and business opportunities associated with the operational phase					
Without Mitigation/ Enhancement	Medium Term	Regional	Slightly Beneficial	May Occur	**Low (+)**
With Mitigation/ Enhancement	Medium Term	Regional	Slightly Beneficial	Probable	**Moderate (+)**
Creation of an alternative income source for farmers, which in turn can assist to reduce and or prevent job losses in the farming sector					
Without Mitigation/ Enhancement	Medium Term	Study Area	Slightly Beneficial	Probable	**Low (+)**
With Mitigation/ Enhancement	Medium Term	Study Area	Slightly Beneficial	Probable	**Low (+)**
Creation of employment and business opportunities associated with the operational phase					
Without Mitigation/	Medium Term	Regional	Moderately	May Occur	**Moderate (+)**

Enhancement			Beneficial		
With Mitigation/ Enhancement	Medium Term	Regional	Severely Beneficial	Definite	**High (+)**
Promotion of clean, renewable energy					
Without Mitigation/ Enhancement	Medium Term	National	Moderate	Probable	**Moderate (-)**
With Mitigation/ Enhancement	Medium Term	National	Moderately Beneficial	Probable	**Moderate (+)**
Visual impact associated with the proposed WEF and the potential impact on the areas rural sense of place					
Without Mitigation/ Enhancement	Medium Term	Study Area	Moderate	Probable	**Moderate (-)**
With Mitigation	Medium Term	Study Area	Moderate	Probable	**Moderate (-)**
Potential impact of the WEF on local tourism					
Without Mitigation/ Enhancement	Medium Term	Study Area	Slight	Probable	**Low (-)**
With Mitigation	Medium Term	Study Area	Slight	Probable	**Low (-)**
Potential visual impacts associated with access roads and construction camps (all alternative locations)					
Without Mitigation/ Enhancement	Medium Term	Study Area	Slight	Probable	**Low (-)**
With Mitigation	Medium Term	Study Area	Slight	Probable	**Low (-)**
Decommissioning Impacts					
Social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income					
Without Mitigation/ Enhancement	Short Term	Study Area	Moderate	Probable	**Low (-)**
With Mitigation/ Enhancement	Short Term	Study Area	Slight	Probable	**Low (-)**
Cumulative Impacts					
Cumulative visual impacts associated with the establishment of a number of WEFs on the on the areas rural sense of place and character of the landscape					
Without Mitigation/ Enhancement	Medium Term	Study Area	Moderate	Probable	**Moderate (-)**
With Mitigation/ Enhancement	Medium Term	Study Area	Moderate	Probable	**Moderate (-)**
The establishment of a number of renewable energy facilities in the KHLM and LLM will place pressure on local services, specifically medical, education and accommodation					
Without Mitigation/ Enhancement	Long Term	Regional	Moderate	Probable	**Moderate (-)**
With Mitigation/ Enhancement[12]	Long Term	Regional	Slight	Probable	**Low (-)**
The establishment of a number of renewable energy facilities in the KHLM and LLM will create employment, skills development and training opportunities, creation of downstream business opportunities					
Without Mitigation/ Enhancement	Long Term	Regional	Moderately Beneficial	Probable	**Moderate (+)**
With Mitigation/ Enhancement	Long Term	Regional	Severely Beneficial	Definite	**High (+)**
No-Go Alternative					
The no-development option would result in the lost opportunity in terms of job and business creation and also the opportunity for South Africa to supplement is current energy needs with clean, renewable energy					
Without Mitigation/ Enhancement	Medium Term	National and Regional	Slight	Probable	Moderate (-)
With Mitigation/	Medium Term	National and	Moderate	Probable	Moderate

[12] The mitigation measures are linked to initiatives undertaken by Provincial and Local Government to address the additional demand for services and accommodation etc. created by the establishment of development renewable energy projects in the Komsberg REDZ.

Enhancement		Regional			(+)

9.12 Traffic and transportation impacts

The impacts associated with the transportation of material and equipment to site was assessed by Mr Hermanus Steyn from Aurecon South Africa (Pty) Ltd (see Appendix G for the full report) and the sections below for key findings, impact assessments, mitigation measures and conclusions.

9.12.1 Key findings

It is estimated that the number of expected trips per turbine would be:

- Abnormal vehicles: 10 (turbine components)
- Heavy vehicles: 60 (reinforcement and concrete)
- Heavy Vehicles: 90 (road layer works)
- **TOTAL: 150 / 10 (Heavy / Abnormal) per turbine**

The wind farm capacity and the specific WTG model to be used has not yet been confirmed and it is therefore not possible to accurately calculate the total expected trips for the construction of the facility. However, the range of potential configurations for the wind farm, provides a basis for the estimation of the total trips that will be required. 140MW are considered to be the possible site capacity, while the options of 1.5-4 MW WTGs are considered as representing the outer limits of the range of possible machines to be utilised. Based on the above, the total trips for one ultimate 70 turbine facility is estimated to be 700 abnormal and 10500 heavy vehicle trips, over an estimated period of 18-24 months. Should concrete towers be used, the number of abnormal loads would decrease, with heavy loads increasing substantially. If the concrete and road building materials could be sourced from newly developed sources in proximity to the site, the number of heavy vehicles on the access roads could be reduced substantially. In the worst case, the number of heavy vehicle trips per day would be in the order of 15 to 20 round trips. The impact of this on the general traffic would therefore be of low significance, as the peak time traffic would be increased by 5 trips at most. Based on Aurecons previous experience, the personnel during construction is estimated to total 250 - 350 persons. The personnel will most likely reside in Sutherland, Matjiesfontein or Laingsburg as the closest communities. It is recommended that the majority of construction personnel be transported to and from site by means of busses.

Current traffic volumes on N1 near Matjiesfontein (Between Laingsburg and Touwsrivier) are estimated from the most recent SANRAL yearbook at about 3834 ADT (Average Daily Traffic), 1497 ADTT (Average Daily Truck Traffic) (both directions with a 50/50 split) and a maximum hourly flow of about 800 veh/h for this section of road. The current traffic volumes on the R354 (Western Cape Provincial Road: Trunk Road 20/1) is in the order of 140 vehicles per day with a 13% heavy vehicle component. It can therefore be stated that the construction traffic and the post construction traffic would be low without any significant impact on the existing traffic flows on the N1 or provincial roads. It will also have a negligible impact on the pavement structures. Furthermore, the impact of the traffic on the provincial gravel access roads will also be of low significance with respect to service levels. This personnel transport will total approximately 15 to 25 daily trips. The impact of this on the general traffic would therefore also be considered to be of low significance, as the peak hour traffic would be increased by 10 trips at most.

9.12.2 Construction phase impacts

The grids/power lines to be constructed during the project will be 33/132kV power lines. The main components being the support mast, cables, connectors, transformers, etc. All the components will be transported by means of general freight. Aurecon is of opinion that the traffic impact for this construction activity will be minimal and that the additional generated traffic is negligible.

- For normal freights the transport of elements from manufacturing centres should occur predominantly on National and Provincial roads.
- sourcing road building materials and concrete aggregate should be sourced locally from new quarries or borrow pits in proximity to the site, provided that it is a feasible with respect

to the target implementation programme, to significantly reduce the number of heavy vehicle trips.

- Certain aspects such as clearances, bridge capacities, etc., needs to be confirmed by the logistics contractor as part of their preparation as this will be dependent on the actual vehicles configuration used.
- Abnormal permits will be required for the transport of the transformer and the turbine elements by the logistics contractor. And could take approximately one month to complete and should be applied for, by the logistics contractor, once the project is awarded preferred bidder status.

9.12.3 Operational phase impacts

After construction, the generated site traffic would be limited to maintenance support, with only a few light vehicles, transporting approximately 20 employees, will be accessing the site per day. Maintenance activities will be executed as and when required, but is not expected to have a low traffic impact.

9.12.4 Decommisioning phase impacts

Traffic is expected to be very similar to the construction phase. The impact of this on the general traffic would therefore also be considered to be of low significance.

9.12.5 Significance ratings

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Construction Phase Impacts					
Traffic impact as a result of transportation of Concrete Towers					
Without Mitigation	Short term	Regional	Moderate	May Occur	Low -
With Mitigation	Short term	Regional	Slight	May Occur	Low -
Traffic impact as a result of transportation of Steel Towers					
Without Mitigation	Short term	Regional	Slight	May Occur	Low -
With Mitigation	Short term	Regional	Slight	May Occur	Low -
Operational Phase Impacts					
Traffic impact as a result of Operations					
Without Mitigation	Medium term	Localised	Slight	Definite	Low -
With Mitigation	Medium term	Localised	Slight	Definite	Low -
Traffic impact as a result of Maintenance					
Without Mitigation	Short term	Regional	Slight	May Occur	Low -
With Mitigation	Short term	Regional	Slight	May Occur	Low -
Decommisioning Phase Impacts					
Traffic impact as a result of transportation of Concrete Towers					
Without Mitigation	Short term	Regional	Moderate	May Occur	Low -
With Mitigation	Short term	Regional	Slight	May Occur	Low -
Traffic impact as a result of transportation of Steel Towers					
Without Mitigation	Short term	Regional	Slight	May Occur	Low -
With Mitigation	Short term	Regional	Slight	May Occur	Low -

10. CONCLUSIONS AND RECOMMENDATIONS

According to Appendix 3(3) of the EIA Regulations (GN R.982 of 2014), *an Environmental Impact Report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include—*

(h) a full description of the process followed to reach the proposed preferred site including:
(xi) a concluding statement indicating the preferred alternative development location within the approved site;
(o) any aspects which are conditional to the findings of the assessment wither by the EAP or specialist which are to be included as conditions of authorisation;
(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;
(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;
(s) an undertaking under oath or affirmation by the EAP in relation to:
(i) the correctness of the information provided in the reports;
(ii) the inclusion of comments and inputs from stakeholders and I&APs ;
(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and
(iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comment or inputs made by interested and affected parties;
(t) where applicable, details of any financial provisions for the rehabilitation, closure and on-going post decommissioning management of the negative environmental impacts.

Brandvalley Wind Farm (Pty) Ltd (the applicant), a subsidiary of G7 Renewable Energies (Pty) Ltd (G7), proposes to develop a 140 megawatt (MW) WEF near Laingsburg, on the border of the Northern Cape Province and the Western Cape Province in South Africa. The proposed WEF is located in the Karoo Hoogland, the Witzenberg (Ceres) and the Laingsburg Local Municipalities, which fall within the Namakwa, the Cape Winelands and the Central Karoo District Municipalities, respectively. The initial proposal was for Brandvalley WEF to comprise of up to 70 turbines, with a generating capacity of between 1.5MW and 4MW each and a foundation of 25m in diameter and 4m in depth. The turbine structures will have a maximum hub height of up to 120m per turbine and a rotor diameter of up to 140m. Please see Chapters **Error! Reference source not found.** and **Error! Reference source not found.** for background to the project and the full project description. A full Soping and Environmental Impact Assessment was undertaken and thus, this chapter concludes and provides recommendations as result of that process.

10.1 Full description of the process followed

In order to assess the proposed wind energy facility and the associated feasible project alternatives (see Chapter **Error! Reference source not found.** for alternatives and Chapter **Error! Reference source not found.** for a description on the need and desireability), the appointed EAP undertook a full Environmental Impact Assessment process in line with the legislative requirements detailed in Chapter **Error! Reference source not found.** of this report. The approach to the EIA process was described in Chapter **Error! Reference source not found.**. The process was subjected to various rounds of public participation as discussed in Chapter **Error! Reference source not found.** to ensure that all interested and affected parties had sufficient opportunity to partake in this process. In order to determine the baseline and assess the identified impacts, various specialist studies were undertaken (see Chapter **Error! Reference source not found.** for the baseline description and Chapter **Error! Reference source not found.** for the impact assessments). This collectively informed the oucome of the EIA process as discussed in this concluding Chapter.

In line with the above-mentioned process, this Chapter of the Draft EIR provides a summary of the findings of the EIA and a comparative assessment of the positive and negative implications of the proposed project and identified alternatives. In addition, this Chapter provides the EAP's opinion and concluding statement as to whether the activity should or should not be authorised as well as the reason(s) for the opinion.

10.2 Summary of all impacts

Table 10.1 indicate the significance ratings for the potential environmental and social impacts associated with the project.

Table 10.1 Summary table of all specialist study impact ratings

DESCRIPTION OF IMPACT	Overall Significance	
	Without Mitigation	With Mitigation
Planning and Design		
Agricultural Impacts		
Increase in erosion potential	Moderate -	Low -
Increase in renewable energy development in the local area	Low -	Low -
CONSTRUCTION PHASE		
Terrestrial Flora Impacts		
Impact on vegetation and listed plant species due to transformation within the development footprint.	Moderate -	Low -
Soil erosion risk as a result of clearing and disturbance within the development footprint and adjacent affected areas.	Moderate -	Low -
Terrestrial Fauna Impacts		
Direct faunal impacts due to the construction phase noise and physical disturbance	High -	Moderate -
Agricultural Impacts		
Management of hazardous chemicals	Moderate -	Low -
Increased risk of fires from construction activities	Moderate -	Low -
Loss of agricultural potential due to poor management of the soil stockpile	Moderate -	Low -
Soil profile disturbance and resultant decrease in soil agricultural capability	Moderate -	Low -
Establishment of renewable energy infrastructure on agricultural land	Moderate -	Low -
Increase in erosion potential	Moderate -	Low -
Avifaunal Impacts		
Habitat loss associated with the construction phase	Low -	Low -
Disturbance and displacement associated with the construction phase	Low -	Low -
Bats Impacts		
Destruction of bat roosts due to earthworks and blasting	Moderate -	Low -
Loss of foraging habitat	Moderate -	Low -
Aquatic Impacts		
Loss of riparian systems and disturbance to alluvial water courses	Moderate -	Low -
Loss of wetlands and wetland function in the construction phase	Moderate -	Low -
Increase in sedimentation and erosion in the construction, operational and decommissioning phases	Moderate -	Low -
Impact on localised surface water quality	Moderate -	Low -
Impact on localised aquatic systems due to the storage of hazardous substances	Moderate -	Low -
Visual Impacts		
Visual impact of construction activity	Moderate -	Moderate -
Construction camp alternatives 1, 2 and 3	Low -	Low -
Noise Impacts		
Impact of construction increase in ambient noise levels	Low -	Low -
Paleontology Impacts		
Disturbance, damage or destruction of fossil heritage within development footprint during the construction phase	Low -	Low -
Potential improved palaeontological database	Low +	High +

Heritage Impacts		
Destruction of precolonial / stone age material	Very High -	Moderate -
Destruction of Stone Walling Features (BV_SW1 - BV_SW17) and associated Historical Artefact Scatters (BV_Hist1 – BV_Hist3)	Very High -	Moderate -
Destruction of Graves (formal and informal burials) (HV_G1 – BV_G2)	Very High -	Moderate -
The Destruction of Homesteads / Farmhouse Complexes (BV_HS1 – BV_HS6)	Very High -	Moderate -
Socio-economic Impacts		
Creation of employment and business opportunities during the construction phase	Low +	Moderate +
Technical advice for local farmers and municipalities	N/A	Moderate +
Impact of construction workers on local communities	Moderate -	Low -
Influx of job seekers	Low -	Low -
Risk to safety, livestock and farm infrastructure	Moderate -	Low -
Increased risk of grass fires	Moderate -	Low -
Impacts associated with construction vehicles	Moderate -	Low -
Impacts associated with loss of farmland	Moderate -	Low -
Potential impact on tourism	Low -	Low -
OPERATION PHASE		
Terrestrial Flora Impacts		
Following construction, the site will be highly vulnerable to soil erosion	Moderate -	Low -
Following construction, the site will be highly vulnerable to alien plant invasion	Moderate -	Low -
Terrestrial Fauna Impacts		
Faunal impacts due to operational activities of the wind farm such as noise, and human presence during maintenance activities.	High -	Moderate -
Agricultural Impacts		
Increase in erosion potential	Moderate -	Low -
Establishment of renewable energy infrastructure on agricultural land	Moderate -	Low -
Establishment of new access roads	High +	High +
Avifaunal Impacts		
Activities and/or presence of intrusive structures cause birds to permanently move away from infrastructure	Moderate -	Moderate -
Turbine collision mortality	Low -	Low -
Powerline collision mortality associated with the placement of 33kV Powerlines throughout the project site	Moderate -	Moderate -
Bat Impacts		
Bat mortalities due to direct blade impact or barotrauma during foraging activities (not migration)	High -	Moderate -
Artificial lighting	High -	Low -
Aquatic Impacts		
Impact on riparian systems through the possible increase in surface water runoff on riparian form and function during the operational and decommissioning phases	Moderate -	Moderate -
Visual Impacts		
Impact of the layout on sensitive visual receptors	High -	High -
The access road, including alternatives 1 and 2	Moderate -	Moderate -

Visual impact of the on-site substation	Moderate -	Moderate -
Shadow flicker	No impact	
Noise Impacts		
Impact of the operational noise on the surrounding environment	Low -	Low -
Paleontology Impacts		
None		
Heritage Impacts		
None		
Socio-economic Impacts		
Creation of employment and business opportunities associated with the operational phase	Low +	Moderate +
Creation of an alternative income source for farmers, which in turn can assist to reduce and or prevent job losses in the farming sector	Low +	Low +
Benefits associated with the establishment of a Community Trust	Moderate +	High +
Promotion of clean, renewable energy	Moderate -	Moderate -
Visual impact associated with the proposed WEF and the potential impact on the areas rural sense of place	Moderate -	Moderate -
Potential impact of the WEF on local tourism	Low -	Low -
Potential visual impacts associated with access roads and construction camps (all alternative locations)	Low -	Low -
DECOMMISSIONING PHASE		
Terrestrial Flora Impacts		
Soil Erosion Risk Following Decommissioning will be high	Moderate -	Low -
Alien plant invasion will be highly likely within disturbed areas following decommissioning	Moderate -	Low -
Terrestrial Fauna Impacts		
Faunal Impacts due to Decommissioning Phase activities such as noise and disturbance due to the presence of construction staff and the operation of heavy machinery	Moderate -	Low -
Agricultural Impacts		
Decommissioning and removal of renewable energy infrastructure on agricultural land	Moderate +	Moderate +
Bat Impacts		
Loss of foraging habitat	Low -	Low -
Aquatic Impacts		
Loss of riparian systems and disturbance to alluvial water courses	Moderate -	Low -
Increase in sedimentation and erosion in the construction, operational and decommissioning phases	Moderate -	Low -
Impact on localised surface water quality	Moderate -	Low -
Impact on riparian systems through the possible increase in surface water runoff on riparian form and function during the operational and decommissioning phases	Moderate -	Moderate -
Visual Impacts		
Visual impact of decommissioning activity	Moderate -	Moderate -
Noise Impacts		
Impact of decommissioning increase in ambient noise levels	Low -	Low -
Paleontology Impacts		

None		
Heritage Impacts		
None		
Socio-Economic Impacts		
Social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income	Low -	Low -
CUMMULATIVE IMPACTS		
Terrestrial Flora Impacts		
Impact on CBAs and Broad-Scale Ecological Processes due habitat loss and the presence and operation of the facility	High -	Moderate -
Avifaunal Impacts		
The combined impacts from other renewable energy developments within close proximity to the Brandvalley wind farm	Moderate -	Moderate -
Bat Impacts		
Cumulative bat mortalities due to direct blade impact or barotrauma during foraging (resident and migrating bats affected).	High -	Moderate -
Aquatic Impacts		
Loss of riparian systems and disturbance to alluvial water courses	Insignificant if all mitigation measures for phases are implemented	
Loss of wetlands and wetland function in the construction phase		
Increase in sedimentation and erosion in the construction, operational and decommissioning phases		
Visual Impacts		
Cumulative Visual impact	High -	High -
Noise Impacts		
Noise increase due to the development of multiple WEF in the same area	Low -	Low -
Paleontology Impacts		
Disturbance, damage or destruction of fossil heritage within development footprint during the construction phase of the WEF	Low -	Low -
Potential improved palaeontological database	Low +	High +
Socio-economic Impacts		
Cumulative visual impacts associated with the establishment of a number of WEFs on the on the areas rural sense of place and character of the landscape	Moderate -	Moderate -
The establishment of a number of renewable energy facilities in the KHLM and LLM will place pressure on local services, specifically medical, education and accommodation	Moderate -	Low -
The establishment of a number of renewable energy facilities in the KHLM and LLM will create employment, skills development and training opportunities, creation of downstream business opportunities	Moderate +	High +
NO-GO		
Agricultural Impacts		
Not constructing the WEF will result in no change in the current agricultural landscape.	Moderate +	Moderate +
Aquatic Impacts		
No-Development	Moderate -	Low -
Socio-economic Impacts		
The no-development option would result in the lost opportunity in terms of job and business creation and also the opportunity for South Africa to supplement is current energy needs with clean, renewable energy	Moderate -	Moderate -

Without implementing mitigation measures, the key concerns would be cumulative impacts on critical biodiversity areas, construction and operational impacts on fauna, operational impacts on bats, operational and cumulative visual impacts and heritage impacts. As indicated in Table 10.1 above, most impacts can be reduced to an acceptable low (-) or moderate (-) significance with the implementation of mitigation measures. The exception is visual impacts associated with the turbines which will have a high (-) visual impact regardless of implementing mitigation measures.

There are positive impacts associated with potential improved paleontological database (high +), agricultural impacts in terms of improved road network (high +) and socio-economic benefits (ranging from moderate to high +).

Based on the summary above, all impacts can be mitigated to an acceptable level except for visual impacts due to the size of the turbines. Wind farms typically have a high negative visual impact due to the size of the turbine, and hence mitigations to apply are limited. It is requested that this impact be viewed in the light that the Brandvalley Wind Farm is located within an area earmarked for Renewable Energy Development in terms of the REDZ which motivates for wind and solar developments to be concentrated in specific areas to limit the areas affected by the visual impact typically associated with these developments.

10.3 Environmental sensitive mapping and layout amendments

The following specialists mapped specific sensitive areas to be mitigated through the planning process:

- Ecology Impact Assessment
- Avifauna Impact assessment
- Bat Impact Assessment
- Heritage Impact Assessment
- Aquatic Impact Assessment

Some of the specialists recommended that layout amendements are part of the mitigation strategy at the planning phase. Amended layout and environmental sensitivities areindicated in the maps below.

For each sensitivity, a pre-mitigation and post-mitigation layout showing the preferred alternatives were provided. The pre-mitigation layout includes all 70 turbine positions whereas the post-mitigation layout excludes turbines 38 and 42. As indicated in these maps, construction camp 1, substation position 4 and access road alternative 1 are the preferred alternatives as discussed later in Section 10.6 below. The access roads will be micro-sitted within the 200m buffer zone to avoid identified sensitivities.

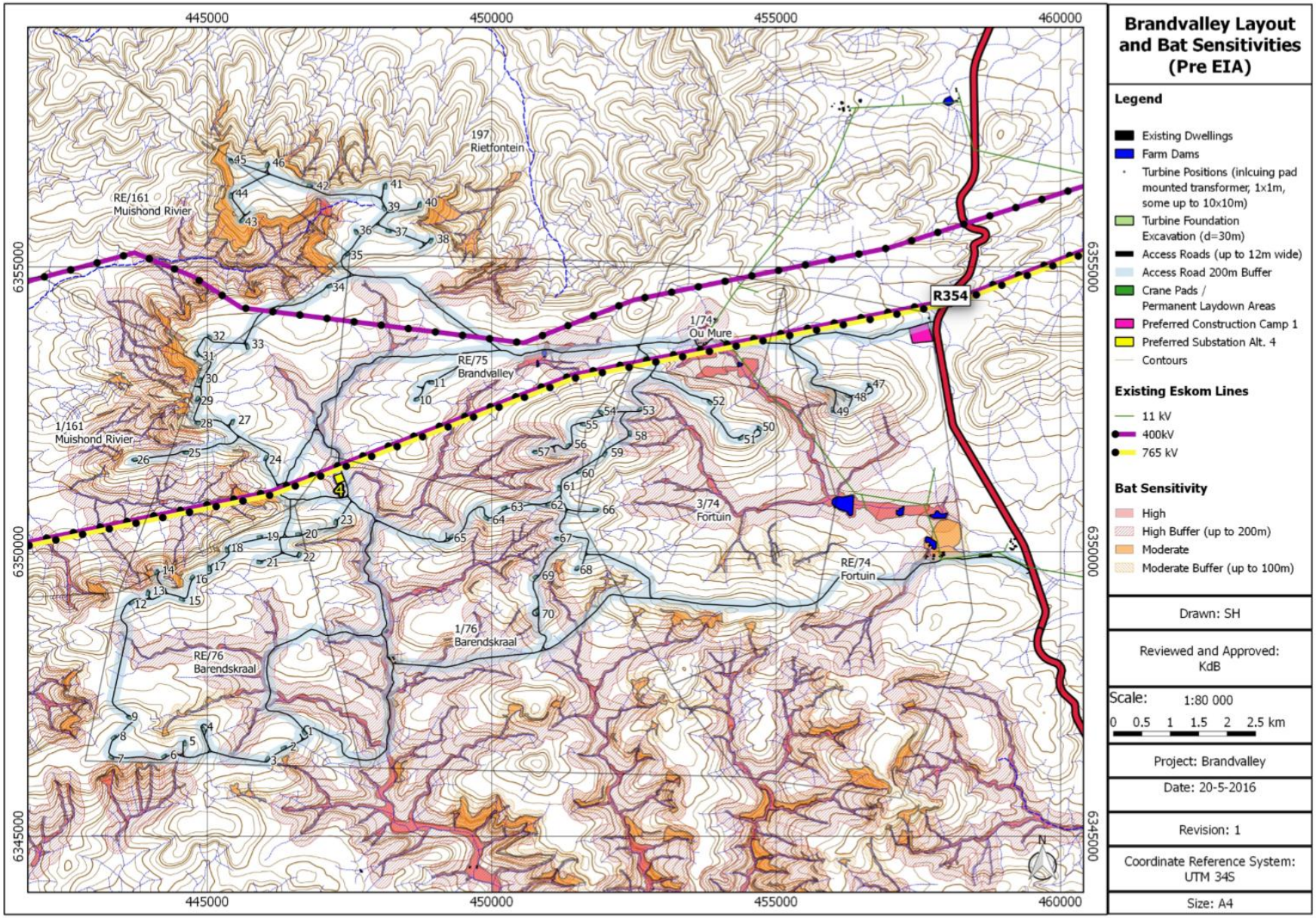


Figure 10.1: Bat sensitivity Pre-EIA findings

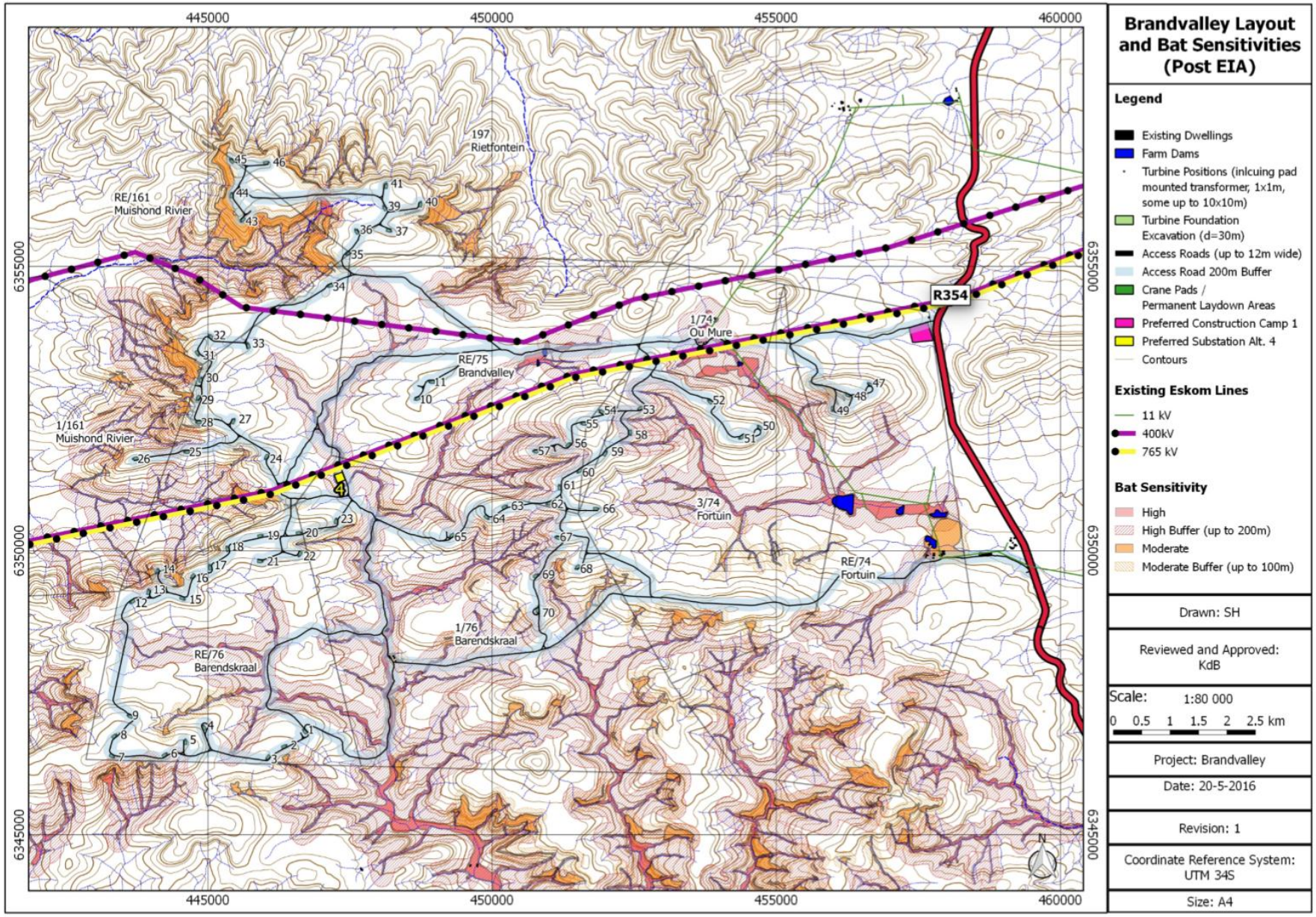


Figure 10.2: Bat sensitivity Post-EIA findings

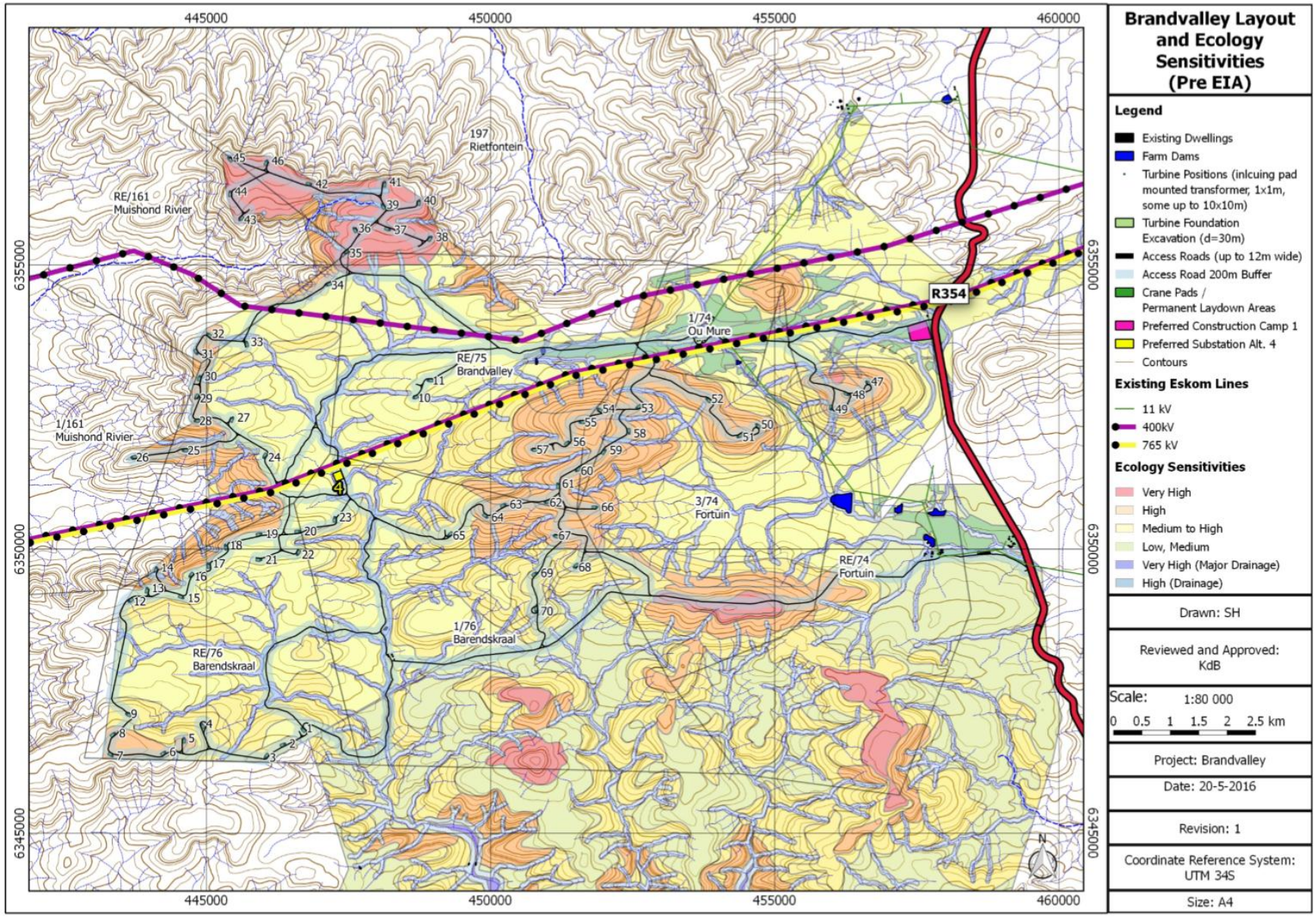


Figure 10.3: Ecological sensitivity Pre-EIA findings

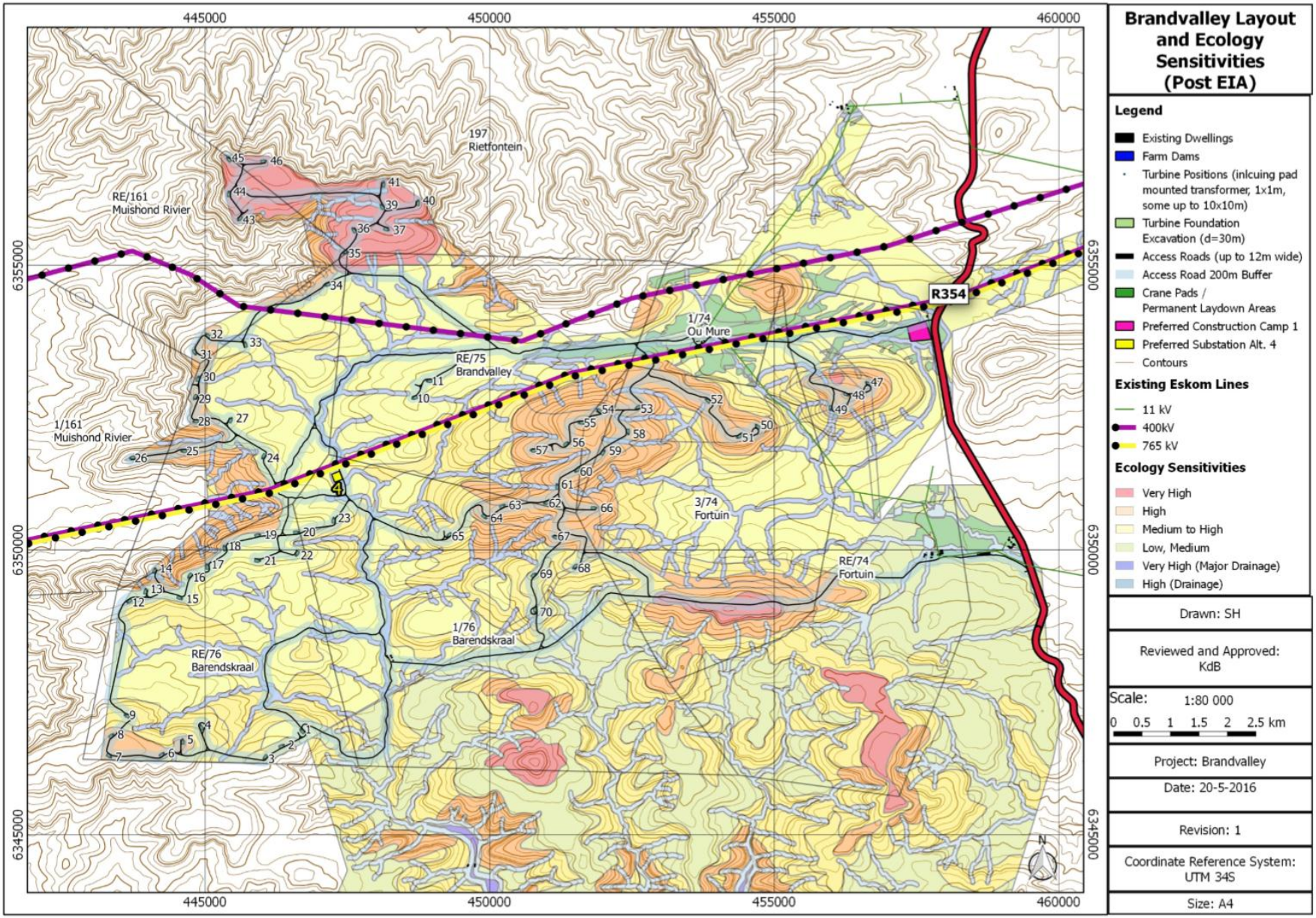


Figure 10.4: Ecological sensitivity Post-EIA findings

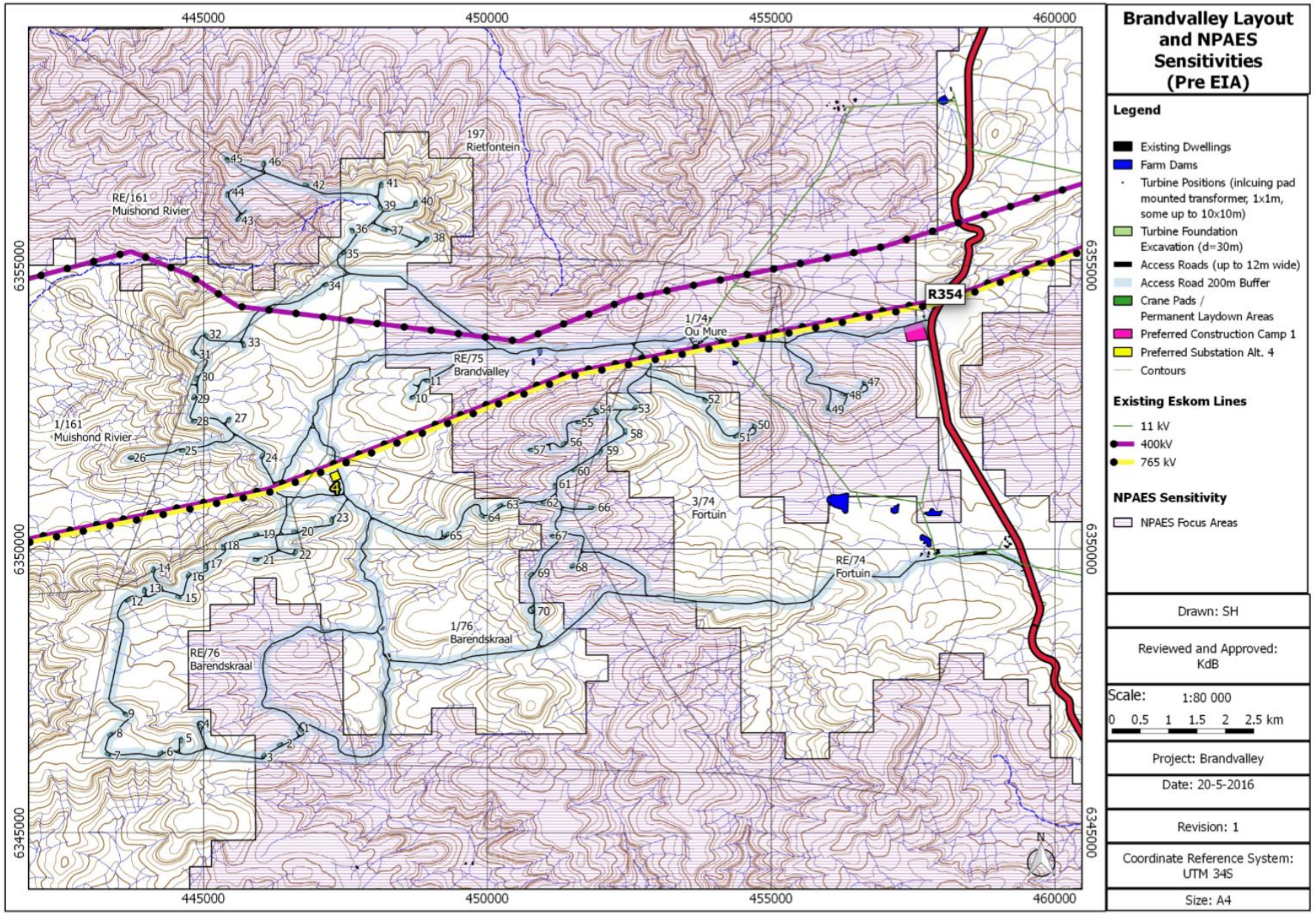


Figure 10.5: Aquatic sensitivity Pre-EIA findings

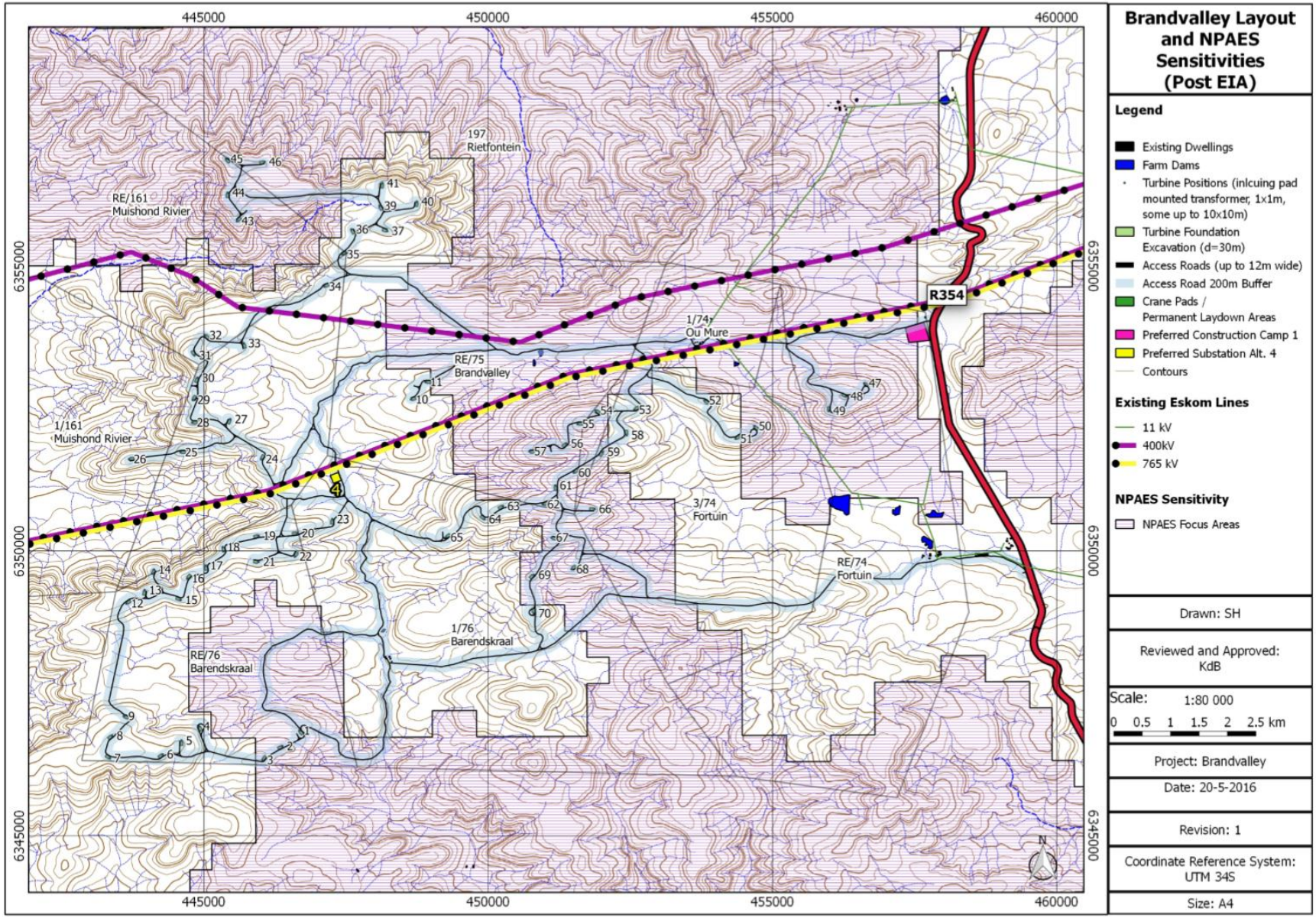


Figure 10.6: Ecological sensitivity Post-EIA findings

10.4 Assumptions, Uncertainties and Gap

The following assumptions have been made during the EIA process:

- The precautionary approach has been used to allow for any assumptions in findings which may require more time to process effectively.
- All specialist studies are accurate and offer an unbiased opinion of the findings.
- In terms of assessing the cumulative impacts, it was assumed that all projects currently proposed or authorised in the area would be constructed. See Figure 21 showing all renewable energy developments proposed in the vicinity of the Brandvalley WEF. In reality, all projects are unlikely to be constructed however, in terms of the precautionary principle the worst case scenario was assessed.
- Individual specialist assumptions are provided in the respective reports (as provided in Appendix H).

There are no known gaps in this environmental impact assessment.

10.5 Consideration of Alternatives

Specialists assessed the following alternatives:

1. Fundamental alternatives:
   - 1.1 Project area location alternative: One project location alternative namely Brandvalley Wind Farm.
   - 1.2 Access road location alternatives: two access road alternatives namely access road alternative 1 and access road alternative 2.
   - 1.3 Three construction camp alternatives.
   - 1.4 Four onsite substation location alternatives.
   - 1.5 Technology alternative: One technology alternative namely a WEF.
2. Incremental alternatives:
   - 2.1 Turbine layout alternatives.
   - 2.2 200m buffer on access roads for sensitivity alternatives (assessed with the access road alternatives).
3. No-go alternative.

Each specialist identified their preferred alternative based on their various assessments (see Appendix G for the full reports). The results of specialist preference are shown in the table below by an x. In certain cases, the specialists had a neutral opinion which means the alternative can proceed and was indicated by an "~". Where alternatives were not supported by a specific specialist, it was indicated with a "no-go" in the table 10-2 below.

Table 10-2: Prefered alternatives as per specialist studies

Specialist Study		Alternative								
		Access roads		Construction Camp			Substation			
		1	2	1	2	3	1	2	3	4
1	Ecological	x	~	x	~	~	x	~	~	~
2	Aquatic	~	~	~	No-go	~	~	~	~	~
3	Agriculture	x	x	x	~	~	x	x	x	~
4	Birds	x	x	x	x	x	x	x	x	x
5	Bats	~	~	~	~	~	~	~	~	~
6	Visual	x	~	x	~	~	x	~	~	~
7	Noise	~	~	~	~	~	~	~	~	~
8	Palaeontological	~	~	~	~	~	~	~	~	~
9	Heritage	~	~	~	x	~	x	~	~	~
10	Social	x	~	x	~	~	x	~	~	~

10.6 Opinion and recommendations of the EAP

Specialists informed these final layouts as indicated in Section 10.3 and where necessary have the weight to exclude turbines or infrastructure components in a given area or portion of the project site.

10.6.1 Preferred alternatives

The following turbines, road sections and infrastructure alternatives are suggested for authorisation based on the technical considerations, landowner feedback the specialist findings and EAP interpretation of combined specialist sensitivities:

Table 10-3: Prefered alternatives

Preferred alternative	Alternative discussion
Project area location alternative namely Brandvalley Wind Farm. Technology alternative namely a WEF.	Project location and technology
Construction camp alternative 1.	Construction camp 1 is preferred by the majority of specialists, and the EAP is in agreement.
Access road alternative 1	Access road 1 is preferred over Access road 2 provided the widening of Access road 1 during the construction phase does not significantly impact on the wetlands through which the existing road traverses.
Onsite substation location 4 (provided it is relocated outside of 32m watercourse buffer).	Substation 1 is preferable from a specialist perspective however from a technical perspective the applicant has indicated that substation 4 will require considerably less cabling for the project. The EAP is happy to recommend the substation 4 *provided* it is repositioned to take into accout the riparian and water course buffer (32m).

10.6.2 Recommendations

The combined sensitivities and sensitive areas identified by the specialist studies and the EAP during the EIA process to date have been refered to inform the conclusions and recommendations contained in the following and final chapter of this report.

- Recommendations for the layout of roads
  - Access road alternative 1 is considered the preferred access corridor owing to the fact that large sections of this corridor are existing gravel roads.
  - As per specialist recommendations the construction of additional roads should be limited as far as possible and should avoid crossing surface water features (including buffer zones and wetlands), where this cannot be avoided permits in terms of the NWA are required.
  - Establishing new roads that are immediately adjacent to existing roads must be avoided where technically possible.
  - A 20 m – 30 m buffer zone must be developed around heritage resources (including archaeological, historical and palaeontological) that may be negatively impacted on by the upgrading of roads. These resources must be clearly demarcated and in some instances

the proposed road should be rerouted to avoid negative impact and promote the implementation of precautionary measures.
    - The preferred access road, Access road 1, should avoid the identified heritage features and maintain the associated buffer areas. This mitigation measure could potentially require the road to be diverted in order to avoid heritage features at the areas, especially around the homesteads, as well as the adjacent wetland and delineated associated buffer zone area.
- Turbines
    - Some of the turbines occur in areas of High sensitivity (12 turbines out of 70 turbines). However, these need to be read in conjunction with the specialist recommendations as stated below.
    - Pending the outcomes of the additional noise modelling that will be required for turbines 52 & 53 once the model type of turbine has been selected it may be that these can remain as proposed, be moved further south or if necessary removed.
    - There are no turbines within the bat high-sensitive areas or within the moderate bat sensitive areas. There are however turbines within the moderate sensitive buffer zone and the following turbines must be subject to a curtailment strategy: Turbines 14, 28 – 31, 42 – 45
    - 12 turbines (turbines 35-46) occur in an area of very high ecological sensitivity. According to the ecological specialist report (Simon Todd):
    - These turbines are located in the northern extension of the site in the Snydersberg area, this is considered the most sensitive area due to the high elevation of this area as well as the current low levels of human impact the likely presence of a number of species of conservation concern in this area.
    - Subsequent to this finding the applicant agreed to remove two of the most productive wind turbines (Turbine 38 and Turbine 42) due to the initial Ecological sensitivity.
    - Turbines within these areas are considered potentially acceptable provided that specific mitigation is implemented to reduce and avoid impact on sensitive species and features.
    - Specific ecological recommendations in this regard require pre- construction and operational monitoring:
        - Monitor key fauna within the study area, concentrating on the very high sensitivity area. This would aid in improving our understanding of the impacts of wind turbines on fauna and potentially inform mitigation for future wind development in the country.
        - A follow-up survey of the Snydersberg ridges in the wet season to identify any specific areas of concern that should be avoided as well as adjust turbine and road locations to minimize the impact on species of concern. This should preferably occur prior to the preconstruction walk-through of the facility to allow for more significant changes to the layout than is usually possible at the preconstruction phase. The best time of year varies from year to year, but August and September are usually the optimal months.

10.7 EAP opinion on whether the project should be authorised

The decision regarding whether to proceed with the proposed development was based on weighing up of the positive and negative impacts as identified and assessed by the independent specialists. In addition to the findings of the specialist studies, it is also necessary to consider the following when making a decision:

- The majority of the impacts associated with the proposed project can be mitigated by applying specialist study findings and recommendations;
- The nature of the site on which the facility is to be sited is suited to the development proposal, and falls within a strategically identified REDZ;
- The project applicant has taken the issues raised by interested and affected parties into consideration;
- The two IAPs objecting to the project on a visual impact basis have been demonstrated to be minimally affected by the potential visual intrusion imposed on their properties by the proposed

facility by virtue of the relatively significant distance (17km) their properties are from the closest WEF turbine.
- The project has extensive potential environmental and socio-economic benefits including the generation of clean energy for the Western Cape, and
- The project will contribute directly and significantly to social upliftment through a community development trust and skills transfer.

Based on the above, it is believed that with appropriate mitigation, the benefits of the proposed Brandvalley Wind Energy Project will outweigh the negative impacts and it is the opinion of the EAP that the No-Go option should not be considered any further and that the proposed Wind Energy Project should be granted authorisation. The opinion of the EAP was also influenced by the fact that the proposed project will aid in:-

- The reduction of greenhouse gases by the use of alternatives to fossil fuel - derived electricity will assist South Africa to begin demonstrating its commitment to meeting international obligations/legislative instruments such as the 1992 United Nations Framework Convention on Climate Change (FCCC) and the Kyoto Protocol (2002). The project will register to generate carbon credits in terms of the Clean Development Mechanism (CDM) mechanism under the Kyoto Protocol in order to be able to trade the emission reduction certificates on the European carbon market.
- Meeting the goals of the White Paper on the Energy Policy for South Africa (Energy White Paper) which aims to create energy security by diversifying energy supply and energy carriers and sets out the policy principles, goals and objectives to achieve, "*An energy economy in which modern renewable energy increases its share of energy consumed and provides affordable access to energy throughout South Africa, thus contributing to sustainable development and environmental conservation*", and;
- The Department of Minerals and Energy (DME) (now the Department of Energy) Integrated Energy Plan (IEP) to develop the renewable energy resources, while taking safety, health and the environment into consideration setting a target of, "*10 000 GWh (0.8Mtoe) renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro*".
- South Africa has also often experienced major power shortages largely as a result of demand outstripping supply. This, in many cases, has resulted in financial losses (many of the sectors contributing to the GDP are practically driven by electricity) and impacted on quality of life (hospitals and schools were among the affected, jobs were lost etc.). The national power utility, Eskom, has indicated that South Africa is not past this crisis and that the possibility of further power cuts remains. With local generation, the networks can be freed up to supply power to other areas and the local community will have a much better chance of more consistent supply.

10.8 Project description and conditions to be included in the EA

The EAP recommends that the *project only be considered for authorisation under certain conditions*, in order to address those impacts with a high significance rating that can potentially be mitigated:

- The final optimized layout will have to be submitted to the DEA prior to construction must demonstrate that specialist designated sensitivities have been taken into consideration.
- It is also strongly suggested that the recommendations made in Environmental Management Programme: Proposed Brandvalley Wind Energy Project (CES, May 2016) also be followed and made a condition to the EA.
- Only existing roads are used where feasible and roads that require construction are kept to a minimum.
- No regulated water use activitities should commence onsite without obtaining the required approvals from the Department of Water and Sanitation.

- The applicant should endevour to minimize their impact on both the natural and social environment and where possible, reduce the area of impact from the proposed maximum number of turbines to the minimum that would make the project feasible.
- The area of very high ecological sensitivity near turbines 47-49 should be cordoned off and considered a No-Go area, especially during construction.

Please see the EAP Declaration of independence included in Apendix E.

Based on the recommendations included in this Chapter, the infrastructure below is recommended for inclusion in the environmental authorisation issued to the applicant, Brandvalley Wind Farm (Pty) Ltd for the Brandvalley WEF with an energy generation capacity (at point of grid feed-in) of up to 140 megawatt (MW):

- A maximum of **68 turbines** (1.5MW to 4MW in capacity each) with a foundation of 25m in diameter and 4m in depth, following layout revisions based on specialist input,
- The hub height of each turbine will be up to 120m, and the rotor diameter up to 140m.
- Permanent compacted hard-standing laydown areas for each wind turbine (70mx50m, total 24.5ha), required during construction and for on-going maintenance purposes.
- Electrical turbine transformers (690V/33kV) adjacent to each turbine (up to 10m x 10m).
- It is noted that the proposed access road alignments may have to shift slightly (within the 200m corridor) to accommodate construction requirements that are fully informed by final detailed design for the facility. These considerations will be appropriately considered in all final layouts to be submitted to the DEA, as and when this becomes necessary.
- 33kV overhead power lines linking groups of wind turbines to onsite 33/132kV substation(s). Underground 33kV cabling between turbines buried along access roads, where feasible.
- The low voltage yard of the 33/132kV onsite substation position number 4. The total footprint of the 33/132kV onsite substation (including both high voltage rad (Eskom yard) and low voltage yards (IPP yard) will be up to 200m x 200m[13].
- Temporary infrastructure including construction camp alternative 1 (~10ha) and an on-site concrete batching plant (~1ha) for use during the construction phase, *provided* it is relocate outside of specialist high sensitive areas and buffers.
- Fencing, up to 4m in height, will be limited around the key infrastructure including substation and will be temporary fencing around the construction camp.

Based on the impacts associated to the lifecycle of the proposed 140MW wind energy as summarised in Section 10.2, the mitigation measures listed in chapter 9 and the EMPr should be included as Conditions in the Environmental Authorisation:

10.9 The Way Forward

All I&APs included in the database (see Appendix C-2) were notified by email/post of the release of the draft EIR, EMPr and specialist reports for a period of 30 days. These I&APs will also be notified of the public meeting which will be held during the public review period at the Laignsburg Flood Museum on 22 June 2016.

Following public review, the Draft EIR, together with the Specialist reports and the EMPr, will be updated as necessary and finalised, incorporating any comments received. It will then be submitted to the DEA for decision-making. Upon thorough examination of the Final EIR, the authority will issue a decision which either accepts or rejects the report. Should the EIR be accepted the authority will then issue an authorisation which will either grant (positive) environmental authorisation or not grant (negative) authorisation. Should an Environmental

[13] The high voltage components of this substation (assessed in a seperate BA) will likely be ceded to Eskom. The exact coordinates of the low voltage components footprint (assessed in this EIA) and high voltage components footprint (to be assessed in the basic assessment process) will be informed by detailed designs.

Authorisation (EA) be granted, it usually carries Conditions of Approval. The applicant is obliged to adhere to the EA conditions.

Within a period determined by the competent authority, all registered I&APs will be notified in writing of (i) the outcome of the application, (ii) the reason for the decision and the (iii) process to appeal the decision.

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12. APPENDICES