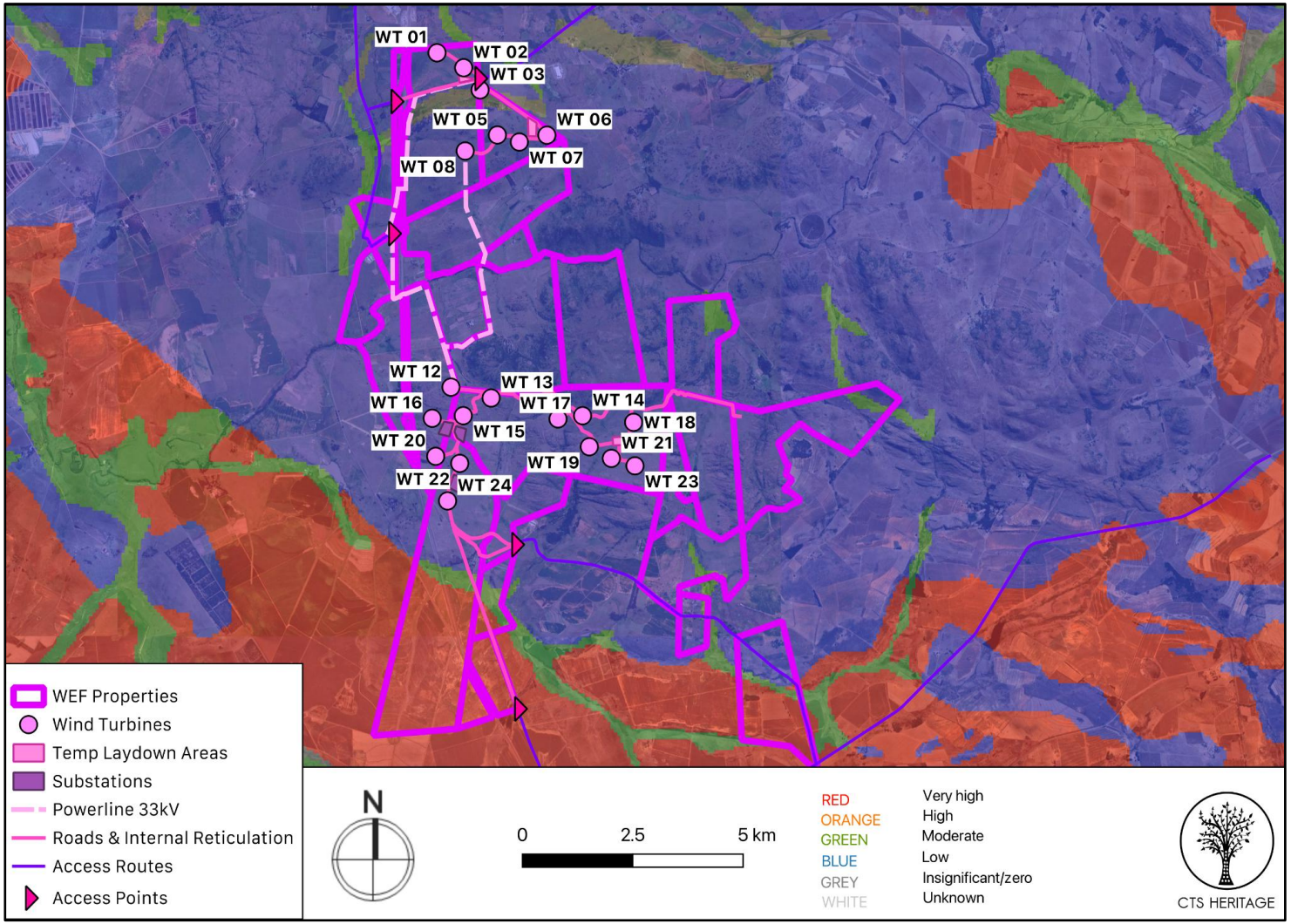

Figure 7-86 - Palaeontological sensitivity of the proposed development area

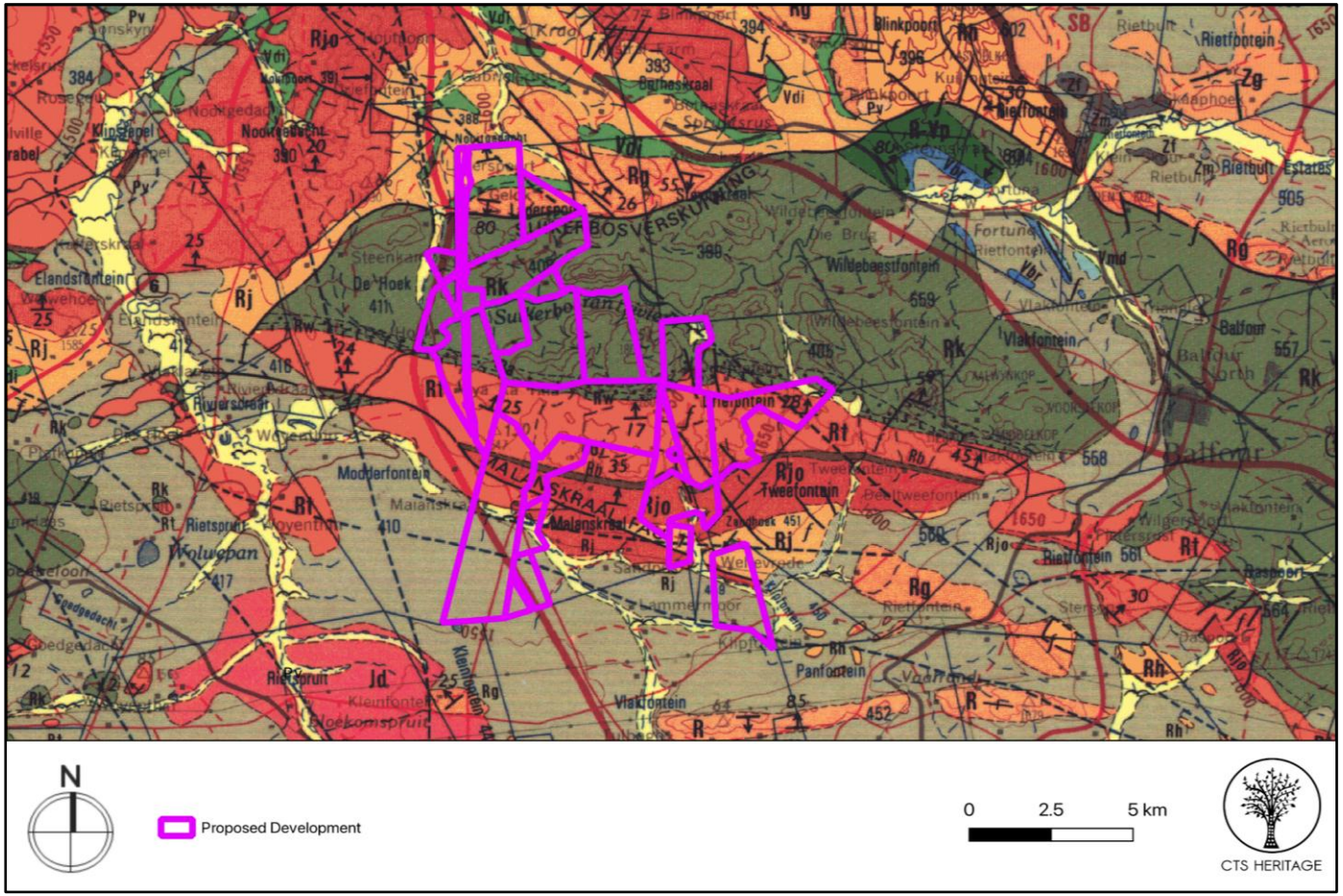

Figure 7-87 - Extract from the CGS 2628 East Rand Geology Map indicating that the development area is underlain by Pv: Vryheid Formation in the Ecca Group, Ra: Alberton, and Rw: Westonaria, both in the Rk: Klipriviersberg Group, Rb: Booysens, Rjo: Johannesburg, and Rt: Turffontein Formations in the Central Rand Group, Rg: Government, and Rj: Jeppestown Formations in the West Rand Group, Q-a: Quaternary Alluvium and V-di: Diabase

7.3.1.5 Identification of heritage resources

Heritage resources identified

In terms of the heritage resources identified in the archaeological field assessment, refer to **Table** 7-42 below and Appendix 1 (of the specialist report) for full descriptions and images.

Table 7-42 - Artefacts identified during the field assessment development area

POINT ID	Description	Type	Period	Density	Co-ordinates		Grading	Mitigation
003	Geluk graves, 20th c. Marked by stone cairns, one headstone. About 20 graves	Graves/ Burial Grounds	Modern	n/a	-26.604938	28.410406	IIIA	100m Buffer
004	Well built stone walled kraal, and modern ruin	Structure, Ruin	Historic	n/a	-26.604957	28.409422	IIIC	50m Buffer
006	Iron Age stone walled kraals hidden under trees	Ruin	Iron Age	n/a	-26.612174	28.407944	IIIA	100m Buffer
008	Lagerspoort sandstone ruins as well as more modern 20th c ruin	Ruin	Historic, Modern	n/a	-26.596735	28.411351	IIIC	50m Buffer
010	Steynskraal werf, sandstone walls and corrugated iron roofs, early 20th c or earlier	Structure	Historic, Modern	n/a	-26.598903	28.460894	IIIC	500m Buffer
011	Strydom family graves, 1907, 1923. About 20 graves under trees with large stone walling	Graves/ Burial Grounds	Historic	n/a	-26.598675	28.459969	IIIA	100m Buffer
012	Farmworkers' graves under gum trees marked by stone cairns and some modern headstones, up to 50 graves here	Graves/ Burial Grounds	Modern, Historic	n/a	-26.600095	28.459435	IIIA	100m Buffer
013	Local stone built ruin with internal plastering, 20th c, 3c	Ruin	Historic	n/a	-26.601053	28.453526	IIIC	50m Buffer
014	Stone walled fort on top of small koppie, SA War/2nd Boer War	Ruin	Historic	n/a	-26.600908	28.455007	IIIA	100m Buffer
015	IA stone walled kraals	Ruin	Iron Age	n/a	-26.603862	28.44707	IIIA	100m Buffer
016	IA stone walled kraals	Ruin	Iron Age	n/a	-26.608417	28.452028	IIIA	100m Buffer
017	Long rectangular stone kraal	Structure	Historic	n/a	-26.609132	28.451527	IIIC	50m Buffer
018	Historical rectangular stone kraal under trees, well packed walls. Brick ruin at foundation level	Ruin	Historic	n/a	-26.613101	28.450916	IIIC	50m Buffer

POINT ID	Description	Type	Period	Density	Co-ordinates		Grading	Mitigation
019	Historical stone walled kraals	Structure	Historic	n/a	-26.615298	28.449083	IIIC	50m Buffer
020	Small rectangular stone building inside ephemeral kraal, historical	Structure	Historic	n/a	-26.616839	28.44956	IIIC	50m Buffer
021	Large IA enclosures with stone cairn marked grave in the centre	Ruin, Grave	Iron Age	n/a	-26.614058	28.453236	IIIA	100m Buffer
022	Another large Iron Age enclosure on hill slope	Ruin	Iron Age	n/a	-26.618461	28.450536	IIIA	100m Buffer
023	Mid 20th century farmworkers' graves marked by stone cairns, some headstones, around 20 graves	Graves/ Burial Grounds	Historic	n/a	-26.612991	28.455453	IIIA	100m Buffer
024	Klipplaat koppie, very prominent landmark koppie	CL Feature		n/a	-26.612212	28.465427		Avoid Impact
025	Historical stock loading platform in IA enclosures	Ruin	Iron Age, Historic	n/a	-26.615071	28.457722	IIIA	100m Buffer
026	Klipplaatdrift werf 20th century buildings with green corrugated iron roofs	Structure	Modern, Historic	n/a	-26.612356	28.478097	IIIC	500m Buffer
027	IA enclosures	Ruin	Iron Age	n/a	-26.623757	28.460306	IIIA	100m Buffer
028	IA enclosures	Ruin	Iron Age	n/a	-26.627548	28.459616	IIIA	100m Buffer
029	20th century werf, white walls and red roof	Structure	Modern, Historic	n/a	-26.626428	28.467488	IIIC	500m Buffer
031	Prominent koppies, cl features and IA sites	Ruin, CL Feature	Iron Age	n/a	-26.631492	28.451111	IIIA	100m Buffer
032	IA enclosures	Ruin	Iron Age	n/a	-26.624678	28.455262	IIIA	100m Buffer
036	Ruined historical kraal, ruined werf and brick building. Marked as cemetery on old topo map but no graves seen	Graves/ Burial Grounds	Historic	n/a	-26.640902	28.381378	IIIA	100m Buffer
040	IA enclosure under trees	Ruin	Iron Age	n/a	-26.646802	28.402908	IIIA	100m Buffer

POINT ID	Description	Type	Period	Density	Co-ordinates		Grading	Mitigation
041	Laagerspoort werf, stone buildings, late 19th century	Structure	Historic	n/a	-26.646211	28.403572	IIIC	500m Buffer
042	IA enclosures	Ruin	Iron Age	n/a	-26.644855	28.405545	IIIA	100m Buffer
043	Laagerspoort werf, early 20th century buildings and some older fabric	Structure	Historic	n/a	-26.643009	28.402389	IIIC	500m Buffer
044	IA walling, linear	Ruin	Iron Age	n/a	-26.645379	28.415182	IIIA	100m Buffer
045	IA enclosure	Ruin	Iron Age	n/a	-26.643796	28.417387	IIIA	100m Buffer
047	Steynskraal werf, stone walled kraals, late 19th and early 20th c buildings	Structure	Modern, Historic	n/a	-26.612115	28.440795	IIIC	500m Buffer
048	Stone walled kraal	Structure	Historic	n/a	-26.614207	28.43744	IIIC	50m Buffer
049	Tuin van Eden campsite and Laagerspoort werf, sandstone building, and 20th c buildings	Structure	Historic, Modern	n/a	-26.619911	28.437361	IIIC	500m Buffer
050	IA enclosures	Ruin	Iron Age	n/a	-26.623305	28.440868	IIIA	100m Buffer
051	Large rectangular stone kraal with ruined building, also local stone, in centre, historical	Ruin	Historic	n/a	-26.625262	28.441559	IIIA	100m Buffer
052	IA enclosures	Ruin	Iron Age	n/a	-26.621244	28.432372	IIIA	100m Buffer
055	IA and historical enclosures, late IA	Ruin	Iron Age	n/a	-26.625007	28.425538	IIIA	100m Buffer
056	Jacobs family graves surrounded by agricultural fields, 1908, at least 10 graves	Graves/ Burial Grounds	Historic	n/a	-26.612566	28.438267	IIIA	100m Buffer
061	IA enclosures	Ruin	Iron Age	n/a	-26.633665	28.423343	IIIA	100m Buffer
062	Large historical stone walled kraal	Ruin	Historic	n/a	-26.629315	28.415407	IIIA	100m Buffer
063	IA enclosures	Ruin	Iron Age	n/a	-26.656076	28.392988	IIIA	100m Buffer
065	Malanskraal werf, green corrugated iron roofs, early 20th and late 19th c.	Structure	Historic	n/a	-26.685623	28.403859	IIIB	500m Buffer

POINT ID	Description	Type	Period	Density	Co-ordinates		Grading	Mitigation
066	About 30 farmworkers' graves, circa 1970s	Graves/Burial Grounds	Modern	n/a	-26.68306	28.407224	IIIA	100m Buffer
067	Historical cemetery, late 19th and early 20th century, Gouws, Bekker, about 16 graves	Graves/ Burial Grounds	Historic	n/a	-26.6679	28.410266	IIIA	100m Buffer
068	IA enclosures on hill	Ruin	Iron Age	n/a	-26.662643	28.413806	IIIA	100m Buffer
069	IA enclosures	Ruin	Iron Age	n/a	-26.657033	28.405666	IIIA	100m Buffer
070	IA enclosures	Ruin	Iron Age	n/a	-26.655986	28.42854	IIIA	100m Buffer
071	Ruined historical werf, sandstone foundations	Ruin	Historic	n/a	-26.668156	28.419551	IIIC	50m Buffer
072	IA enclosure	Ruin	Iron Age	n/a	-26.668928	28.419409	IIIA	100m Buffer
075	Modipa family graves, 1990s to present, stone cairns and headstones, partially broken fence. Around 30 graves	Graves/ Burial Grounds	Modern	n/a	-26.634941	28.45496	IIIA	100m Buffer
076	Ruined hut foundations lined with stone	Ruin	Historic	n/a	-26.635024	28.455275	IIIC	50m Buffer
078	Driefontein ruins, historical	Ruin	Historic	n/a	-26.653229	28.4591	IIIC	50m Buffer
079	Driefontein werf, mostly modern buildings, some older stone walled kraals	Structure	Historic, Modern	n/a	-26.654118	28.460801	IIIC	500m Buffer
080	IA enclosure	Ruin	Iron Age	n/a	-26.655754	28.453869	IIIA	100m Buffer
081	IA enclosures	Ruin	Iron Age	n/a	-26.662841	28.458797	IIIA	100m Buffer
083	IA enclosure	Ruin	Iron Age	n/a	-26.672937	28.462625	IIIA	100m Buffer
084	Old gold mining shaft, historical	Ruin	Historic	n/a	-26.674611	28.462071	IIIA	100m Buffer
085	IA enclosures	Ruin	Iron Age	n/a	-26.676558	28.458638	IIIA	100m Buffer
086	Wildebeestfontein farmworkers' graves, about 40 marked by stone cairns, 20th c	Graves/ Burial Grounds	Historic, Modern	n/a	-26.630372	28.478703	IIIA	100m Buffer
087	IA enclosures	Ruin	Iron Age	n/a	-26.65463	28.486046	IIIA	100m Buffer

POINT ID	Description	Type	Period	Density	Co-ordinates		Grading	Mitigation
088	About 25 farmworkers' graves marked by stone cairns, 20th c.	Graves/ Burial Grounds	Modern, Historic	n/a	-26.658761	28.481473	IIIA	100m Buffer
089	Ruined sandstone historical buildings and kraal	Ruin	Historic	n/a	-26.659982	28.479951	IIIC	50m Buffer
091	Ephemeral remains of hut floors and possible grave	Ruin	Iron Age	n/a	-26.661748	28.482403	IIIA	100m Buffer
092	IA enclosures	Ruin	Iron Age	n/a	-26.666569	28.482643	IIIA	100m Buffer
094	Ntaopane family graves early 20th c. 14 graves	Graves/Burial Grounds	Historic	n/a	-26.689895	28.455334	IIIA	100m Buffer
096	Zandhoek ruins, werf, kraals, later brick ruins too	Ruin	Historic	n/a	-26.698223	28.454265	IIIC	50m Buffer
097	Zandhoek ruins, early 20th c corrugated iron roof ruin, sandstone ruins	Ruin	Historic	n/a	-26.700918	28.455601	IIIC	50m Buffer
098	Ruined sandstone building	Ruin	Historic	n/a	-26.70596	28.464307	IIIC	50m Buffer
099	Ruined werf with mostly 20th c brick buildings, one sandstone building	Ruin	Historic, Modern	n/a	-26.715055	28.471408	IIIC	50m Buffer
100	Weltevreden farm cemetery, werf 20th century	Graves/Burial Grounds	Modern, Historic	n/a	-26.701417	28.456496	IIIA	100m Buffer
102	Goosen family graves, 1890s, at least 5 graves	Graves/Burial Grounds	Historic	n/a	-26.674524	28.447016	IIIA	100m Buffer
103	Malanskraal, historical kraal. 2 sandstone ruins	Ruin	Historic	n/a	-26.672805	28.447128	IIIC	50m Buffer
104	Malanskraal historical werf, stone walled kraals, silos, Cape Revival gables on main farmhouse, corrugated iron roof	Structure	Historic, Modern	n/a	-26.667854	28.446656	IIIC	500m Buffer
105	Sandstone ruins, historical near clump of gum trees	Ruin	Historic	n/a	-26.661011	28.449313	IIIC	50m Buffer
106	Historical stone walling against outcrop	Ruin	Historic	n/a	-26.659722	28.449971	IIIC	50m Buffer

POINT ID	Description	Type	Period	Density	Co-ordinates		Grading	Mitigation
107	IA enclosures	Ruin	Iron Age	n/a	-26.658518	28.44011	IIIA	100m Buffer
108	Farmworkers' graves, over 60 here. 20th c. 1960s, 1980s	Graves/Burial Grounds	Modern, Historic	n/a	-26.67873	28.396049	IIIA	100m Buffer
109	Farmworker's grave, 1972, in road reserve	Graves/Burial Grounds	Modern	n/a	-26.719862	28.472479	IIIA	100m Buffer
110	Burial Site identified by a landowner	Graves/Burial Grounds	Historic	n/a	-26.662178	28.395526	IIIA	100m Buffer

Mapping and spatialisation of Heritage resources

The below figures illustrate all heritage resources within proximity to the PAOI.

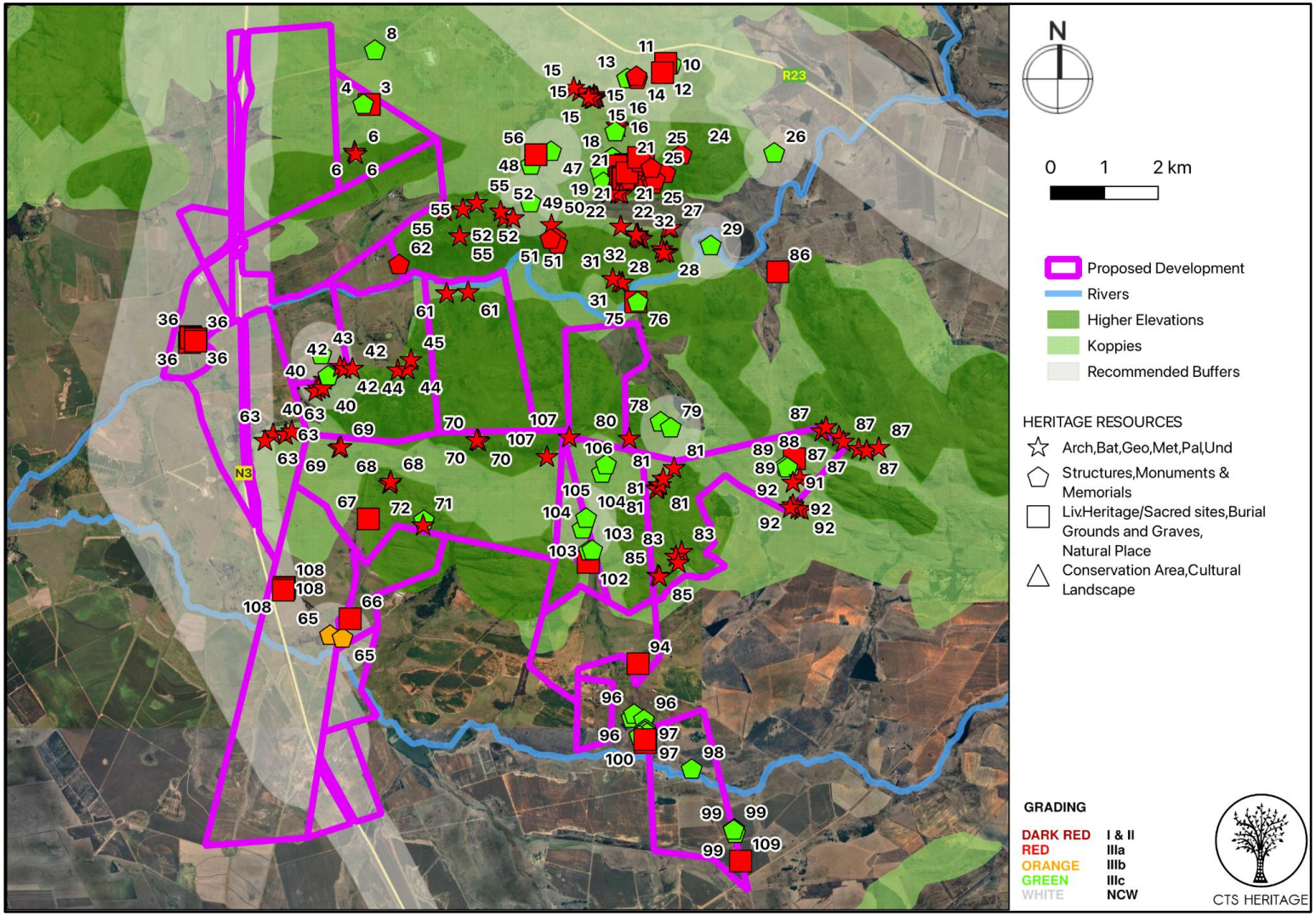

Figure 7-88 - All heritage resources within proximity to the development area

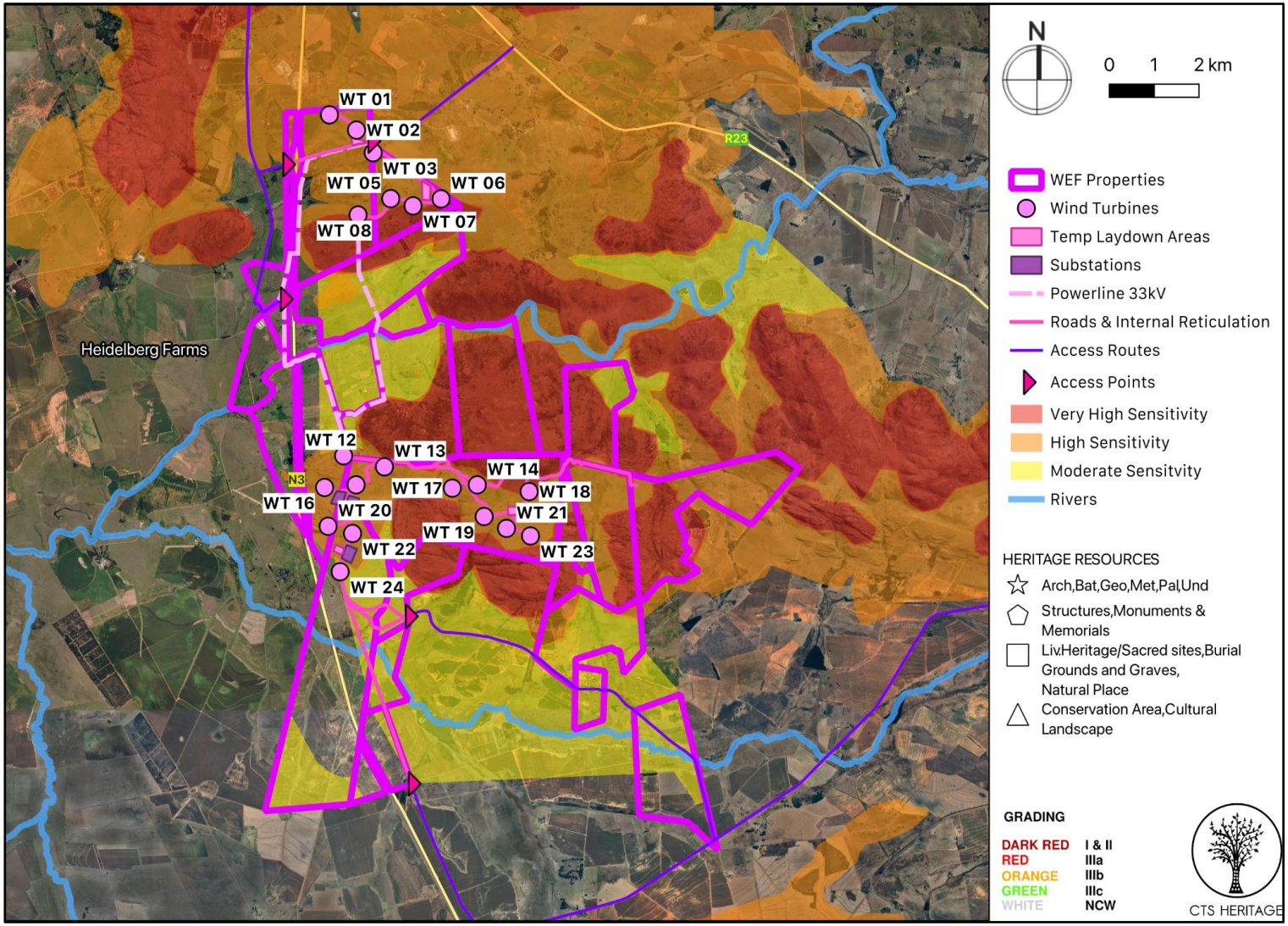

Figure 7-89 - Heritage sensitivity map of project based on the findings of the cultural heritage and archaeology assessment

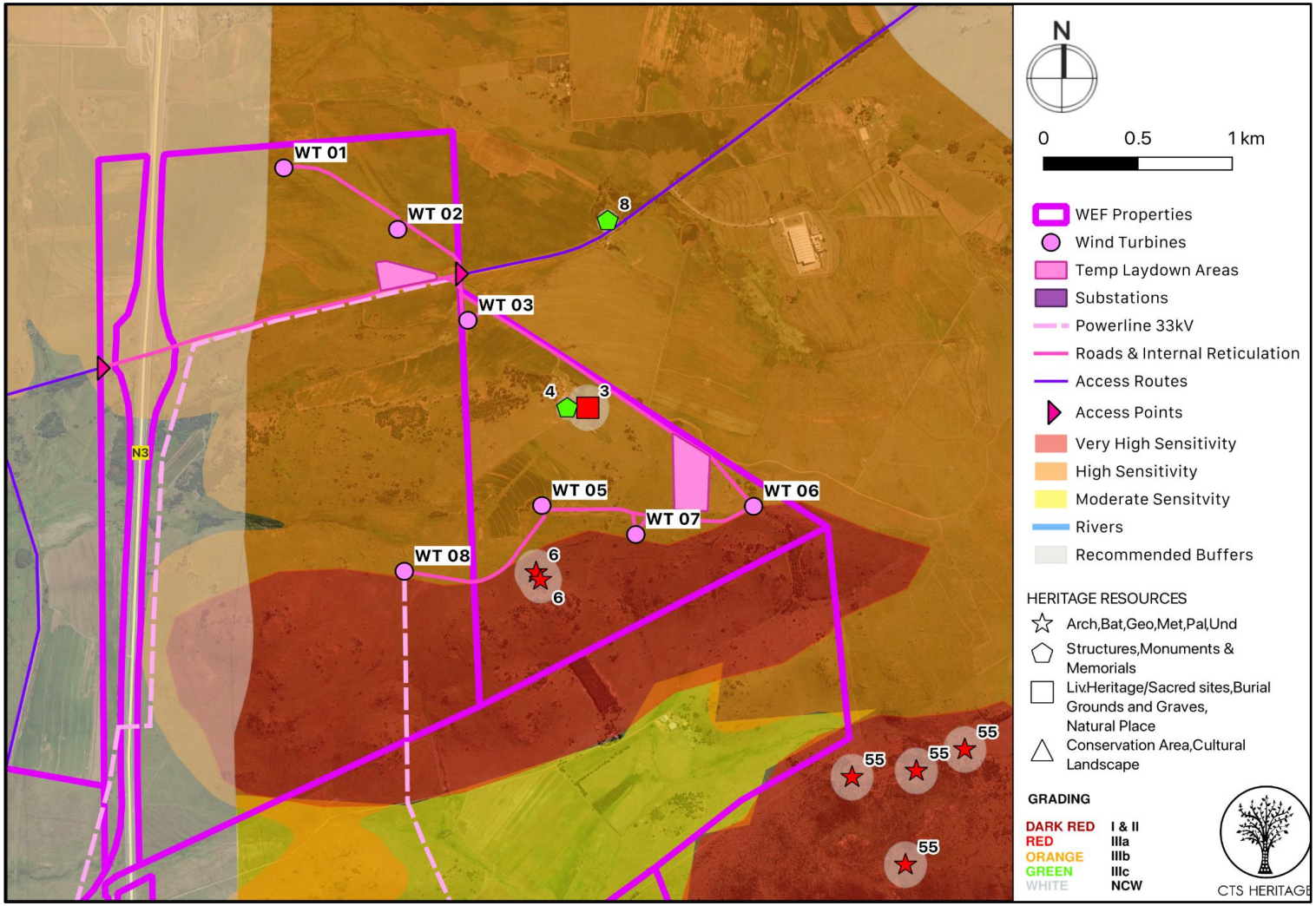

Figure 7-90 - Heritage sensitivity map of the project based on the findings of the cultural heritage and archaeology assessment with the proposed layout

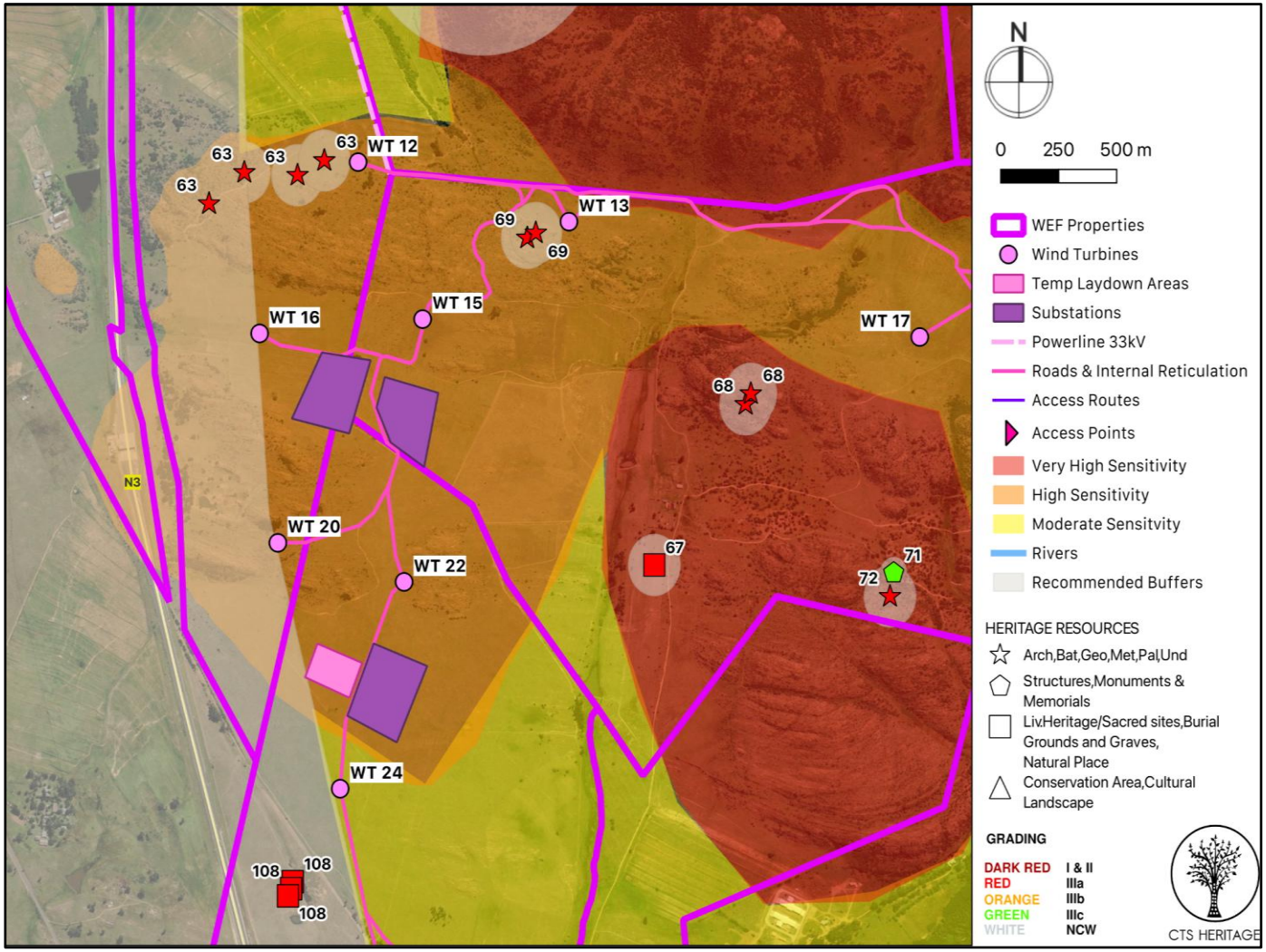

Figure 7-91 - Heritage sensitivity map of the project based on the findings of the cultural heritage and archaeology assessment with the proposed layout

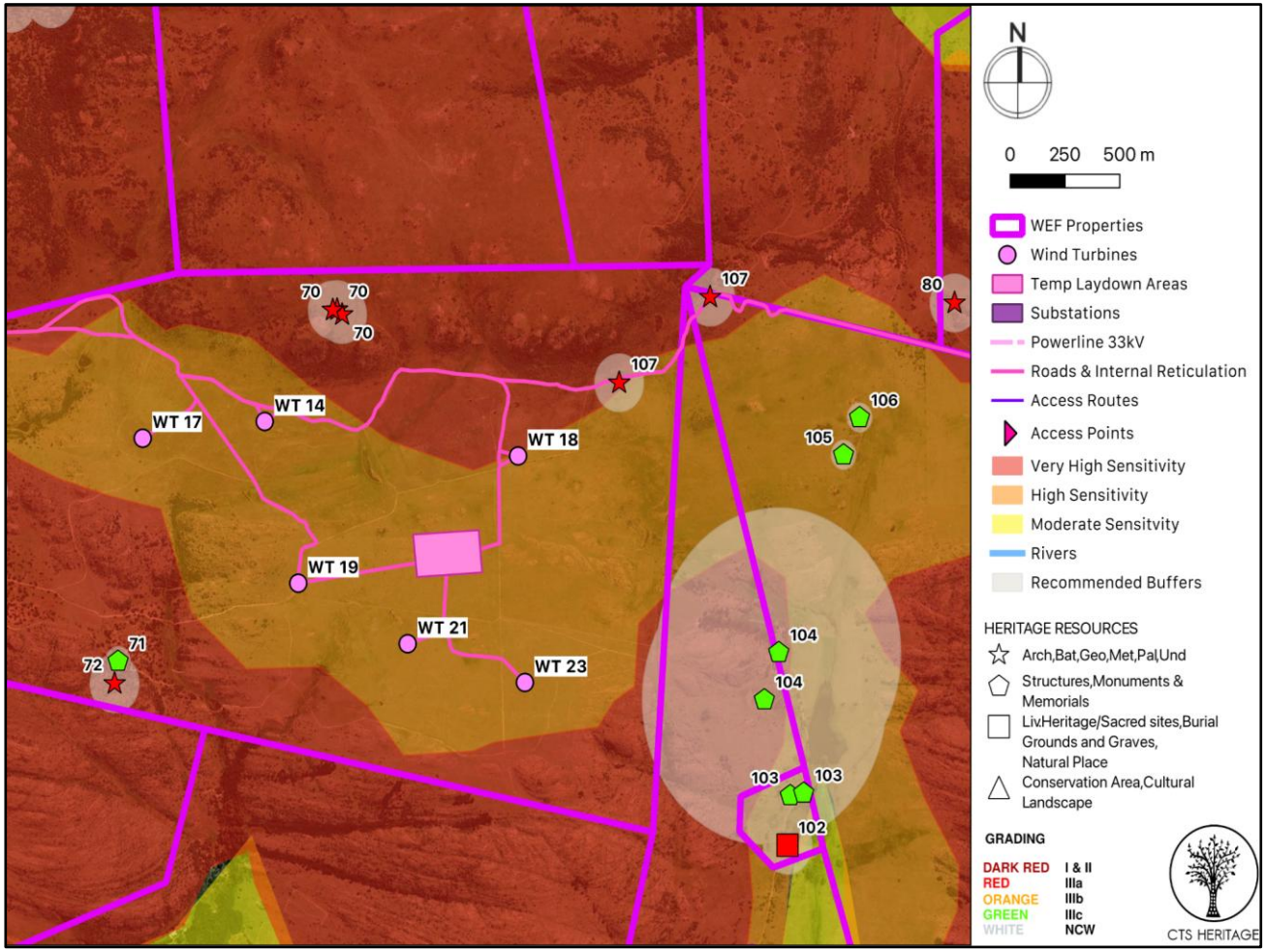

Figure 7-92 - Heritage sensitivity map of the project based on the findings of the cultural heritage and archaeology assessment with the proposed layout

7.3.2. TRAFFIC

The following is extracted from the Traffic Impact Report compiled by iWink Consulting and included as Appendix G.9.

Accessibility

The project site can be accessed via a number of existing roads and have a network of internal farm roads and paths that are proposed to be used as far as possible. The accessibility from the external roads onto/towards the site has been assessed taking into account:

- Distance to site from external road;
- No direct access from high order roads (such as the N3);
- Geometry of the external road, from which access is taken;
- Sight lines on the external road when turning into such road;
- Limit impact on communities;
- Consider possible gradients for abnormal and large haulage vehicles (i.e. avoid mountainous terrain as far as possible);
- Utilising existing farm roads or gates; and
- Upgrading requirements
- Consider road safety principles.

Even though not all the assessed access roads may eventually be chosen, the feasible ones from a traffic engineering respective have been included for the purpose of this study and shown **Figure** 7-93**:**

1. Access route 1 (in light blue): from N3 onto D1290 east and then immediately left towards the site (north) –(~15km depending on site parcel to be accessed);
2. Access route 2 (in darker blue): from N3 onto D605 west, then onto D1422 and eventually D1220 towards the site (~19km distance from N3 to site);
3. Access route 3 (orange): from N3 just north of Villiers onto the R54 west, after approximately 28km right onto the D1490 north, then right onto R234/1 towards the site; alternatively, construction vehicles arriving via the R549 will turn into P243/1 towards the site (shown in light orange) – (~55 km from N3 to site);
4. Access route 4 (in light green): turning north of the site from the N3 onto the R23 west and after approximately 14km onto D1177 towards the site (~21 km from the N3 to site); and
5. Access route 5 (in dark green): from N3 onto R23 west and immediately left onto D1220 towards the site

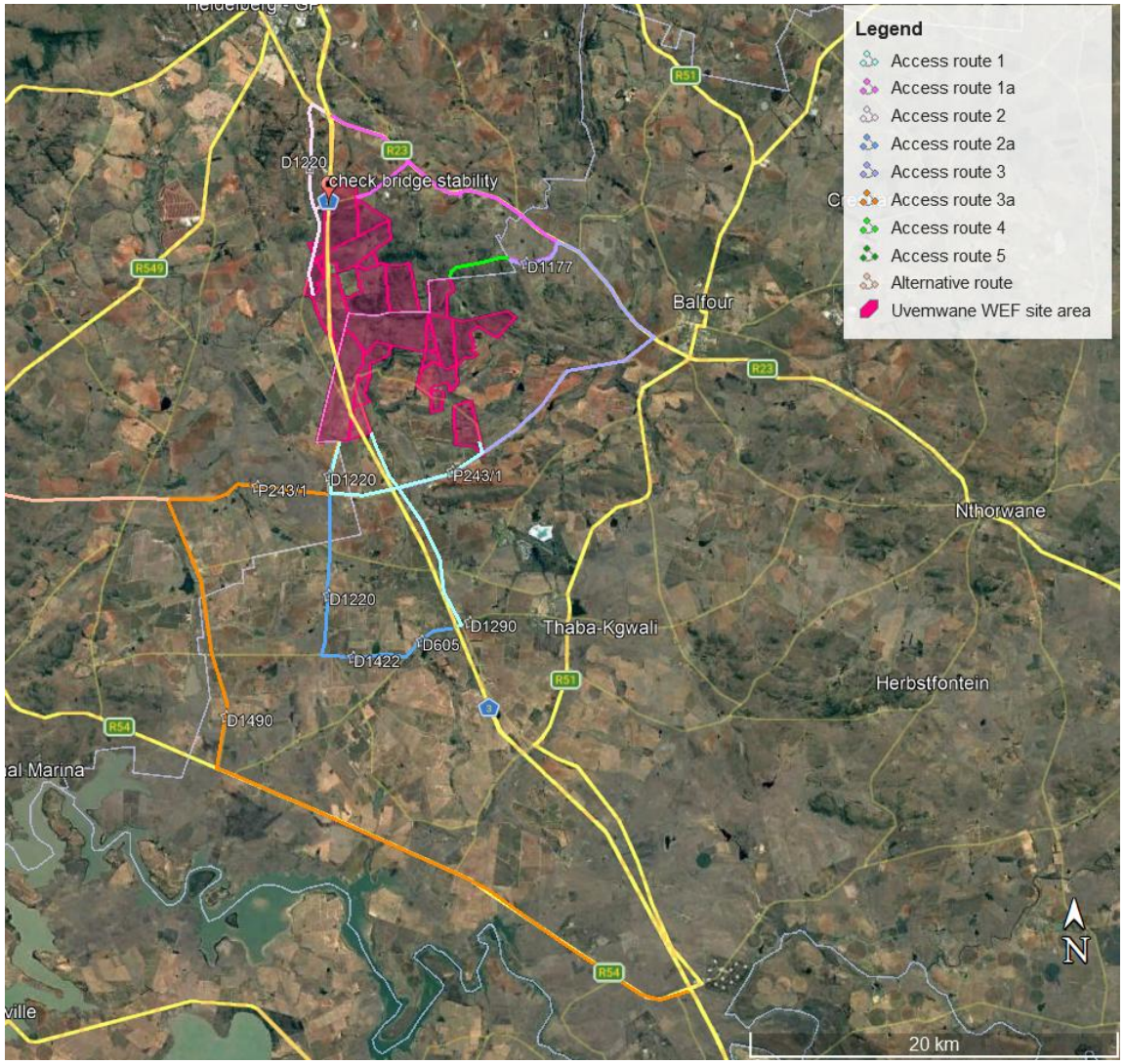

Figure 7-93 - Aerial view of assessed access routes

Sight distances

As some of the roads will be under the jurisdiction of SANRAL (i.e., N3, R23), while other will be provincial and municipal roads (i.e., R243/1, R549), the *SANRAL Geometric Design Guidelines as well the TRH17 Guidelines for the Geometric Design of Rural Roads* were taken into consideration when establishing the required sight distances.

SANRAL Geometric Guideline

As per Section 3.5.1 of the SANRAL guideline, the Intersection Sight Distance allows a driver on a minor or access road to evaluate whether it is safe to enter the opposing traffic of the intersecting road. Table 3.5 in these guidelines shows a required sight distance of 200 m for a speed limit of 100km/h (see **Figure 7-94**).

Table 3.5: Recommended stopping sight distances for design

Design Speed (km/h)	Stopping Sight Distance (m)		
	Calculated	Recommended for Design	Green Book 2000
30	32,5	35	35
40	48,6	50	50
50	67,2	70	65
60	88,4	90	85
70	112,3	110	105
80	138,7	140	130
90	167,8	170	160
100	199,4	200	185
110	233,6	230	220
120	270,5	270	250
130	309,9	310	285

Figure 7-94 - Recommended Stopping Sight Distances as per SANRAL Geometric Design Guideline

However, in accordance with Figure 2.5.5(a) of the TRH17 Guidelines for the Geometric Design of Rural Roads, the Shoulder sight distance for a stop-controlled condition on a road with a speed limit of 100 km/h, needs to be a minimum of 420 m for the largest vehicle (from 5m set back at access in each direction of the road) (see **Figure 7-95**). For the purpose of this study, the 500m sight distance was used to determine if the sight lines at the access points are acceptable.

For a conservative approach, the 420m sight distance was used to determine whether the sight lines are sufficient along the assessed access routes.

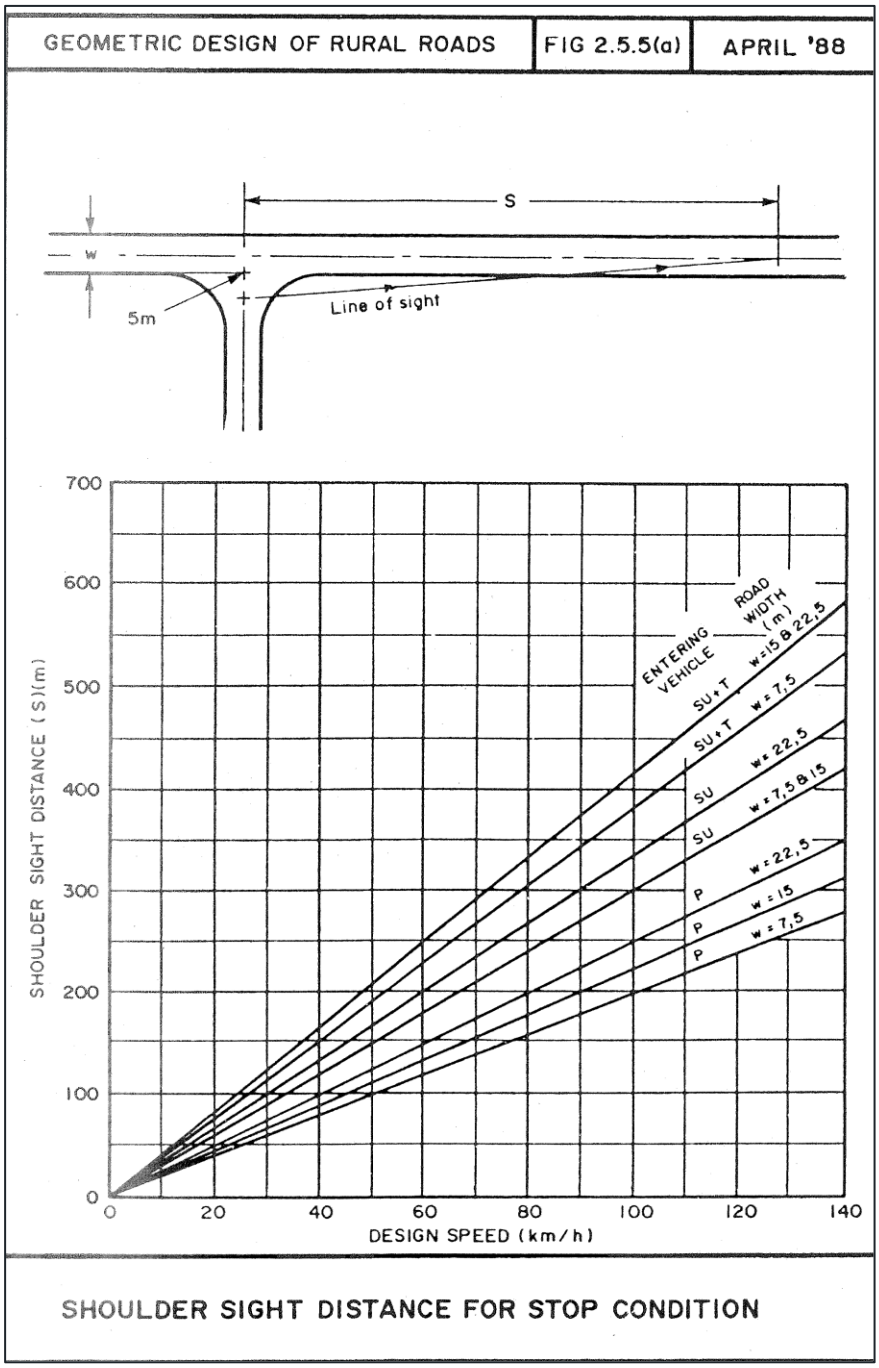

Figure 7-95 - Shoulder Sight Distances as per TRH17 Guidelines

Access route 1

Access route 1 turns off of the N3 at its connection with the R243/1 (see **Figure 7-96**). This route follows an existing gravel road, which may be widened at some locations (see **Figure 7-97** and **Figure 7-98**). The required sight distances of 420 m are met in both directions for vehicle accessing the P243/1 (northern and southern direction) when turning from the Access into the P243/1.

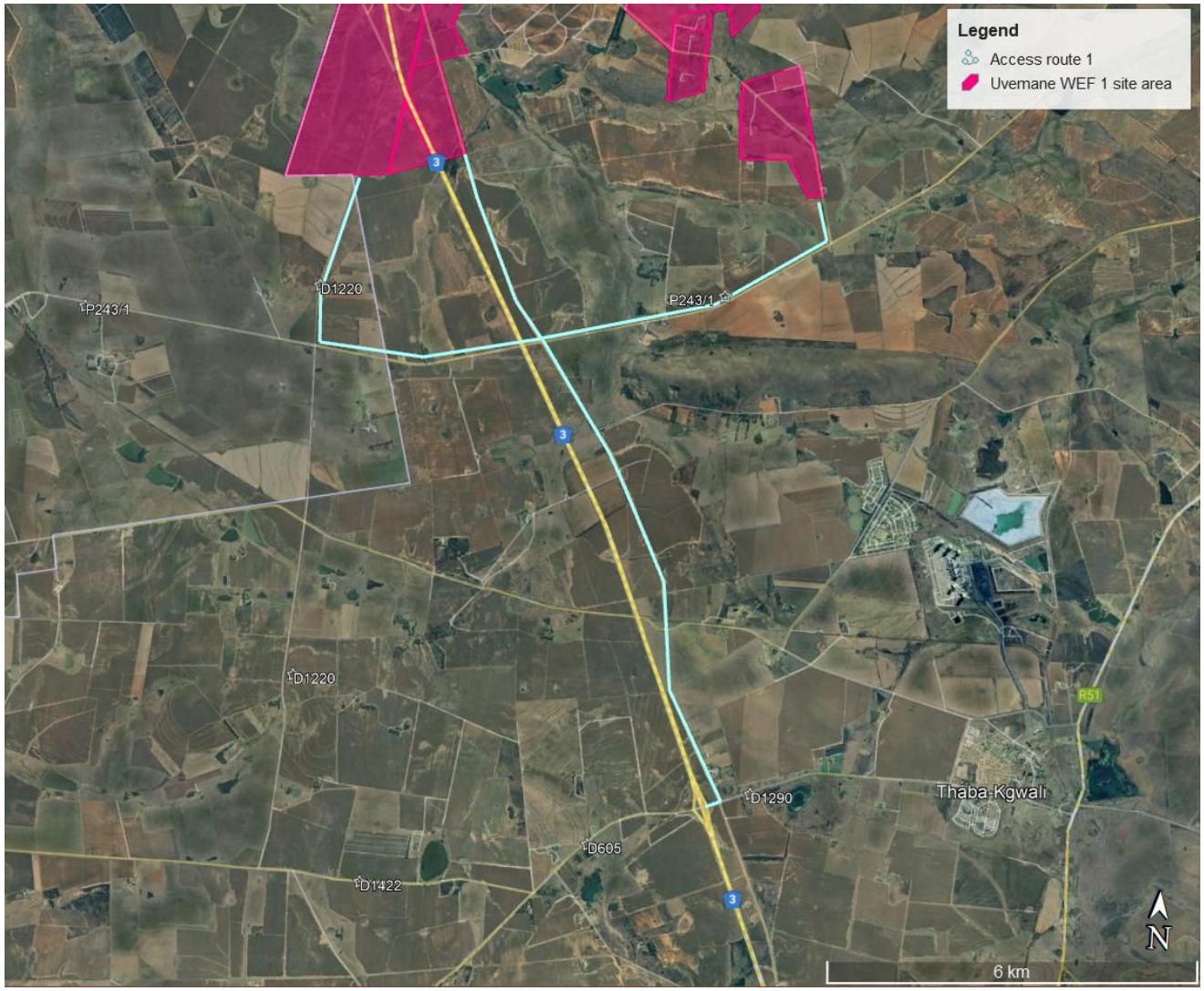

Figure 7-96 - Aerial overview of Access route 1

This access route is supported from a traffic engineering perspective, provided that the turns along this route are wide enough for large haulage and construction vehicles to navigate. Any vegetation obstructing light lines for vehicles turning from one road into another will need to be cut back. This route will provide access to development parcels on both sides of the N3.

Figure 7-97 - Aerial View of intersection P243/1 and farm road

Figure 7-98 - View from P243/1 to Farm road toward the project site

Access route 2

An alternative access route to reach the portion of the project site being located on the western side of the N3 is Access route 2 (**Figure 7-99**). This route exits the N3 at its connection with the D1422 and approaches the western parcel of the project site via the D1220

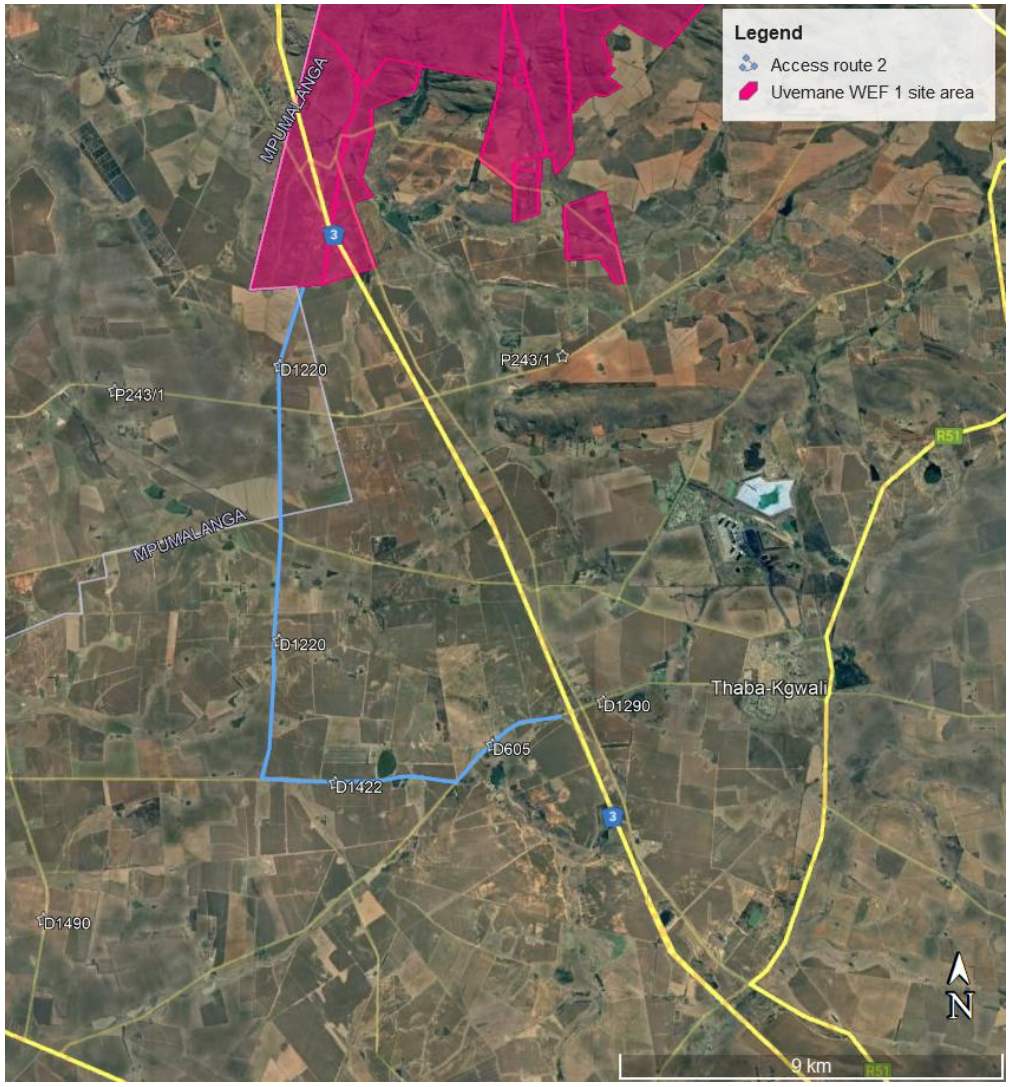

Figure 7-99 - Aerial View of Access route 2

This route is gravel surfaced and may require some upgrading (i.e. widening, grading), specifically at the two turning points shown with red circles in **Figure 7-100**. Sight distances are met as both turns, and this route would provide an alternative to access route 1 for the western portion of the project site. Provided that the route has been upgraded to accommodate all construction vehicles safely, it is supported from a traffic engineering perspective.

Figure 7-100 - Aerial view of intersections of D1422/D605 and D1422/D1220

Access point 3

This access route has been included into the study, should there be any limitations traveling on the N3 to site from a southern direction. This route follows the R54 south of the project site for approximately 28 km before turning right into the D1490, after around 15 km right again into the P243/1 and eventually left into the D1220 towards the site (see **Figure 7-101** and **Figure 7-102**).

Sight distances at the intersections, shown in the Figure with circles, are acceptable. Any sight limiting vegetation will need to be cut back.

Provided that this route has been upgraded, where required, to accommodate all construction vehicles safely, it is supported from a traffic engineering perspective

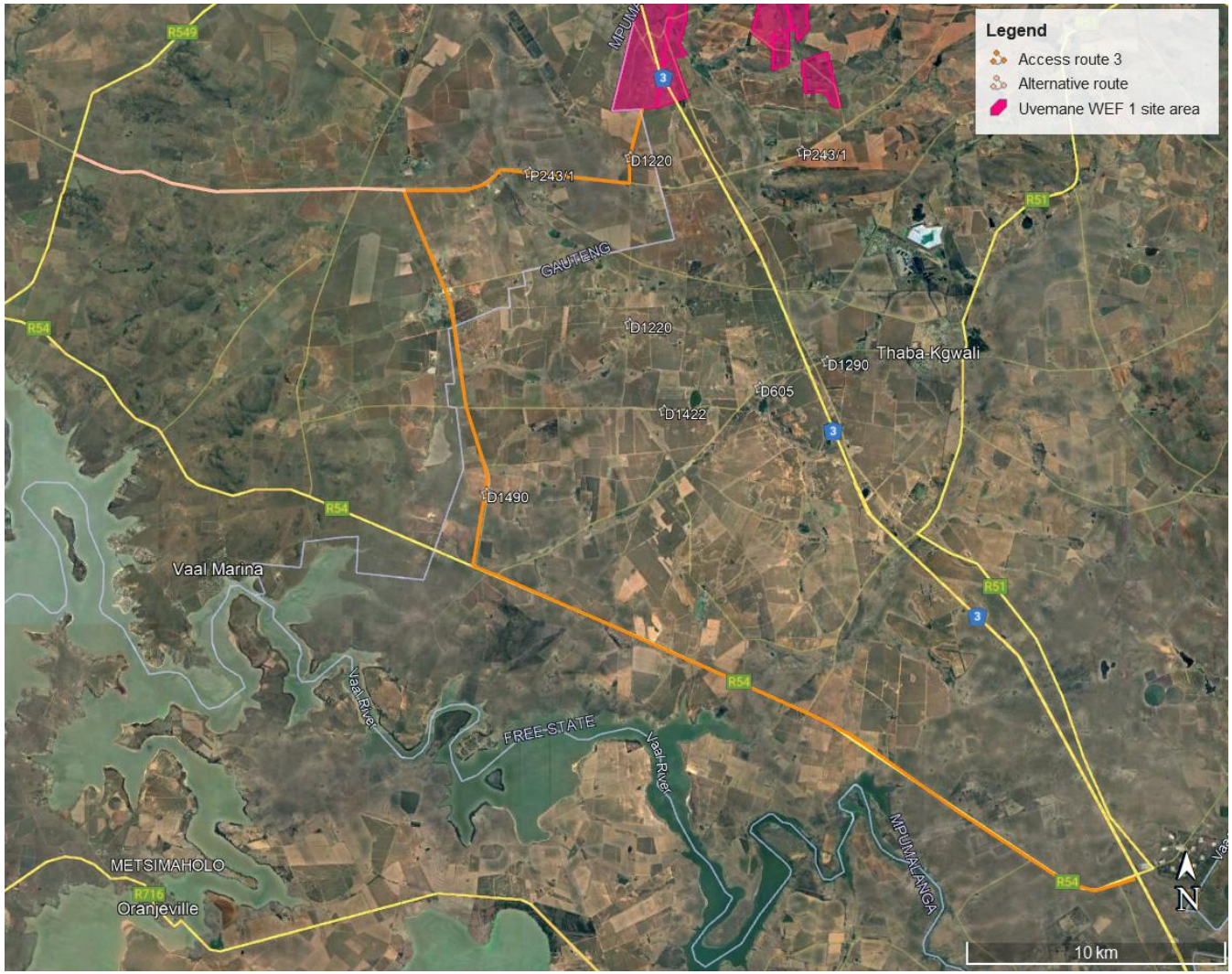

Figure 7-101 - Aerial View of Access route 3

Figure 7-102 - View of existing access road (D1220) on P243/1

Access route 4 and 5

Access route 4 and 5 would cater for construction vehicles arriving at the project site from a northern direction on the N3 (see **Figure 7-103**) with:

- Access route 4 providing access to the northern part of the project via the R23 and then D1177; and
- Access route 5 providing access to the small parcel located on the western side of the N3 via the R23 and D1220.

The required sight distances are met at the intersection along the routes (see **Figure 7-103**). Both access routes are suitable from a traffic engineering perspective, provided that the necessary upgrades along the routes will be implemented to ensure that construction vehicles can safely navigate the roads.

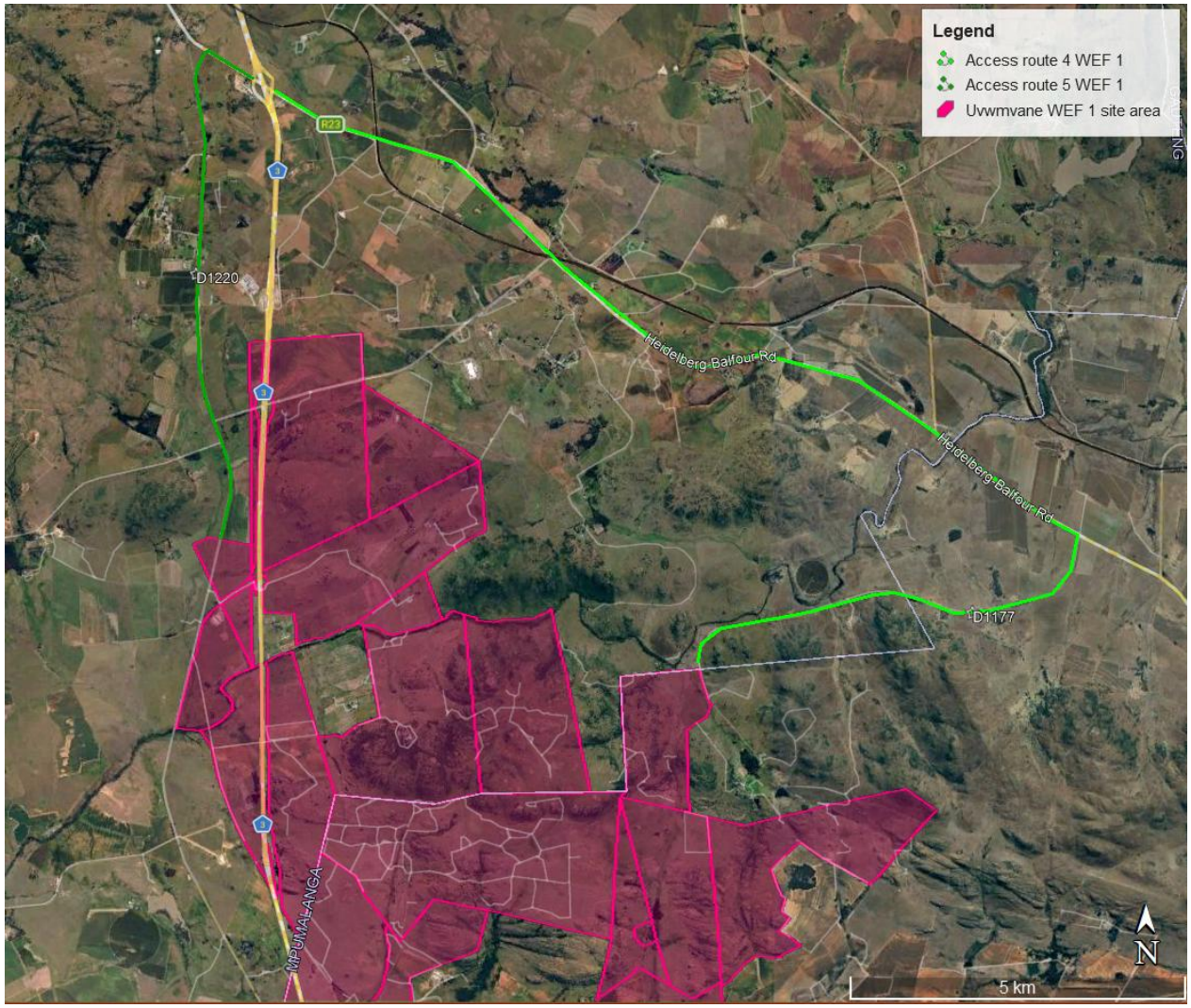

Figure 7-103 - Aerial View of Access routes 4 (light green) and 5 (dark green)

7.3.2.1 General

The following general comments are made regarding accessibility:

- All access routes assessed are suitable in principle. However, some will require more upgrading than others. The preferred number of accesses by the client is currently unknown. However, taking into account the dimension of the proposed project, it is recommended to provide several accesses during the construction period to avoid congestion.
- The exact upgrades necessary will be established at detail design stage.
- It needs to be ensured that no road signage or other road furniture obstruct turning movements and that the lifting of any existing overhead lines for the accommodation of large and abnormal vehicles need to be communicated to the respective service provider and reinstated after delivery.
- The direct site access points onto the site should be security controlled with security staff to be stationed on site and at the site access(es) during the construction phase.
- Temporary road markings and signage need to be erected on the external roads of the eventually chosen access routes to alert drivers of heavy construction vehicles turning in and out of side roads. The signage needs to be in accordance with the South African Road Traffic Signs Manual (SARTSM).

7.3.2.2 Internal Roads

The geometric design and layout for the internal roads from the site access need to be established at detailed design stage. Existing structures and services, such as drainage structures, signage, street lighting and pipelines will need to be evaluated if impacting on the roads. It needs to be ensured that gravel sections remain in good condition and will need to be maintained during the additional loading of the construction phase and then reinstated after construction is completed.

Preferably, the internal roads need to be designed with smooth, relatively flat gradients (recommended to be no more than 8%) to allow a larger transport load vehicle to ascend to the respective laydown areas.

7.3.2.3 Transportation of Materials, Plant and People to the proposed site

It is assumed that the materials, plant, and workers will be sourced from the surrounding towns as far as possible.

7.3.2.4 Public Transport and Non-Motorised Transport

In terms of the National Land Transport Act (NLTA) (Act No.5 of 2009), the assessment of available public transport services is included in this report. The following comments are relevant in respect to the public transport availability for the proposed development.

It is expected that Non-Motorised Transportation (NMT) is an important mode of transportation, together with private cars and minibus/taxis. Currently, there are no known future planned public transport facilities in the vicinity of the site. However, it is expected that the appointed contractor of a large-scale project, such as many renewable energy projects, will provide shuttle buses or similar to pick up and drop off workers at predetermined locations during the construction phase.

7.3.3. VISUAL

The following is extracted from the Visual Impact Assessment Scoping Report compiled by LOGIS and is included as Appendix G.7.

7.3.3.1 Topography

The study area, as per the extent of the maps below encompassing the proposed development site / WEF site boundary, occurs on land that ranges in elevation from approximately 1450m above sea level (a.s.l.) along the drainage lines and water courses (i.e. Suikerbosrant, Blesbokspruit, etc.) occurring in this area, to 1925m a.s.l. on the top of the hills associated within the Suikerbosrand Nature Reserve to the northwest of the site. The topography or terrain morphology of the region is broadly described as comprising of hill slopes and valleys with gentle to moderately undulating landscapes on the highveld plateau.

The development site itself is located on land with an average elevation of between approximately 1525m – 1820 a.s.l, it contains representations of both the undulating valley landscapes as well as the hills associated with the study area. Refer to **Figure 7-112** for the shaded relief/topography map of the study area.

Figure 7-104 - General topography of the site and study area

7.3.3.2 Land cover and land use

The region has a largely rural character, interspersed with commercial agricultural activities (i.e. dryland, irrigated and livestock production activities), scattered human settlements and numerous protected areas. Settlements closest to the site are the town of Heidelberg to the northwest and Balfour to the east. Formal agricultural activities are mostly associated with the watercourses of the region including the Suikerbosrant and Blesbokspruit Rivers.

Figure 7-105 - Rural character of the study area interspersed with commercial agricultural

The natural vegetation or land cover types of the region are described as Grassland interspersed with scattered areas of wetlands and includes small pockets of dense woodland, open woodland and exotic plantations (Refer to **Figure 7-113**).

Figure 7-106 - land use and land cover occurring within the study area

Several prominent rivers and hydrological features occur within the study area. These include numerous wetlands, farm dams, numerous perennial spruits scattered throughout the study area including the Suikerbosrant and Blesbokspruit Rivers located in the northern portion of the study area, as well as the Vaal Dam to the southwest.

Figure 7-107 - Scattered homesteads and settlements found in and around the site

The study area is densely populated to the north in the Gauteng Province with a population density of 67 people per km^2, however the more south you travel towards the Mpumalanga Province the study area is less populated with a population density of 16 people per km^2 within

the local municipality. The most populated areas within the study area are the towns of Heidelberg and Nigel to the north, as well as Balfour and Grootvlei to a lesser extent located southeast of the site. Outside of these areas, there are isolated homesteads and scattered settlements throughout the study area. The study area particularly located south of Heidelberg and around the site itself is a known wedding venue and tourist destination.

The inhabited status of all homesteads within the proposed development site has been verified via a combination of desktop and on-site verification methods. It stands to reason that farmsteads that are not currently inhabited will not be visually impacted upon at present and have therefore been removed as potential sensitive receptors within this report. However, it must be noted that these farmsteads do retain the potential to be affected visually should they ever become inhabited again in the future.

Access to the sites is via a network of national, arterial and secondary roads that branch off of either the national N3 to the west, or the arterial R103 to the west and the R23 to the east. The N3 is a national route in South Africa that connects Johannesburg and Durban, respectively South Africa's largest and third-largest cities. Johannesburg is the financial and commercial heartland of South Africa, while Durban is South Africa's key port and one of the busiest ports in the Southern Hemisphere. It is also a popular holiday destination. As a result, the N3 is a very busy highway that transports a high volume of traffic especially during peak holiday times[16]. The N3 Toll Route Agency confirms that volumes can spike up to 2000-3500 vehicles per hour on peak days and that high (heavy) constitutes 1500 vehicles per hour in a particular direction[17].

Figure 7-108 - Looking over the site from the R23

[16] Source: https://en.wikipedia.org/wiki/N3_(South_Africa)
[17] Source: http://www.n3tc.co.za/n3-toll-route-traffic-and-crash-data-provide-numerous-safety-clues/#:~:text=Traffic%20forecasts,per%20hour%20on%20peak%20days.

Figure 7-109 - View over the site from the R103

Other industrial infrastructure within the study area includes existing high voltage powerlines scattered throughout the study area, as well as numerous associated substations.

Figure 7-110 - Existing power lines within the study area

There are numerous protected areas scattered throughout the study area[18], located predominately in the northern and southern portions of the study area. None of the protected areas are found within the proposed development site itself. The closest protected areas are the Alice Glockner and Suikerbosrand Nature Reserves, which are located approximately 5.1km and 12.3km respectively, to the northwest of the site. The study area is also a popular tourist and wedding destination. Refer to **Figure 7-112** for the locations of the protected areas within the study area relative to the proposed development site.

The greater environment with its wide open, predominately rural agricultural and undeveloped landscapes is considered to have a moderate to high visual quality.

Refer to Map 3 and Map 4 of the specialist study report for the location of the images taken during the site visit and the location of the images relative to the site used within the report.

[18] The study area is defined as the extent of the maps outlined in this report, encompassing the proposed development site or WEF Site Boundary.

Figure 7-111 - Moderate to high visual quality of the study area

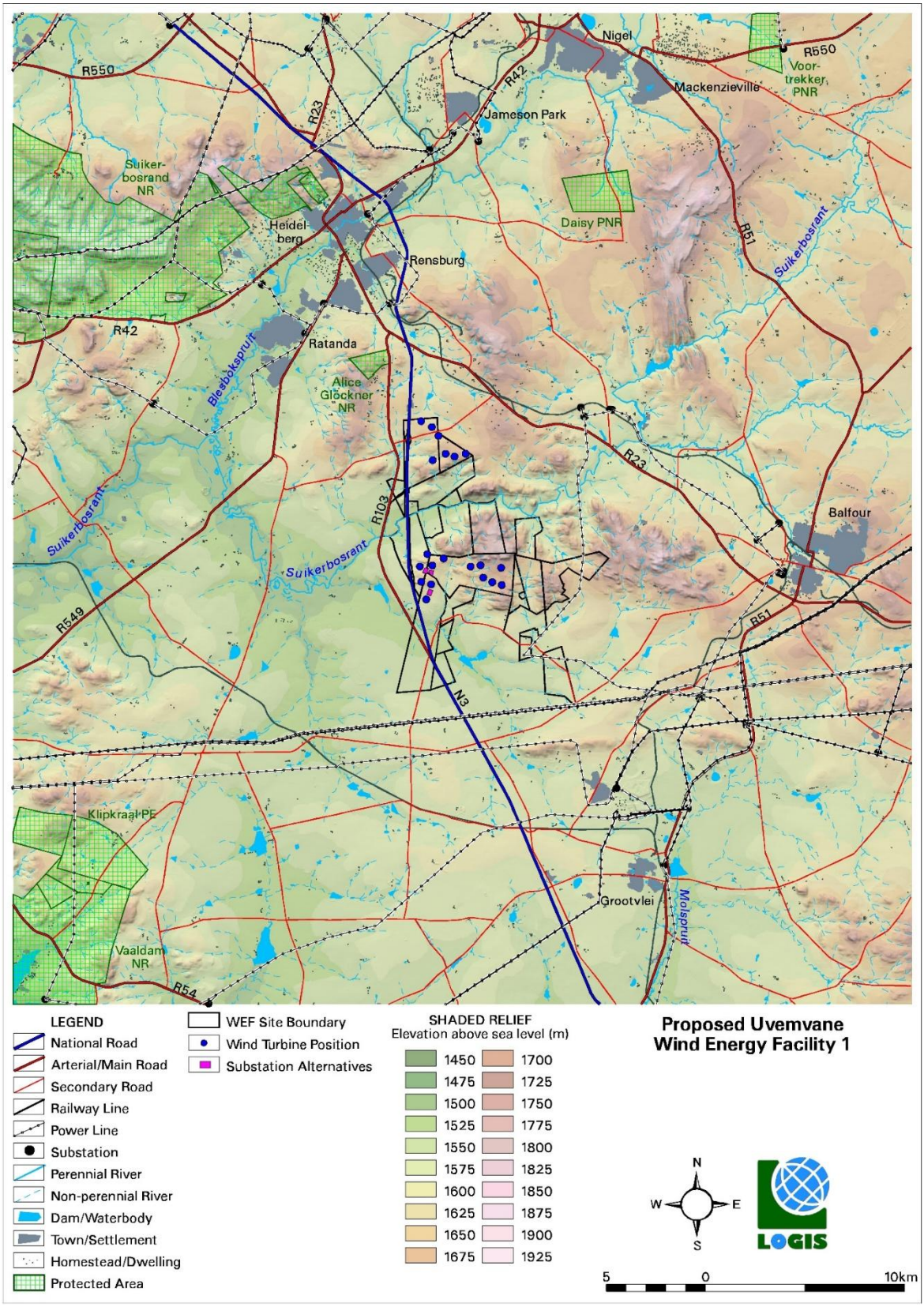

Figure 7-112 - Shaded relief map of the study area

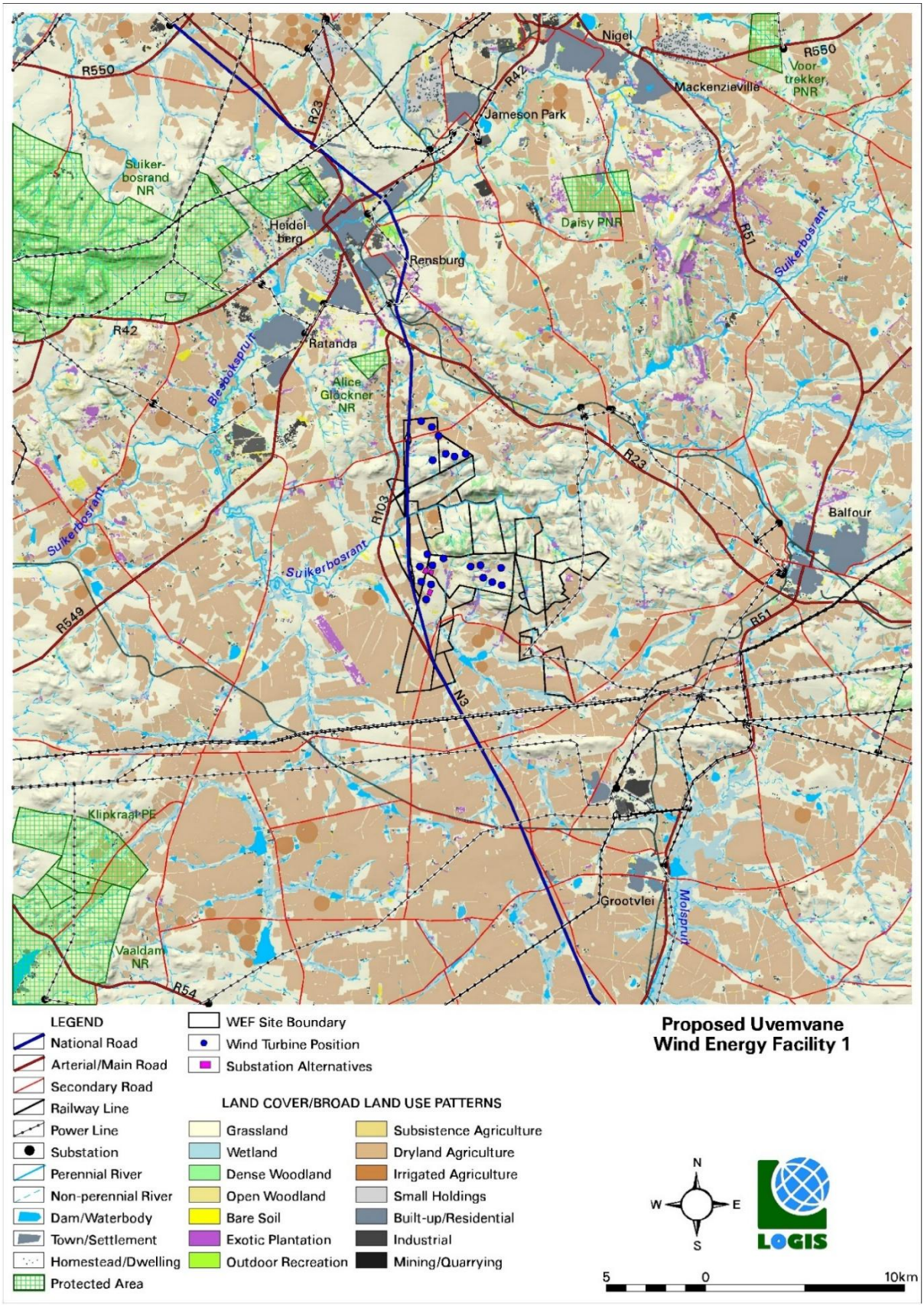

Figure 7-113 - Land cover/ broad land use patterns within the study area

7.3.3.3 Visual disturbance and observer proximity

Proximity offsets (the radial distance between the proposed development and the identified visual receptors) were determined based on the anticipated visual experience of the observer over varying distances.

These proximity offsets are based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger facilities and downwards for smaller facilities (i.e. depending on the size and nature of the proposed infrastructure). This rationale was developed in the absence of any known and/or acceptable standards for South African WEFs. Therefore, for the purpose of this study, proximity offsets have been calculated from the expected boundary of the site, as indicated on **Figure 7-115** and as follows:

0 – 5 km. Short distance view where the facility would dominate the frame of vision and constitute a very high visual prominence.
5 – 10 km. Short to medium distance view where the structures would be easily and comfortably visible and constitute a high to moderate visual prominence.
10 – 20 km. Medium to long distance view where the facility would become part of the visual environment but would still be visible and recognisable. This zone constitutes a moderate visual prominence.
20 km. Long distance view of the facility where the structures are not expected to be immediately visible and not easily recognisable. This zone constitutes a lower visual prominence for the facility.

The figure below helps to place the above explanations in context, illustrating what scale a turbine structure will be perceived at different viewing distances.

Figure 7-114 - Schematic representation of a wind turbine from 1, 2, 5 and 10km under perfect viewing conditions

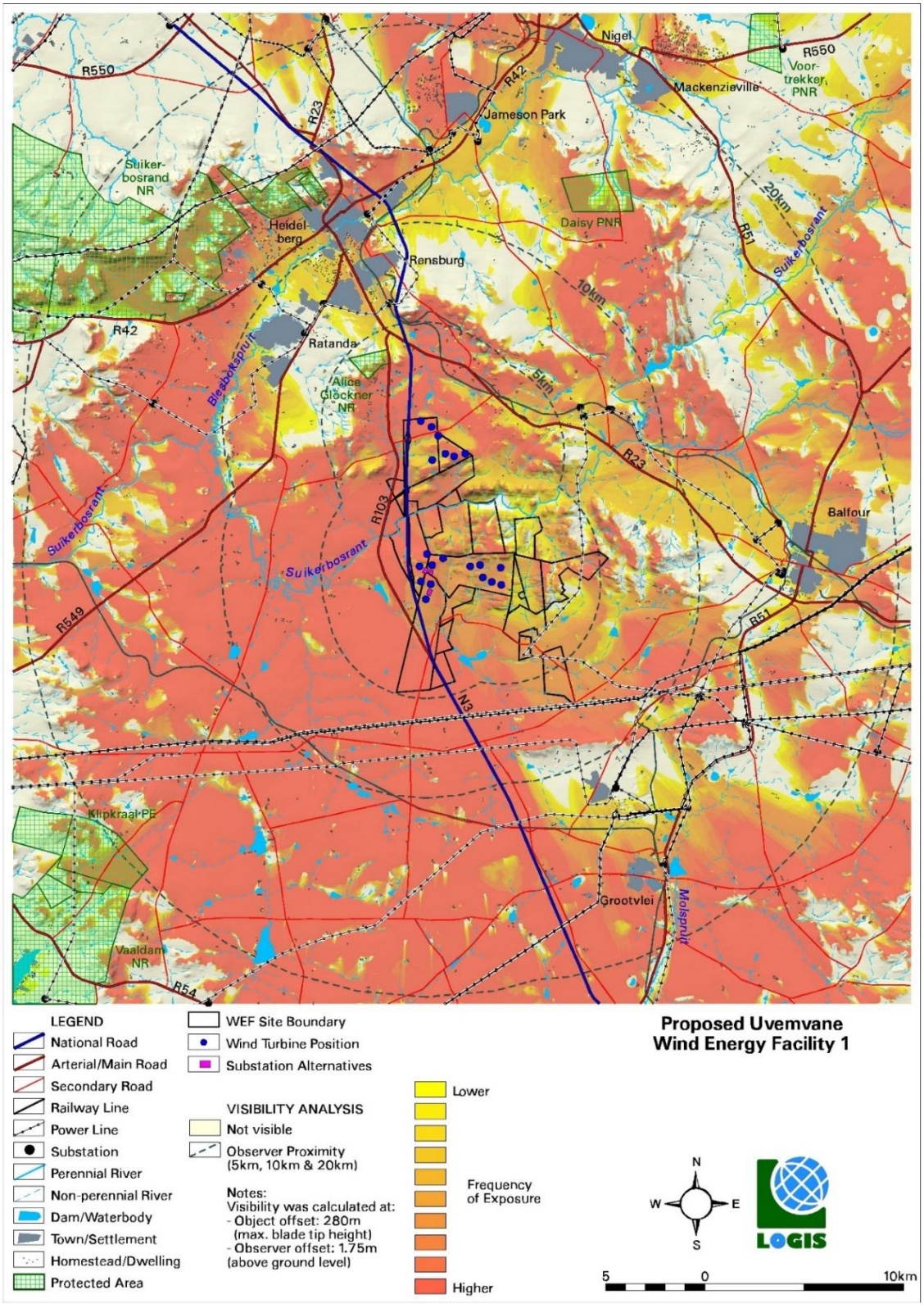

Figure 7-115 - Viewshed analysis of the proposed project, indicating the frequency of visual exposure

7.3.3.4 Viewer incidence / viewer perception and sensitivity

To aid in assessing the overall viewer sensitivity, visual receptors have been graded according to their sensitivity to changes in the landscape as per the table below:

Table 7-43 – Visual receptor sensitivity

Visual receptor sensitivity	Description
Very High	Occupiers of residential properties within a very short to medium distance to the proposed development (0-10 km)
	Guest houses, lodges, other tourist accommodation within a very short to medium distance to the proposed development (0-10 km)
	Users/visitors to outdoor recreational facilities/ areas including protected areas, private nature reserves, and nature-based recreational activities- walking, cycling, hiking, horse-riding, swimming etc where their attention or interest is focussed on the landscape
High	Communities where views contribute to the landscape setting enjoyed by residents
	Visitors to identified heritage sites and cultural landscapes or other attractions where views of surroundings are an important contributor to the cultural experience
	Guest houses, lodges, other tourist accommodation within a medium to long distance to the proposed development (>10 km)
	Road users in motor vehicles along scenic routes where the primary focus is the landscape
Moderate	Occupiers of residential properties within medium to long distance from the proposed development (>10 km)
	Outdoor recreation users where the focus is primarily on the activity and the landscape/views are secondary and not the focus i.e. sporting activities
	Road users in motor vehicles travelling through or past the affected landscape on provincial/secondary roads where views are transitory and fleeting.
Low	People at their place of work
	Road users in motor vehicles travelling through or past the affected landscape on major/national roads where views are fleeting
Negligible	No receptors present

Viewer incidence is highest along the public roads within the study area (N3, R103, R23 and various secondary roads). Travellers using these roads may be negatively impacted upon by visual exposure to the WEF. Additional sensitive visual receptors are located at the farm residences (homesteads) throughout the study area. It is expected that the viewer's perception, unless the observer is associated with (or supportive of) the WEF, would generally be negative.

7.3.3.5 Landscape quality

Sensitivity of the landscape character is intrinsically linked to its ability to absorb change.

Table 7-44 - Landscape character sensitivity

Landscape character sensitivity	Description
Very High	The landscape character is such that its capacity to accommodate change is very low such as, formally protected landscapes inclusive of National Parks, Nature Reserves etc. where the management objective is protection of the existing character. This also applies to non-designated landscapes of similar character and quality where the condition of the landscape is natural in state with little to no development or transformation.
High	The landscape character is such that it has limited/low capacity to accommodate change such as informal conservation areas not formally proclaimed i.e. Private Nature Reserves, Game Farms, areas identified in the Protected Area Expansion Strategy. The condition of the landscape is largely natural in state with little development or transformation.
Moderate	The landscape character is such that there is some capacity for change. This includes the urban edge which consists of a mixture of land uses (residential, recreational facilities and farming) and rural countryside. These landscapes may be recognized at a local (municipal) planning/policy level. The condition of the landscape is somewhat natural with a fair amount of built infrastructure and transformation.
Low	The character is such that it has capacity for change and where development would not result in a significant change or alternatively would have a positive impact. This includes the urban edge and rural countryside where these landscapes are not recognized at a local (municipal) planning/policy level. The condition of the landscape is largely transformed with a high level of built infrastructure.
Negligible	The character is such that its capacity to accommodate change is high and where development would make no significant change or would make a positive impact i.e. landscapes with little to no natural environment remaining i.e. urban areas, industrial and mining lands.

	The landscape often exhibits negative character and no longer holds any natural value.

The study area is considered to have a moderate landscape quality based on its location within the urban edge and mixture of land uses. The condition of the landscape is somewhat natural with a fair amount of built infrastructure and transformation; the landscape character is such that there is some capacity for change.

7.3.3.6 Visual absorption capacity

Visual Absorption Capacity (VAC) is the capacity of the receiving environment to absorb the potential visual impact of the proposed development

The land cover within the study area consists primarily of low mountains and undulating plains with very flat extensive areas covered mostly by grasslands interspersed with scattered areas of agriculture throughout the study area. Therefore, the VAC of the receiving environment of the proposed project is deemed to be low to moderate owing to the low growing vegetation grassland vegetation. However, the undulating and hilly topography aids in reducing the potential visual exposure to some degree as some receptors may experience a moderate VAC depending on where in the study area the receiver is located relative to a topographical feature of elevation at that specific location.

7.3.3.7 Potential visual exposure

The result of the viewshed analyses for the proposed ABO Uvemvane WEF 1 is shown on **Figure 7-115** that follows.

The analysis has been undertaken from each proposed turbine position as indicated within the proposed development area of the project in order to determine the general visual exposure (visibility) of the area under investigation. It is expected, from a visual impact perspective, that the wind turbines themselves would constitute the highest potential visual impact of the WEF, therefore, the viewshed analysis for the facility was undertaken at an offset height of maximum 300m above average ground level (i.e. the approximate maximum blade tip height of the turbines).

The result of the viewshed analysis displays the potential areas of visual exposure. Land that is more elevated is typically more exposed to the proposed WEF, whilst lower lying areas such as valleys are shielded, or not as exposed.

It must be noted that the viewshed analysis does not include the effect of vegetation cover or existing structures on the exposure of the proposed wind turbines, therefore signifying a worst-case scenario.

Figure 7-116 indicates areas from which the proposed project could potentially be visible, as well as proximity offsets (5km, 10km and 20km) from the proposed development area. Typically, structures of this height (i.e. 300m) may be visible from up to 20km away. In this respect, the anticipated Zone of Visual Influence for this facility as calculated from the development footprint (i.e. determined from the edge of the proposed development areas) has been indicated at 20km. The extent of visual exposure within this zone is expected to be very high.

The following is an overview of the findings of the viewshed of the proposed project, based on the layout illustrated on the Map provided:

0 – 5km

The proposed facility will have a large core area of potential visual exposure on the project site itself, and within a 5km radius thereof. Small pockets of visually screened areas can be found to the far east and northwestern portions of this zone.

Potential sensitive visual receptors within this visually exposed zone include residents of numerous scattered homesteads/farmsteads, and tourist accommodations, as well as visitors to portion of the Alice Glockner Nature Reserve. This zone also contains various roads, namely the N3 national road, the R23 and R103 regional roads, as well as various secondary roads, which are located adjacent to or traverse the site. Observers travelling along these roads will similarly be exposed to the WEF infrastructure.

5 – 10km

Potential visual exposure is still fairly concentrated within this zone though it does become slightly more scattered (i.e. between 5 and 10km). Visually screened areas can be found in the northern, southeastern and northwestern portions of this zone. These screened areas are mostly associated with the screening effects of the hilly topography. Visual exposure and frequency of exposure is predominately concentrated to the northeastern and southwestern portions of this zone.

Sensitive visual receptors comprise residents of the numerous homesteads/farmsteads scattered around the study area, as well as residents located on the outskirts of the town of Heidelberg. Additionally, potential sensitive visual receptors include observers travelling along the various roads listed above, as well as a portion of the R549, and other various secondary roads.

10 – 20km

In the longer distance (i.e. between 10 and 20km offset), the extent of potential visual exposure become more scattered with larger visually exposed areas concentrated to predominately to the southwestern portions of this zone. The frequency of exposure is also incredibly concentrated and high in the visually exposed areas to the southwest. Visual exposure to the northeastern portions of the zone is more scattered and the frequency of exposure lower. Visually screened areas are largely associated with low lying areas located behind scattered ridges throughout the study area. Visually screened areas are found scattered in the northern, eastern and southeastern portions of this zone.

Sensitive visual receptors comprise residents of various homesteads/farmsteads and towns/settlements (i.e. Heidelberg, Nigels, Balfour, Grootvlei, etc.) scattered throughout the zone. Potential sensitive visual receptors also include observers travelling along the R549, R548, R23, R42 and R51, as well as various secondary roads. Several protected areas including Suikerbosrand Nature Reserve, Daisy Private Nature Reserve and Klipkraal Nature Reserve / Protected Environment are located within this zone and may also potentially be impacted upon.

> 20km

Beyond the 20 km offset from the proposed site, potential sensitive visual receptors are not likely to be visually exposed to the proposed facility, despite lying within the viewshed.

In general terms it is envisaged that the turbines associated with the proposed project where visible from shorter distances (e.g. less than 5km and potentially up to 10km), and where sensitive visual receptors may find themselves within this zone, may constitute a high visual prominence, potentially resulting in a high to very high visual impact. This may include tourists visiting the region, observers travelling along the roads, as well as residents of the homesteads and towns / settlements mentioned above.

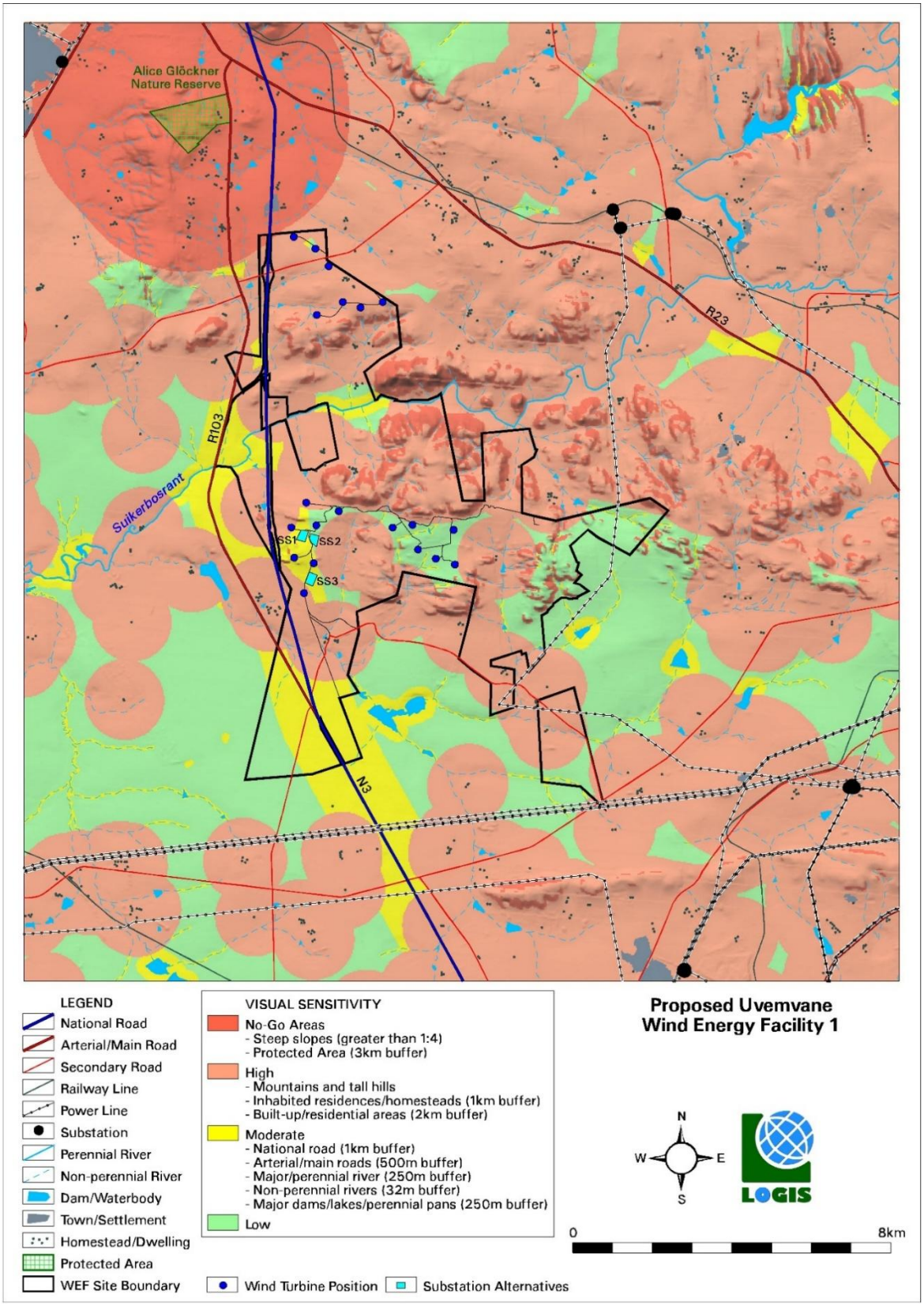

Figure 7-116 - Proximity of the proposed project's development footprint to areas of visual sensitivity

7.3.4. Noise

- ***The following is extracted from the Noise Impact Assessment Report compiled by Enviro-Acoustic Research cc and is included as Appendix G.8.***

7.3.4.1 Noise sensitive receptors

Potential noise-sensitive developments, receptors and communities (NSR) were identified using tools such as Google Earth® within, and near the PFA, with the status of the NSR verified during site visits on 14 and 20 November 2024, as well as on 23 February 2025. These receptors are highlighted in **Figure 7-117**.

Generally[19], noises from wind turbines:

- could be significant within 500 m, with receptors staying within 500 m from operational WTG subject to noises at a potentially sufficient level to be considered disturbing. There are no NSR staying within 500m from any WTG;
- are normally limited to a distance of approximately 1,000m from operational wind turbines. Night-time ambient sound levels could be elevated and the potential noise impact measurable. There are 11 NSR locations within this zone; and
- likely to be audible up to a distance of 2 500m at night. Noises from the WTG are of a low concern at distances greater than 2 500m, although the sound of the WTGs may be audible at greater distances during certain metrological phenomena.

[19] Depending on the layout as well as the specific sound power emission levels of the selected wind turbine. Multiple WTG located within 1,000 - 2,000m from an NSR may result in a higher noise level at an NSR than the case with the same singular WTG located 500m from an NSR.

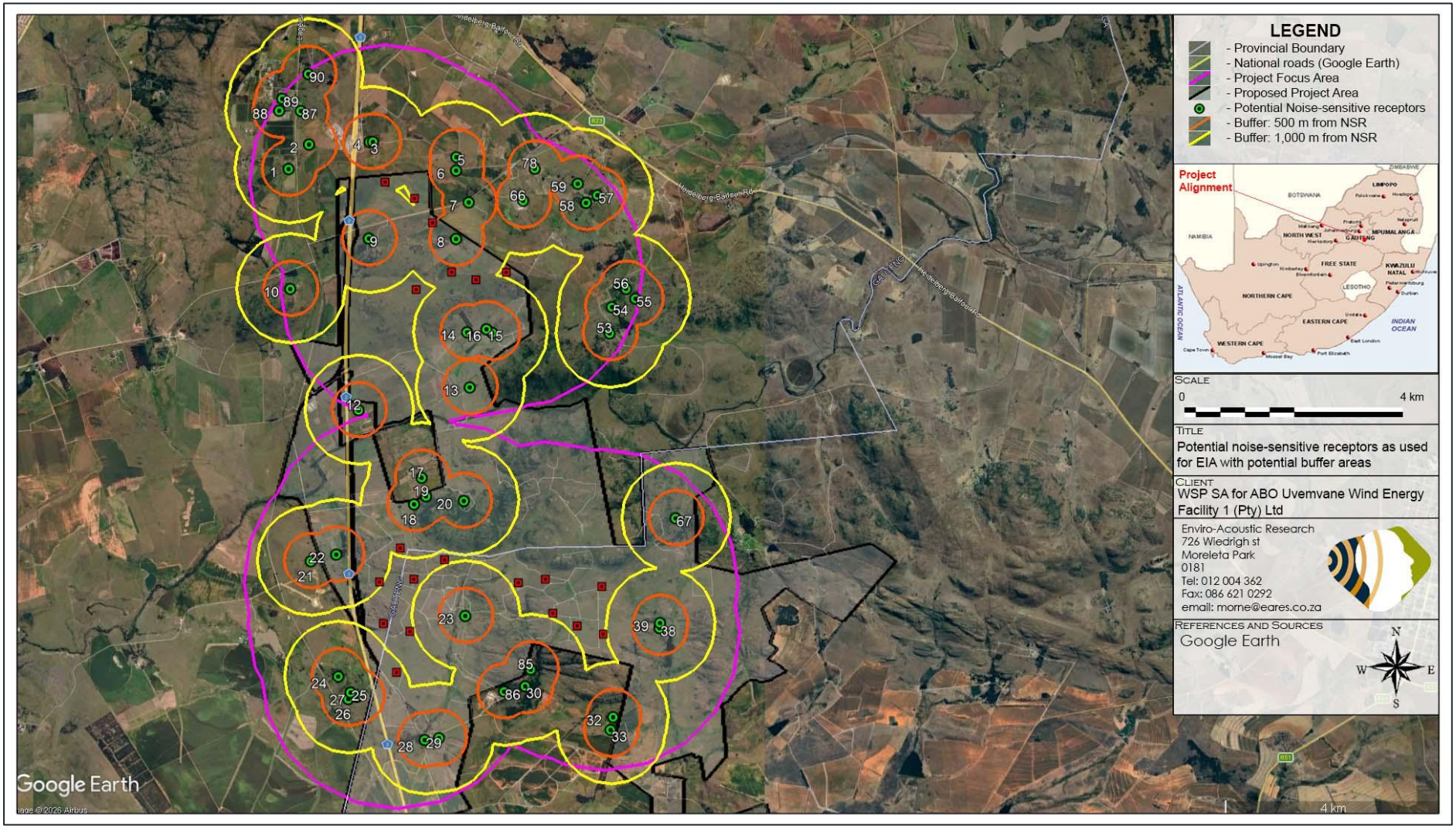

Figure 7-117 - Potential noise-sensitive receptors assessed during the EIA phase

7.3.4.2 Current environmental sound character

Existing ambient sound levels

Ambient sound levels were measured within the PFA in a semi-continuous manner over a period of around 6 nights in November 2024 (resulting in more than 2,000 daytime and 1,000 night-time measurements – each with a minimum duration of 10-minutes).

Daytime ambient sound levels ranged between 27 and 72 dBA, with the average daytime sound levels for the 2,192 10-minute measurements being 47 dBA. Night-time ambient sound levels ranged between 22 and 68 dBA, with the average night-time sound levels for the 1,152 10-minute measurements being 43 dBA.

Ambient sound level measurement resulted in sound levels higher than expected, significantly higher than a rural noise district. Based on sounds heard and spectral information, ambient sound levels were mainly due to a combination of wind-induced, faunal and farming related noises (with cattle noises – relative constant moos, bawling and snorts audible at two measurement locations). Passing traffic was also audible at measurement locations two and three, and passing traffic may have influenced the measurements during the quieter periods at measurement location three.

Ambient sound level data collected during these measurement periods indicated ambient sound levels typical of a suburban noise district, even though the area may be considered rural.

Results of the various sound level measurements

All the measurements were done in accordance with the South African National Standard SANS 10103:2008 "The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication".

The sound levels were measured using class-1 Sound Level Meters (SLMs, details in **Table 7-45**) with the measurement localities presented in **Figure 7-118**. Appendix D of the Noise specialist report presents photos of all measurement locations The SLMs would measure “average” sound levels over 10-minute periods, save the data and start with a new 10-minute measurement until the instruments were stopped.

Table 7-45 - Equipment used to measure ambient sound levels

Equipment	Model	Serial no	Calibration Date
WAULTSL01			
Sound Level Meter	SVAN 977	36176	Feb 2024
Pre-amplifier	SV 12L	25685	Feb 2024
Microphone	ACO 7052E	49596	Feb 2024
Calibrator	Quest CA-22	J 2080094	July 2024
WAULTSL02			
Sound Level Meter	NA-28	00901489	March 2023
Pre-amplifier	NH-21	28879	March 2023
Microphone	UC-53A	315479	March 2023

Equipment	Model	Serial no	Calibration Date
Calibrator	Quest CA-22	J 2080094	July 2024
WAULTSL03			
Sound Level Meter	Larson Davis 824	824A0896	Feb 2023
Pre-amplifier	PRM902	1345	Feb 2023
Microphone	2541	6427	Feb 2023
Calibrator	Quest CA-22	J 2080094	July 2024
WAULTSL04			
Sound Level Meter	Svan 977	34849	January 2023
Pre-amplifier	SV 12L	32395	January 2023
Microphone	ACO 7052E	33077	January 2023
Calibrator	Quest CA-22	J 2080094	July 2024

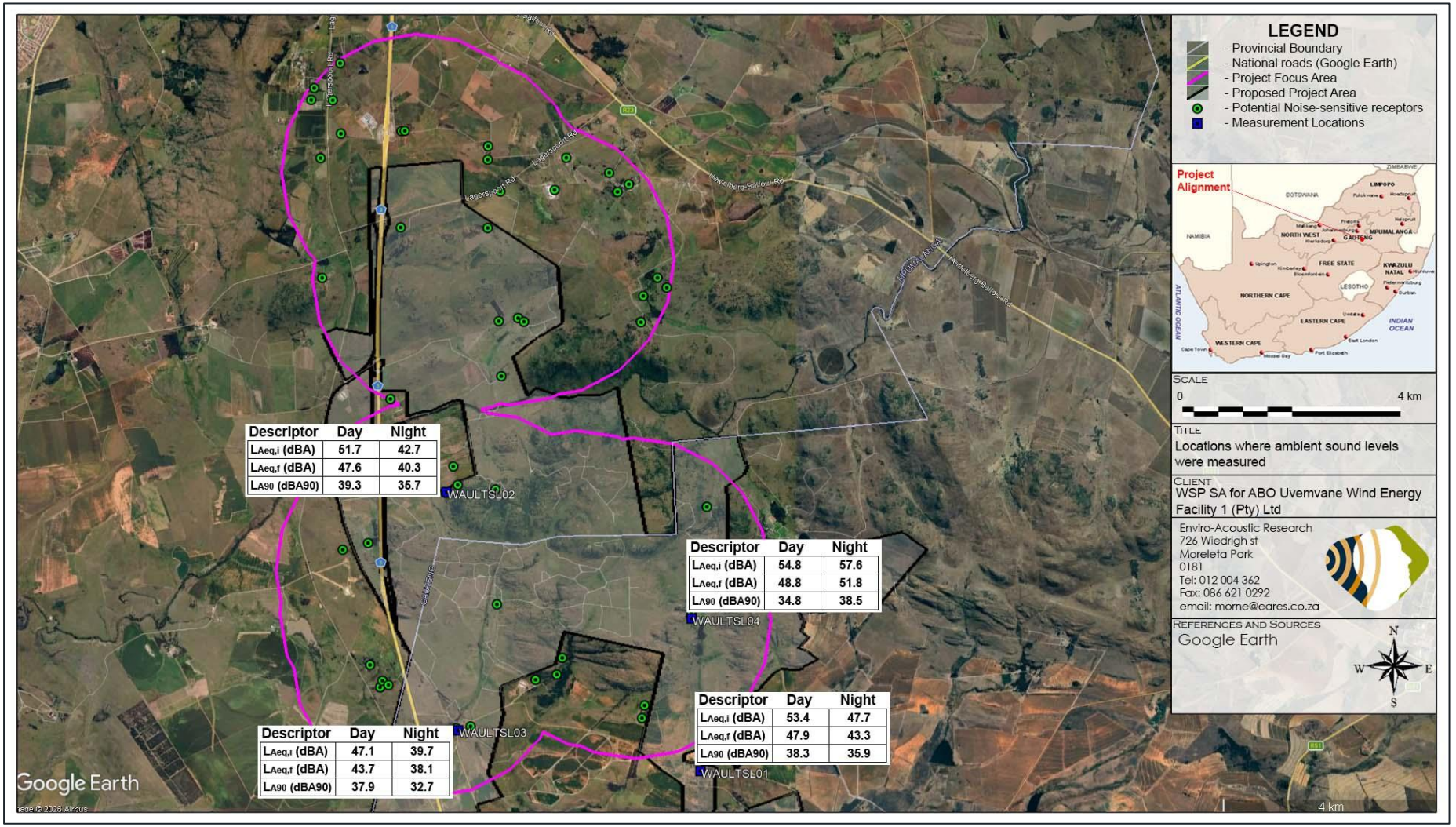

Figure 7-118 - Localities where ambient sound levels were measured during November 2024

Long-term Measurement Location WAULTSL01

The SLM was deployed in the garden in the corner of the property near a large tree. Natural noises were dominant (bird communication), with cattle audible at times. Noises from cattle did impact measurements during event.

Impulse time-weighted equivalent sound levels ($L_{AIeq,10min}$) and fast time-weighted equivalent sound levels ($L_{AFeq,10min}$) are presented in **Figure 7-119** and **Figure 7-120**,summarized in **Table 7-46** below. Although the developmental character is rural, LA90 levels were elevated.

Table 7-46 - Sound levels considering various sound level descriptors at WAULTSL01

	LAmax,i (dBA)	LAeq,i (dBA)	LAeq,f (dBA)	LA90,f (dBA90)	LAmin,f (dBA)
Day arithmetic average	-	53.4	47.9	38.3	-
Night arithmetic average	-	47.7	43.3	35.9	-
Day Equivalent Levels	-	59.5	53.0	-	-
Night Equivalent Levels	-	53.4	47.6	-	-
Day minimum	-	38.7	35.1	-	24.1
Day maximum	104.7	80.8	72.1	-	-
Night minimum	-	34.3	30.4	-	23.9
Night maximum	83.9	66.3	57.8	-	-

The numerous 10-minute measurements are further classified for the day- and night-time periods in terms of the SANS 10103:2008 typical noise district areas **Figure 7-121** (day) and **Figure 7-122** (night).

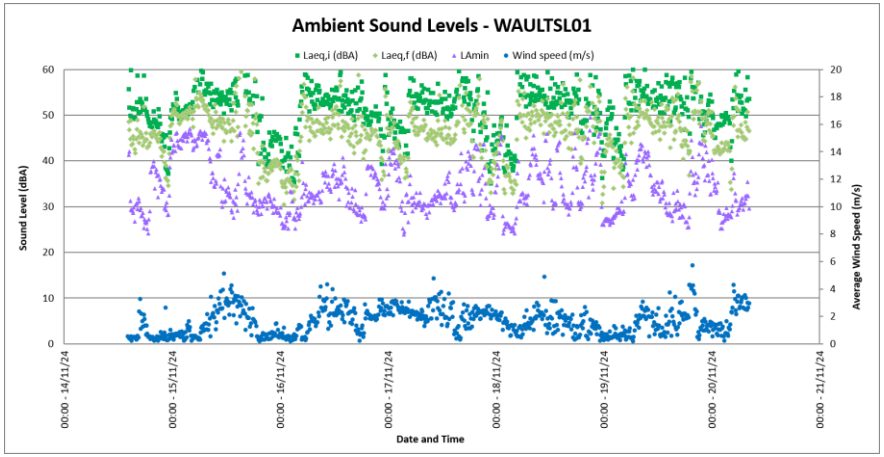

Figure 7-119 - Ambient sound levels at WAULTSL01

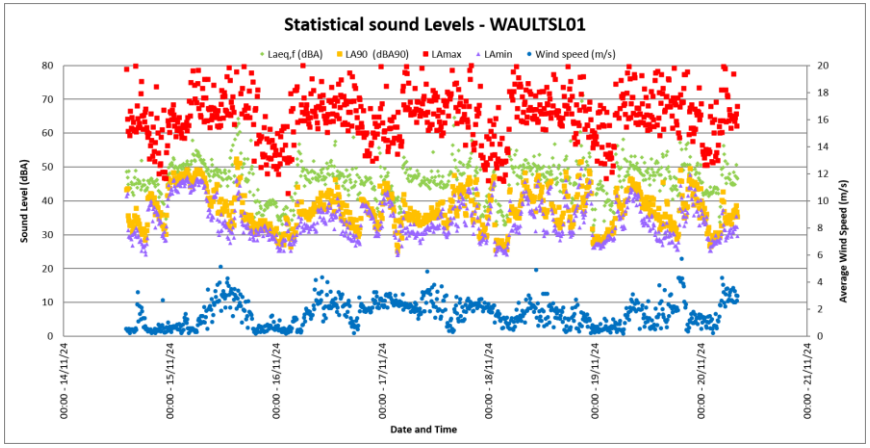

Figure 7-120 - Various sound level descriptors for WAULTSL01

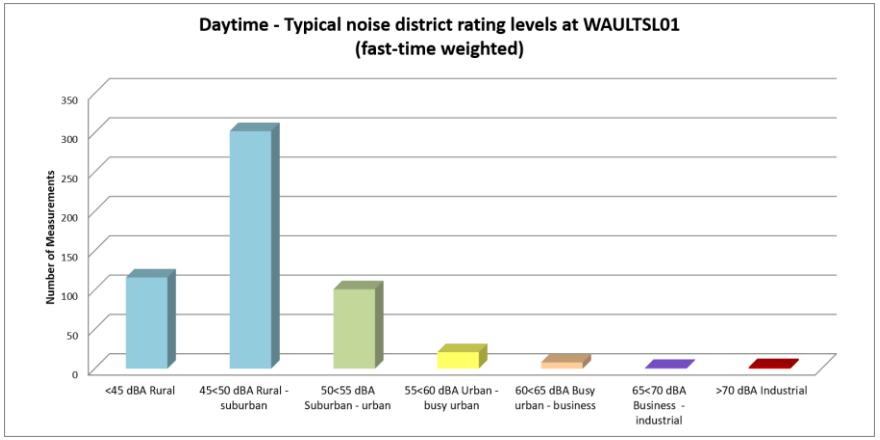

Figure 7-121 - Classification of daytime measurements in typical noise districts at WAULTSL01

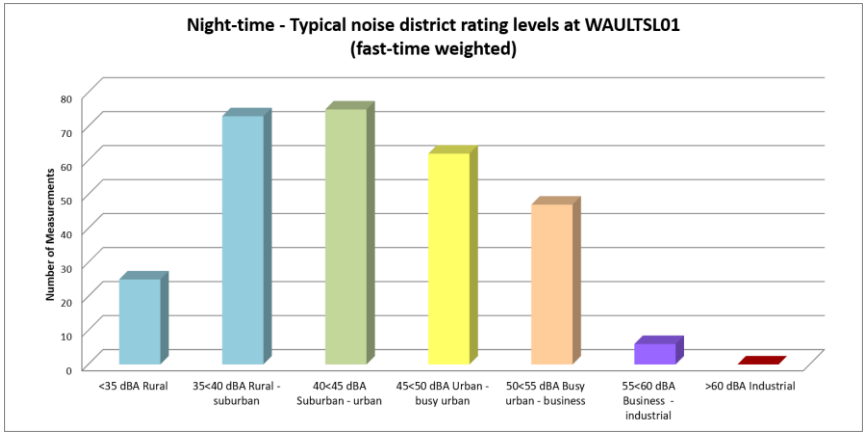

Figure 7-122 - Classification of night-time measurements in typical noise districts at WAULTSL01

Long-Term Measurement Location - WAULTSL02

The SLM was deployed near a large tree in the corner of the property. Though bird communication was generally dominant, road traffic noises were audible and constant.

Impulse time-weighted equivalent sound levels ($L_{AIeq,10min}$) and fast time-weighted equivalent sound levels ($L_{AFeq,10min}$) are presented in **Figure 7-123** and **Figure 7-124**,summarized in **Table 7-47** below

As with WAULTSL01, while the developmental character is rural, LA90 levels were elevated and more typical of the LA90 levels expected for a suburban to urban noise district.

Table 7-47 - Sound level descriptors as measured at WAULTSL02

	LAmax,i (dBA)	LAeq,i (dBA)	LAeq,f (dBA)	LA90,f (dBA90)	LAmin,f (dBA)
Day arithmetic average	-	51.7	47.6	39.3	-
Night arithmetic average	-	42.7	40.3	35.7	-
Day Equivalent Levels	-	57.5	54.3	-	-
Night Equivalent Levels	-	54.8	47.8	-	-
Day minimum	-	28.3	27.6	-	22.1
Day maximum	99.3	74.1	67.8	-	-
Night minimum	-	24.0	22.2	-	19.2
Night maximum	95.2	72.6	60.9	-	-

The numerous 10-minute measurements are further classified for the day- and night-time periods in terms of the SANS 10103:2008 typical noise district areas in **Figure 7-125** (night) and **Figure 7-126** (day).

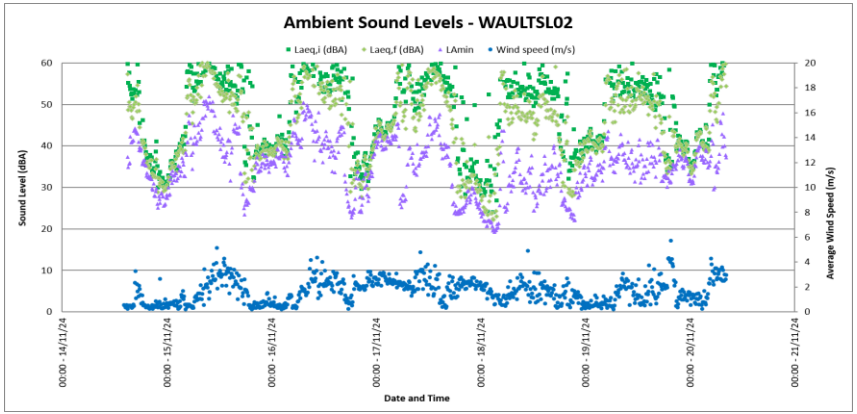

Figure 7-123 - Ambient sound levels at WAULTSL0

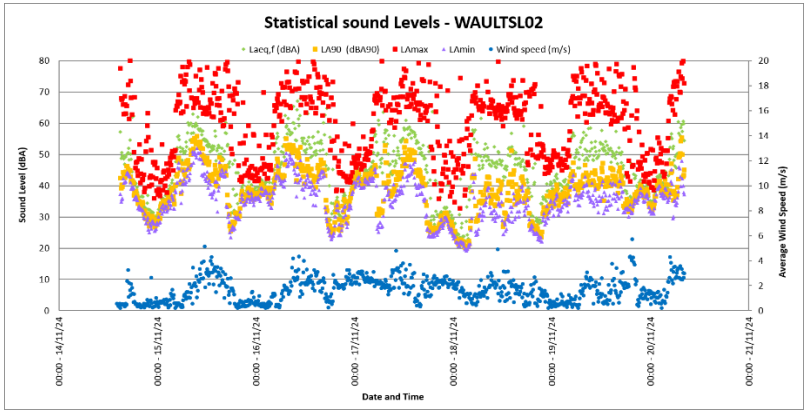

Figure 7-124 - Maximum, minimum and statistical values at WAULTSL02

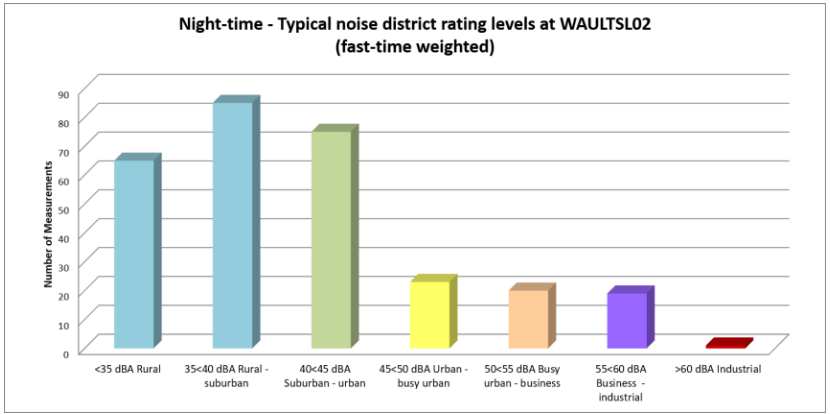

Figure 7-125 - Classification of night-time measurements in typical noise districts at WAULTSL02

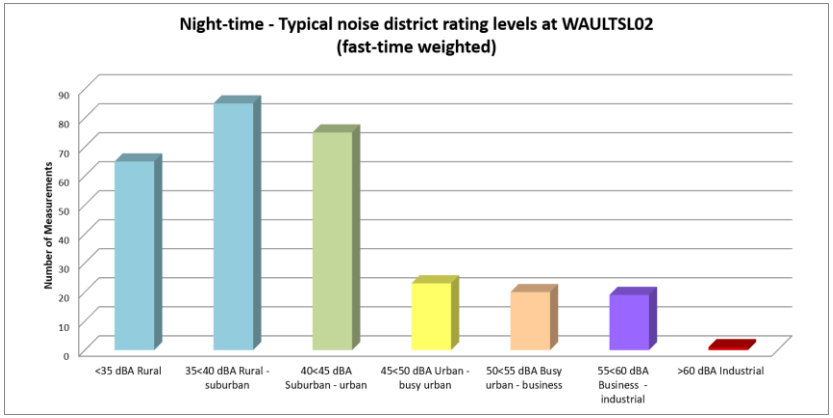

Figure 7-126 - Classification of daytime measurements in typical noise districts at WAULTSL02

Long-Term Measurement Location - WAULTSL03

The SLM was deployed in the corner of the property, away from the house and any audible sources of noise. The main sources of noise were birds, with the noise from traffic on the N3 just audible (did not influence the measurements). Barking dogs and voices were audible at times. There were a number of large trees in the area.

Impulse time-weighted equivalent sound levels ($L_{AIeq,10min}$) and fast time-weighted equivalent sound levels ($L_{AFeq,10min}$) are presented in **Figure 7-128** and **Figure 7-127** ,summarized in **Table 7-48** below.

As with WAULTSL01 and WAULTSL02, while the developmental character is rural, LA90 levels were elevated and more typical of the LA90 levels expected for a suburban noise district.

Table 7-48 - Sound level descriptors as measured at WAULTSL03

	LAmax,i (dBA)	LAeq,i (dBA)	LAeq,f (dBA)	LA90,f (dBA90)	LAmin,f (dBA)
Day arithmetic average	-	47.1	43.7	37.9	-
Night arithmetic average	-	39.7	38.1	32.1	-
Day Equivalent Levels	-	50.8	46.2	-	-
Night Equivalent Levels	-	47.0	43.6	-	-
Day minimum	-	33.9	31.7	-	24.6
Day maximum	86.5	66.1	58.0	-	-
Night minimum	-	31.6	30.5	-	21.2
Night maximum	75.6	63.1	62.5	-	-

The numerous 10-minute measurements are further classified for the day- and night-time periods in terms of the SANS 10103:2008 typical noise district areas in Figure 7-129 (night) and Figure 7-130 (day).

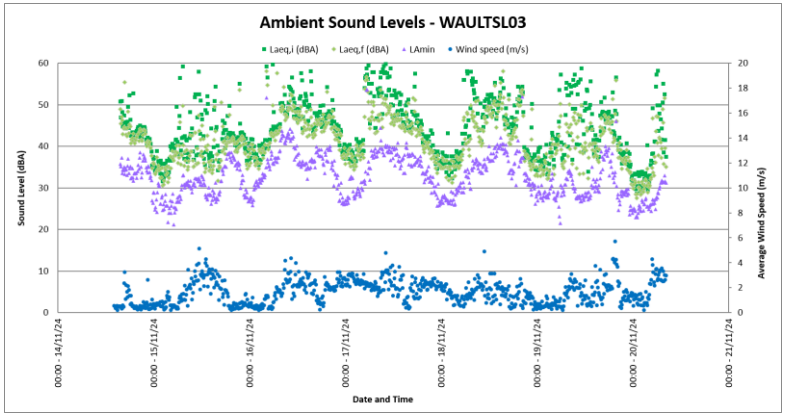

Figure 7-127 - Ambient sound levels at WAULTSL03

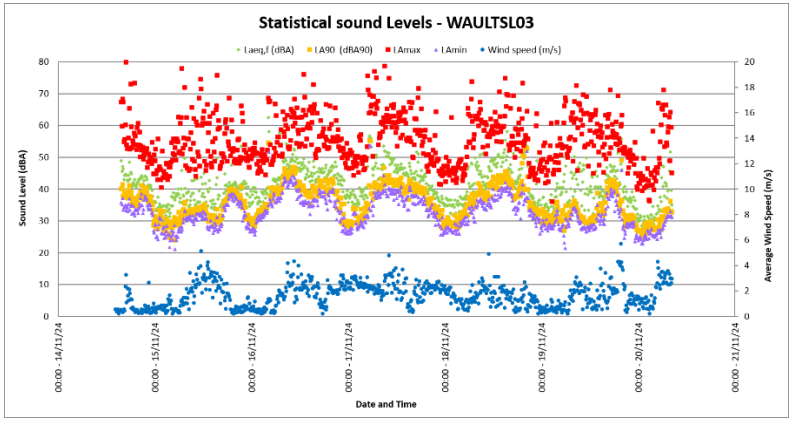

Figure 7-128 - Maximum, minimum and statistical values at WAULTSL03

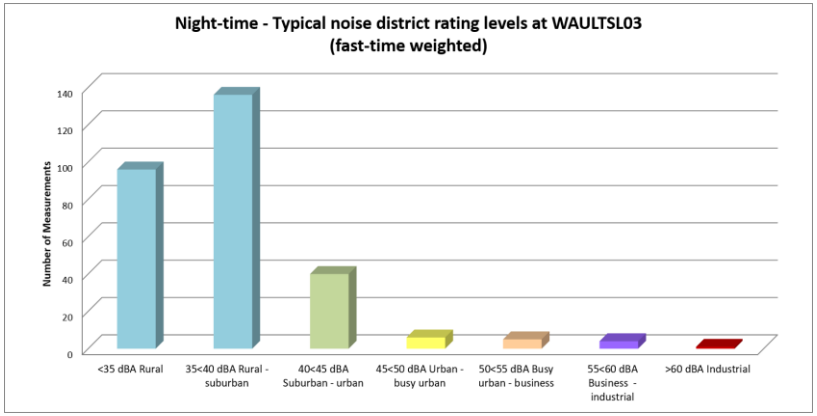

Figure 7-129 - Classification of night-time measurements in typical noise districts at WAULTSL03

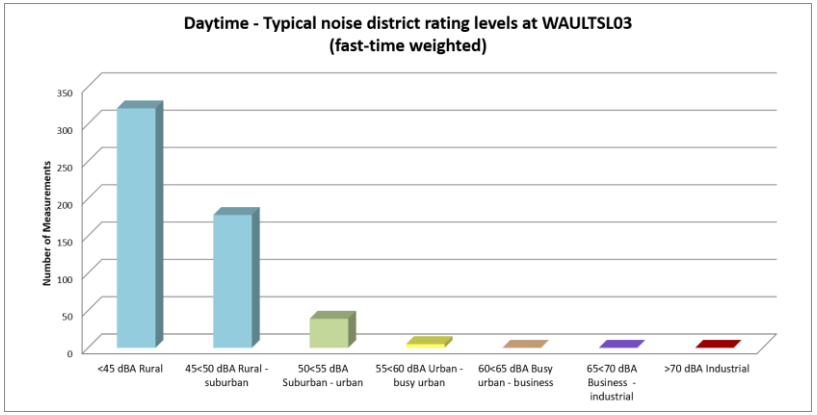

Figure 7-130 - Classification of daytime measurements in typical noise districts at WAULTSL03

Long-Term Measurement Location - WAULTSL04

The SLM was deployed just outside the fence of a residential building, in a fairly open area with no vegetation near the microphone. Faunal noises were the dominant source of noise, with dogs barking in the area.

Impulse time-weighted equivalent sound levels ($L_{AIeq,10min}$) and fast time-weighted equivalent sound levels ($L_{AFeq,10min}$) are presented in **Figure 7-131** and **Figure 7-132** ,summarized in **Table 7-49** below

While the daytime LA90 levels were typical of a rural noise district, night-time LA90 levels were elevated. Based on spectral information, this l$_{ike}$ly relates to faunal communication due to a significant peak $_{in}$ the 4 – 6.3 kHz frequency band.

Table 7-49 - Sound level descriptors as measured at WAULTSL04

	LAmax,i (dBA)	LAeq,i (dBA)	LAeq,f (dBA)	LA90,f (dBA90)	LAmin,f (dBA)
Day arithmetic average	-	54.8	48.8	34.8	-
Night arithmetic average	-	57.6	51.8	38.5	-
Day Equivalent Levels	-	60.0	55.4	-	-
Night Equivalent Levels	-	62.1	56.4	-	-
Day minimum	-	37.9	32.1	-	23.1
Day maximum	103.1	77.6	71.1	-	-
Night minimum	-	41.3	38.6	-	25.1
Night maximum	93.0	74.1	68.1	-	-

The numerous 10-minute measurements are further classified for the day- and night-time periods in terms of the SANS 10103:2008 typical noise district areas in **Figure 7-133** (day) and **Figure 7-134** (night)

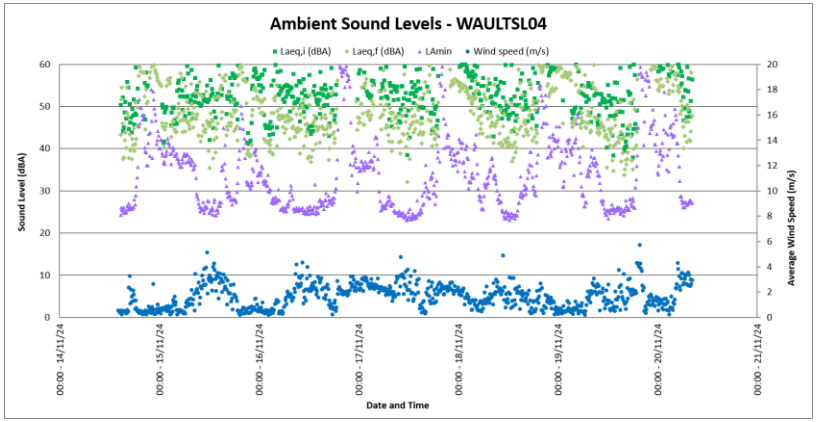

Figure 7-131 - Ambient sound levels at WAULTSL04

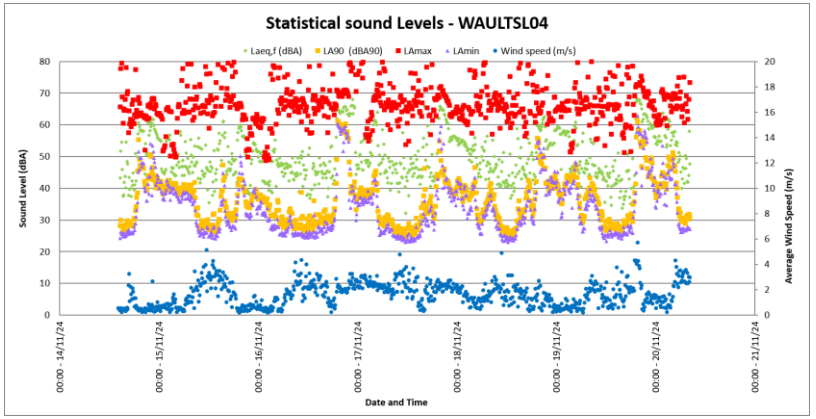

Figure 7-132 - Maximum, minimum and statistical values at WAULTSL04

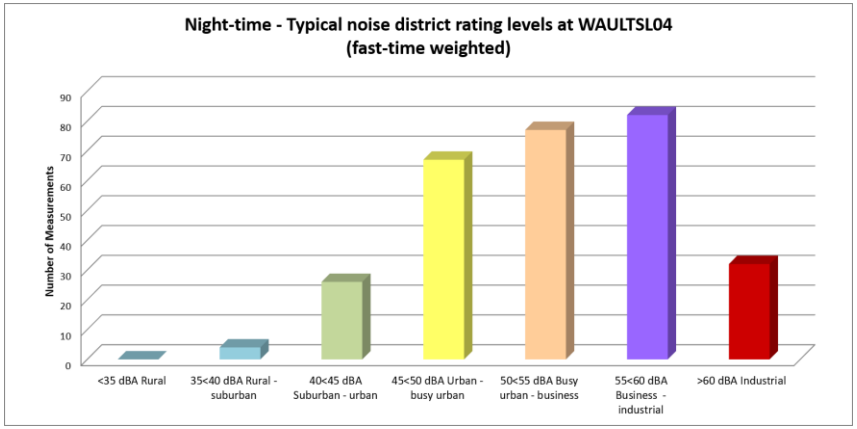

Figure 7-133 - Classification of night-time measurements in typical noise districts at WAULTSL04

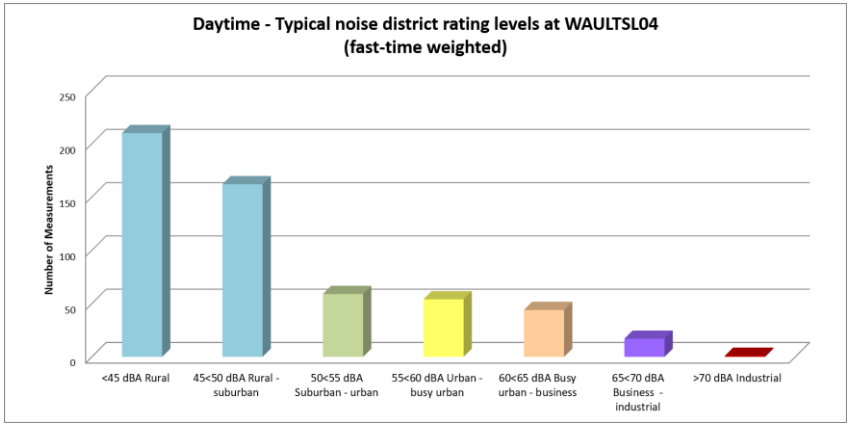

Figure 7-134 - Classification of daytime measurements in typical noise districts at WAULTSL04

7.3.4.3 Summary of sound level data measured

The specialist report mainly discusses the average fast-weighted sound level ($L_{Aeq,f}$), as this sound descriptor is generally used internationally to define the ambient sound levels. Using the arithmetic average minimizes the risk of underreporting ambient sound levels during quieter periods and overreporting during brief loud events, ultimately leading to more informed decisions regarding noise mitigation strategies that protect both human health and wildlife. The fast-weighted weighted sound descriptor is also used instead of the impulse-weighted sound level, as the impulse-weighted sound level can easily be 10 dBA higher than the fast-weighted level, especially in an area with significant bird communication.

Based on the sound measurements:

- 2,192 10-minute measurements were collected during the day (all the 10-minute measurements during the period 06:00 – 22:00), with sound levels ranging between 27.6 and 72.1 dBA. The average daytime ambient sound level was calculated at 47.0 dBA (typical of a rural to suburban noise district) for the four measurement locations; and
- 1,152 10-minute measurements were collected during the night-time period, with sound levels ranging between 22.2 and 68.1 dBA. The average night-time ambient sound level was calculated at 43.4 dBA (typical of a suburban to urban noise district) for the four measurement locations. When excluding night-time data for measurement location WAULTSL04, the average sound level was 40.6 dBA for the 3 “quieter” locations.

Considering the developmental character as well as the ambient sound levels measured, the acceptable zone sound level (noise rating level) during low and no-wind conditions would be expected to be that of a suburban noise district for the day- and night-time periods, setting rating levels of:

- 50 dBA for the daytime period; and,
- 40 dBA for the night-time period.

Considering measurements collected over the past decade at numerous locations during different seasons, ambient sound levels will likely increase as wind speeds increase, as illustrated in **Figure 7-135** (daytime period) and **Figure 7-136** (night-time period). The sound level data collected for this project is also illustrated on these figures.

This trend of the increased ambient sound levels as wind speed increase is also illustrated on these figures ,with this data considered for the operational phase (as the wind turbines will only operate during a period with increased wind speeds).

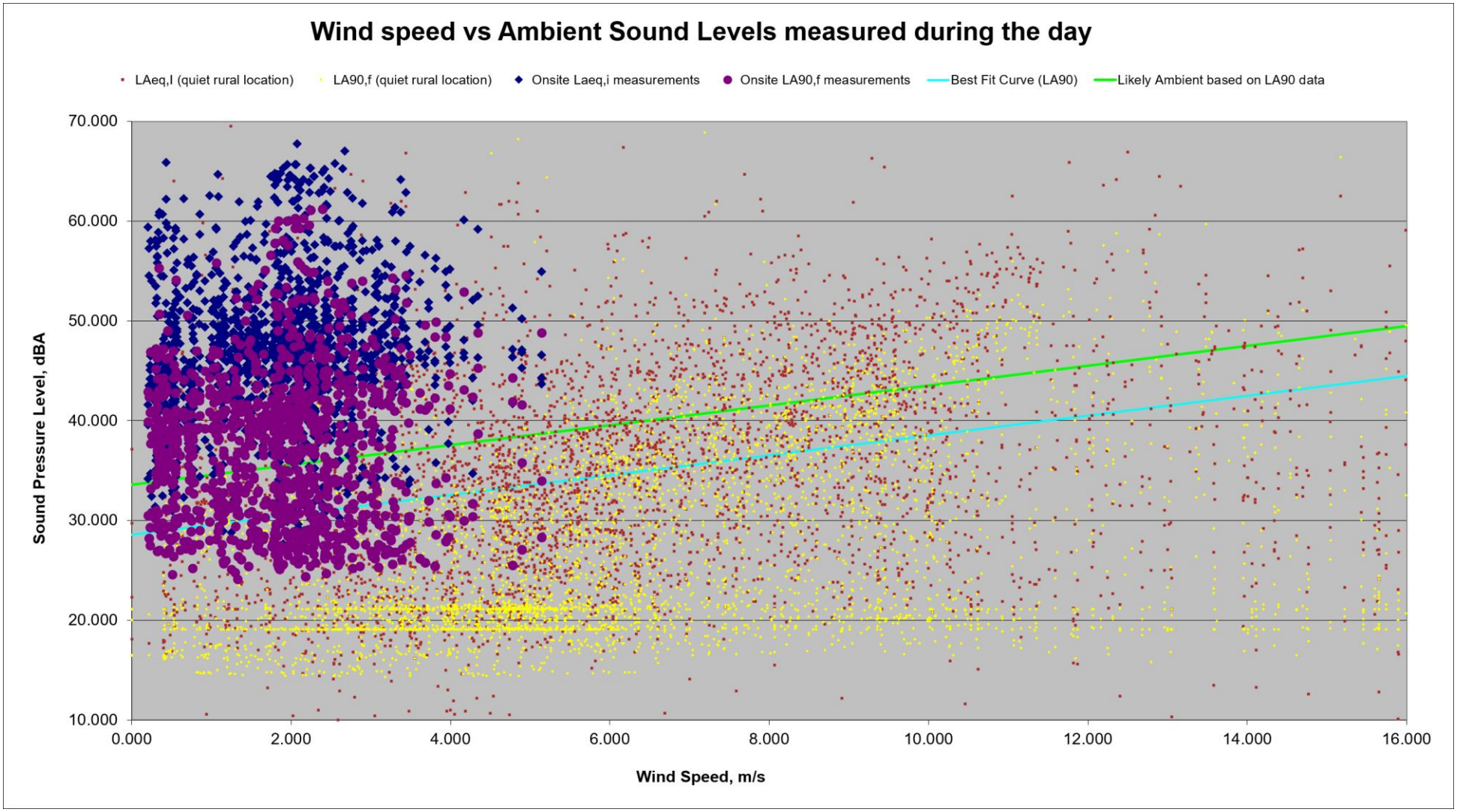

Figure 7-135 - Daytime ambient sound levels measured in vicinity of project

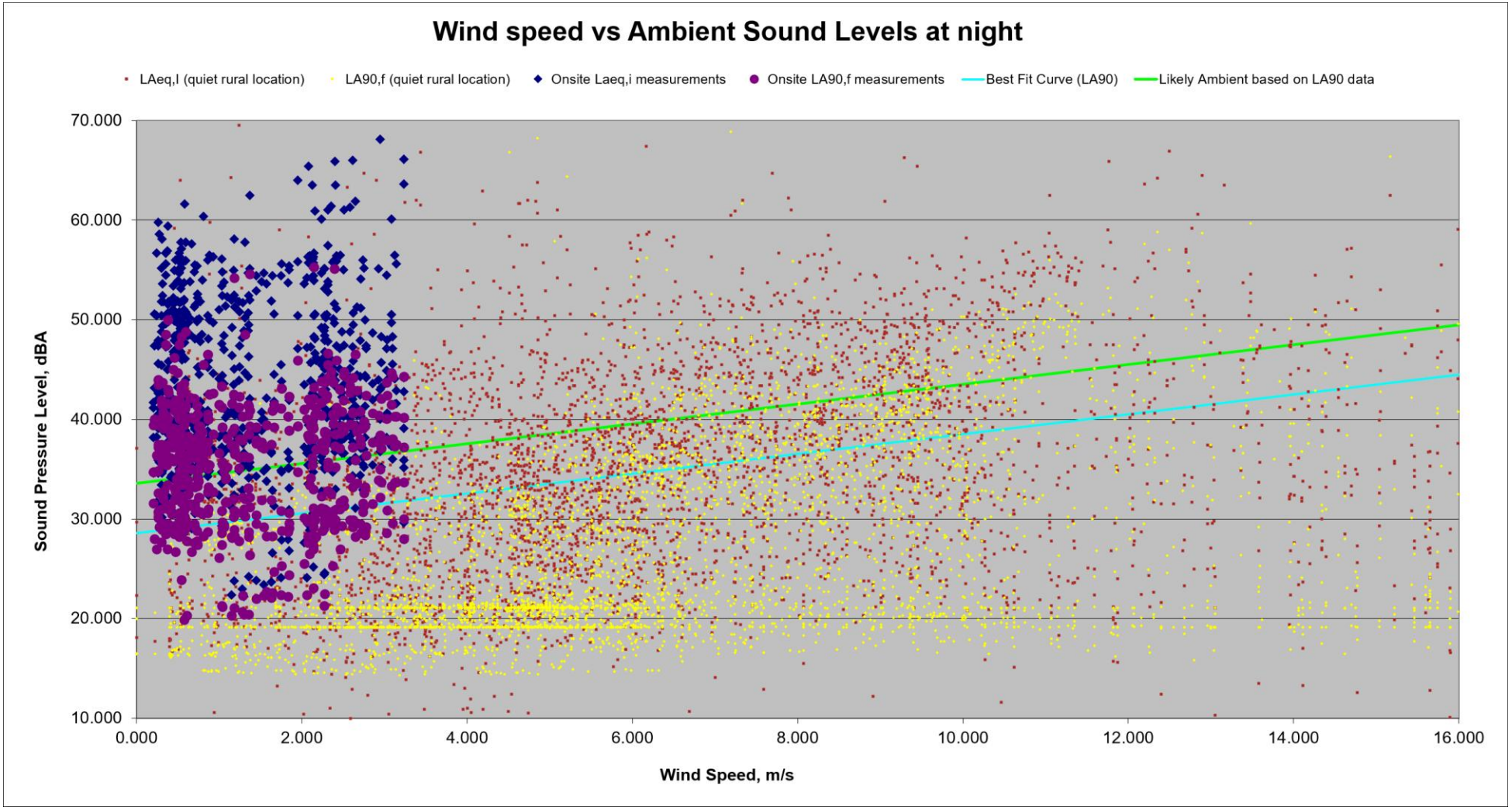

Figure 7-136 - Night-time ambient sound levels measured in vicinity of project

7.3.5. SOCIAL

The following is extracted from the Social Impact Report compiled by WSP and is included as Appendix G.11.

The proposed Project extends across two provinces, Mpumalanga and Gauteng, covering a wide development footprint that includes both district and local municipalities. Specifically, it spans the Gert Sibande District and Dipaleseng Local Municipality in Mpumalanga, as well as the Sedibeng District, Lesedi Local Municipality, and Midvaal Local Municipality in Gauteng.

7.3.5.1 Mpumalanga province

Mpumalanga Province is located in the north-eastern part of South Africa. The province borders two of South Africa's neighbouring countries, Mozambique and Eswatini, and four other South African provinces: Gauteng, Limpopo, KwaZulu-Natal, and the Free State (**Figure 7-137**)Mpumalanga is characterised by the high plateau grasslands of the Middleveld, which roll eastwards for hundreds of kilometres. It rises towards mountain peaks in the northeast and terminates in an immense escarpment (Mpumalanga Provincial Government, 2022).

Gert Sibande District

The GSDM has municipal executive and legislative authority in an area that includes more than one municipality, making it a Category C municipality in the Mpumalanga Province. It is one of three district municipalities in the province, comprising nearly half of the province's area. The GSDM includes the Chief Albert Luthuli, Dipaleseng, Dr Pixley Ka Isaka Seme, Govan Mbeki, Lekwa, Mkhondo and Msukaligwa local municipalities (**Figure 7-137**) The GSDM is headquartered in Ermelo (Municipalities of South Africa, n.d.)

Figure 7-137 - Dipaleseng District Municipality (Municipalities of South Africa)

Dipaleseng Local Municipality

DLM is approximately 2,607 square kilometres in extent, representing 3.4% of the GSDM's landmass. It is bordered by the Govan Mbeki and Lekwa Local Municipalities to the east, and the Sedibeng and Fezile Dabi District Municipalities to the northwest and southwest, respectively (Municipalities of South Africa, 2025).

Population

The DLM population decreased from 42,390 to 35,980 between 2011 and 2022, representing a 15.1% decline over 11 years. The gender distribution of the municipality was almost equal, with females representing 51.0% and males 49.0% of the population in 2022 (**Figure 7-138**) People aged 15 to 64 years represent 68.2% of the population, with 25.4% representing the young and 6.4% the elderly (Stats SA, 2024).

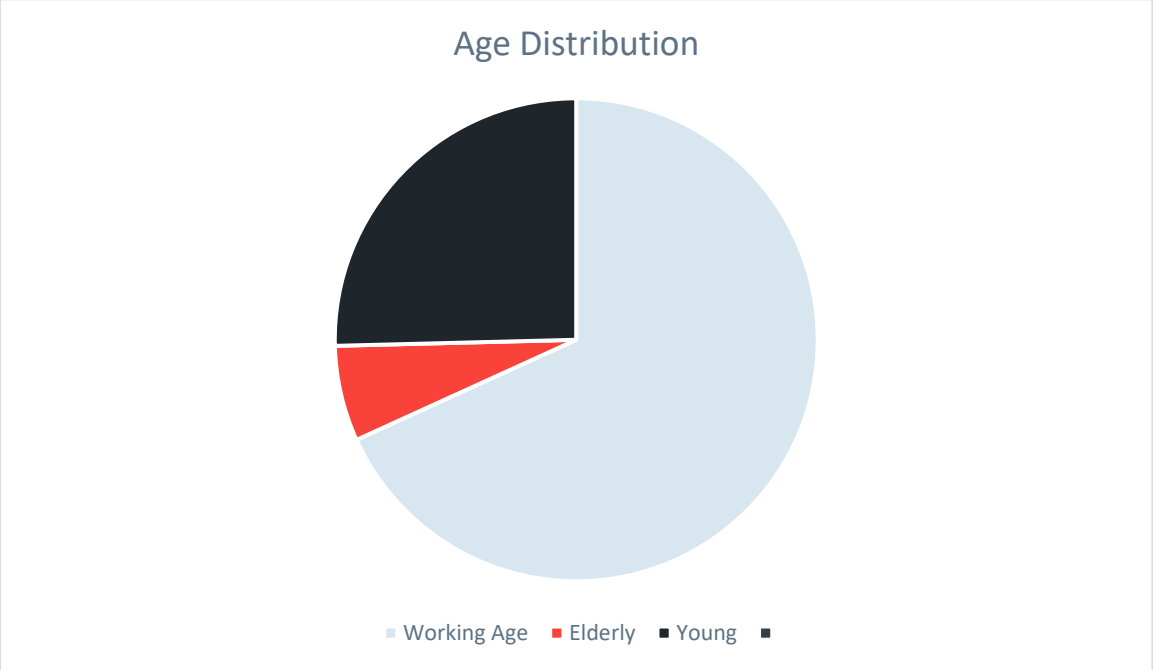

Figure 7-138 - DLM age distribution (Stats SA, 2024)

Ethnicity and language

Over 91% of the municipality is represented by Black African people, followed by 7.6% White, with smaller ethnic groups accounting for the remaining ethnicities, as shown in Table **7-50**

Table 7-50 - Dipaleseng Local Municipality Distribution by Population Group (Stats SA, 2024)

Group	Percentage
Black African	91.6%
Coloureds	0.5%
Indian or Asian	0.3%
White	7.6%

Group	Percentage
Other	0.0%

Isizulu is the language most spoken in the municipality, followed by Sesotho, Afrikaans, isiXhosa and others in smaller proportions **(Table 7-51).**

Table 7-51 – Distribution of Dipaleseng Local Municipality by language spoken (Stats, SA, 2024)

Language	Percentage
IsiZulu	58.1%
Sesotho	25.9%
Afrikaans	6.9%
isiXhosa	1.7%
Others	6.1%

Education

In 2022, approximately 8,581 people over 20 had completed some secondary education, and about 7,373 had completed secondary education. About 5.4% (1 227) had received higher education. **Table 7-52** shows the educational levels represented in the municipality.

Table 7-52 – Distribution of the levels of education represented in the municipality (Stats SA, 2024)

Group	Percentage
No Schooling	7.7%
Some Primary	11.9%
Completed Primary	4.3%
Some Secondary	37.7%
Completed Secondary	32.4%
Higher Education	5.4%
Not Applicable	0.5%

Employment and income profile

The unemployment rate in DLM was 37.2% in 2011, leading youth to leave the municipality in search of better opportunities. Youth unemployment was higher than the national average of 43.5% and is at 45.2% (Dipaleseng Local Municipality, 2025).

Figure 7-139 - DLM unemployment distribution

Housing

The number of households in the DLM increased from 12,637 in 2011 to 13,129 in 2022. The DLM provides these households with water, electricity and waste services. The average household size decreased from 3.4 to 2.7 people over the same period (Stats SA, 2024).

Security and safety

The Balfour Police Station is the closest to the Project site. The crime statistics published for the fourth quarter of the 2024/2025 financial year by the South African Police Service (SAPS) indicated that 94 crimes were committed. Theft and Burglary of a residence are the most prevalent crimes, accounting for 34.0% of crimes.

The Project will either provide or contract for security during construction and operation. These will be trained professionals who must sign a code of conduct to protect the local communities.

Gender-based violence

Regarding gender-based violence, i.e. Rape, Sexual assault, and contact sexual offences, one case was recorded at the Balfour Police Station during the first quarter of the 2024/2025 financial year.

No organisation in the Balfour area offers Gender-Based Violence (GBV) services to victims. However, the Department of Social Development established a GBV command centre in 2013, allowing survivors to contact the centre and be assigned a nearby social worker. Some national NGOs offer services to GBV victims: People Opposing Women Abuse (POWA), Sonke Gender Justice and Shukumisa.

Schools

As of 2022, 73.3% of children within the municipality were enrolled in some form of school, including early childhood development centres, primary schools, and secondary schools.

However, 26.7% of children were not attending any formal schooling (Dipaleseng Local Municipality, 2025).

Healthcare

There are two health care facilities in the municipality, the largest of which is the Balfour Community Health Centre (Dipaleseng Local Municipality, 2025).

Water and sanitation

In the DLM, 64.9% of households have access to piped water inside their dwellings, and 97.1% have access to water through the municipality or other water service providers (Stats SA, 2024).

Electricity

As of 2022, 90.2% of households had access to electricity, however, 1,286 households had no electrical connection (Dipaleseng Local Municipality, 2025).

Access to sanitation

Nearly 90% of MLM households have access to flush toilets, and 7.5% use pit or bucket toilets. The rest of the households rely on other sanitation facilities (Stats SA, 2024).

Access to waste removal

In 2022, the municipality removed refuse at least once weekly for 83.7% of households. Communal containers are the second most common method of refuse disposal with 5.7% of households utilising them (Stats SA, 2024).

Telecommunications

Heidelberg, the largest town near the Project location, is serviced by all the major network providers in the country. It has access to 4G/LTE coverage and limited 5G networks via the service provider Rain.

7.3.5.2 Gauteng Province

The Gauteng Province is located in the north-eastern part of South Africa. The province borders four other provinces: Mpumalanga, Limpopo, North West and Free State Provinces (**Figure 7-140**).

The Gauteng Province covers an area of 18,178 km² and has a population of approximately 15,100,000, the largest in the country (Statistics South Africa, 2024). The capital city is Johannesburg, and other major cities and towns include Pretoria, the West Rand, the East Rand and the Vaal.

The province is divided into three metropolitan municipalities —the City of Ekurhuleni, the City of Johannesburg, and the City of Tshwane —and two district municipalities, Sedibeng and West Rand. These two districts are further subdivided into six local municipalities. The proposed development falls within the SDM. The Project falls within the Lesedi Local Municipality (LLM) (Municipalities of South Africa, 2024).

Sedibeng District Municipality

The SDM has municipal executive and legislative authority in an area that includes more than one municipality, making it a Category C municipality in the Gauteng Province. It is one

of two district municipalities in the province, which also contains three metropolitan municipalities. The SDM includes the Emfuleni, Midvaal and Lesedi local municipalities **(Figure 7-140)**. The SDM is headquartered in Vereeniging (Municipalities of South Africa, n.d.).

Figure 7-140 - Sedibeng District Municipality (Municipalities of South Africa, 2025)

Lesedi Local Municipality

LLM is approximately 1,484 square kilometres in extent, representing 44.3% of the SDM's land mass. To the west, it is bordered by the Midvaal Local Municipality, the City of Ekurhuleni Metropolitan Municipality to the north, the DLM to the south and the Victor Khanye and Govan Mbeki Local Municipality to the east (Municipalities of South Africa, 2025).

Population

The LLM population increased to 132,783 between 2011 and 2022, representing a 33.4% increase over 11 years. The growth rate was 2.66% over the same period. The gender distribution in the municipality was equal, with females and males representing 50.0% of the population in 2022 (**Figure 7-141**). People aged 15 to 64 years represent 66.9% of the population, with 23.8% representing the young and 6.3% the elderly (Stats SA, 2024).

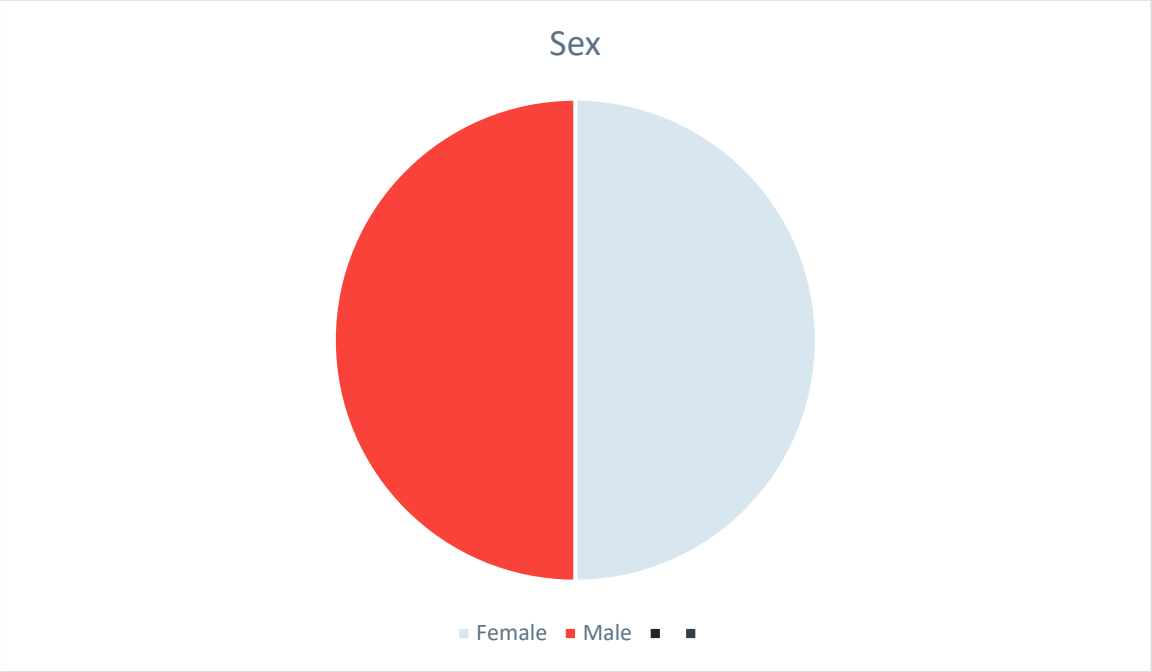

Figure 7-141 - LLM gender distribution (Stats SA, 2024)

Ethnicity and language

Most of the municipality (86.0%) is represented by Black Africans, followed by 12.3% White, with the remaining ethnicities represented by smaller groups, as shown in **Table 7-53**.

Table 7-53 - Lesedi Local Municipality Distribution by Population Group (Stats SA, 2024)

Group	Percentage
Black African	86.0%
Coloureds	0.8%
Indian or Asian	0.7%
White	12.3%
Other	0.02%

Isizulu is the most spoken language in the municipality, followed by Sesotho, Afrikaans, English, and others in smaller proportions (**Table 7-54**).

Table 7-54 - Distribution of Lesedi Local Municipality by language spoken (Stats SA, 2024)

Language	Percentage
IsiZulu	50.1%
Sesotho	23.8%
Afrikaans	11.5%
English	3.1%
Others	11.4%

Education

In 2022, approximately 4,024 people aged 20 or older had no formal education, and about 31,993 had completed secondary education. About 11.7% (9,934) had received higher education.**Table 7-55** shows the educational levels represented in the municipality.

Table 7-55 - Distribution of the levels of education represented in the municipality (Stats SA, 2024)

Group	Percentage
No Schooling	10,9%
Some Primary	7.1%
Completed Primary	3.3%
Some Secondary	32.4%
Completed Secondary	38.7%
Higher Education	1.1%
Not Applicable	0.5%

Employment and income profile

In 2011the unemployment rate for LLM was 11.1%, which was much lower than the national rate (26.5%). Discouraged work seekers accounted for 2.9% (Lesedi Local Municipality , 2021).

Figure 7-142 - LLM unemployment distribution

Housing

The number of households in the LLM increased from 29,664 in 2011 to 42,597 in 2022. The LLM provides these households with water, electricity and waste services. The average household size decreased from 3.4 to 3.1 people over the same period (Stats SA, 2024).

Security and Safety

The Ratanda Police Station is the closest to the Project site. The crime statistics published for the fourth quarter of the 2024/2025 financial year by the SAPS indicated that 236 crimes were committed. Assault with intent to inflict grievous bodily harm and burglary at residential premises are the most prevalent, representing 38.6% of crimes.

The Project will either provide or contract for security during construction and operation. These will be trained professionals who must sign a code of conduct to protect the local communities.

Gender-based violence

Regarding gender-based violence, i.e. Rape, Sexual assault, and contact sexual offences, one case was recorded at the Ratanda Police Station during the first quarter of the 2024/2025 financial year.

No organisation in the Project area offers GBV services to victims specifically for the area. However, the Department of Social Development established a GBV command centre in 2013, allowing survivors to contact the centre and be assigned a social worker nearby. Some national NGOs offer services to GBV victims: POWA, Sonke Gender Justice and Women for Change.

Schools

In 2022, approximately 4,024 people aged 20 or older had no formal education, and about 31,993 had completed secondary education. About 11.7% (9 934) had received higher education training.

Healthcare

There are three healthcare facilities close to the Project site, the largest being Heidelberg Hospital.

Water and sanitation

In the LLM, 72.8% of households have access to piped water inside their dwellings, and 99.3% have access to water through the municipality or other water service providers (Stats SA, 2024).

Electricity

As of 2022, 95.8% of households had access to electricity; however, 3.2% had no electrical connection (Stats SA, 2024).

Access to sanitation

Most LLM households (97%) have access to flush toilet facilities, and the remaining 3% use pit toilets, bucket toilets, and other sanitation facilities (Stats SA, 2024).

Access to waste removal

In 2022, the municipality removed refuse at least once weekly for 91.3% of households. Own refuse dumps are the second most common refuse disposal method, with 3.8% of households using them.

Telecommunications

Heidelberg, the largest town near the Project location, is serviced by all the major network providers in the country. It has access to 4G/LTE coverage and limited 5G networks via the service provider Rain.

Midvaal local municipality

MLM is approximately 1,723 square kilometres in extent, representing 41.3% of the SDM's land mass. To the west, it is bordered by the Emfuleni Local Municipality to the east, the LLM to the south, the City of Johannesburg and the City of Ekurhuleni Metropolitan Municipalities to the north, and the Metsimaholo Local Municipality in the Free State province to the south (Municipalities of South Africa, 2025).

Population

The MLM population increased to 6,572,721 between 2011 and 2022, representing a 21.6% increase over 11 years. The growth rate was 1.79% over the same period. The gender distribution of the municipality was almost equal, with females representing 52.8% and males 47.2% of the population in 2022 (**Figure 7-143**). People aged 15 to 64 years represent 61.4% of the population, with 31.6% representing the young and 6.9% the elderly (Stats SA, 2024).

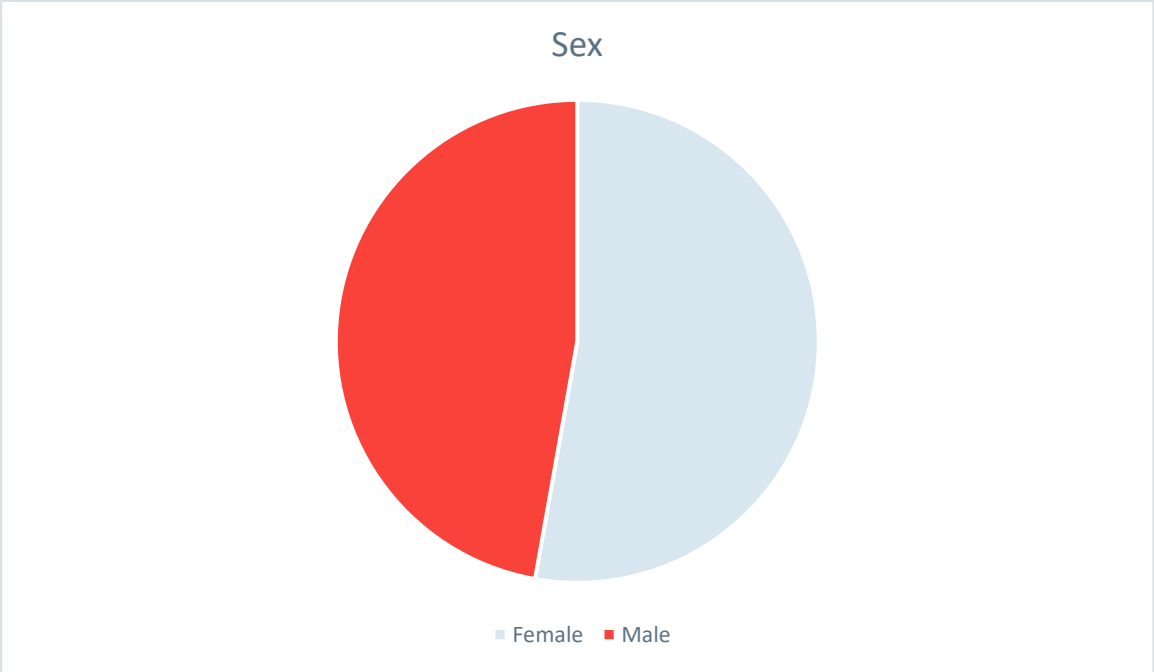

Figure 7-143 - MLM gender distribution (Stats SA, 2024)

Ethnicity and Language

Over 96% of the municipality is represented by Black African people, followed by 2.5% White, with smaller portions representing the remaining ethnicities, as shown in**Table 7-56**.

Table 7-56 - Midvaal Local Municipality Distribution by Population Group (Stats SA, 2024)

Group	Percentage
Black African	96.5%
Coloureds	0.3%
Indian or Asian	0.5%
White	2.5%
Other	0.1%

Sesotho is the language most spoken in the municipality, followed by Afrikaans, isiZulu, English, and others in smaller proportions (**Table 7-57**)

Table 7-57 - Distribution of Midvaal Local Municipality by language spoken (Stats SA, 2024)

Language	Percentage
IsiZulu	15.7%
Sesotho	35.4%
Afrikaans	19.6%
English	11.8%
IsiXhosa	5.4%
Others	12.1%

Education

In 2016, approximately 7.8% of people aged 20 and older had no formal education, and about 77.1% had completed secondary education. About 9.1% had received higher educational training. **Table 7-58** shows the educational levels represented in the municipality.

Table 7-58 - Distribution of the levels of education represented in the municipality (Stats SA, 2024)

Group	Percentage
No Schooling	7.8%
Completed Primary	6.1%
Completed Secondary	77.1%
Higher Education	9.1%

Housing

The number of households in the MLM increased from 1,418,085 in 2011 to 1,811,565 in 2022. The MLM provides these households with water, electricity and waste services. The average household size decreased from 3.8 to 3.6 people over the same period (Stats SA, 2024).

Security and Safety

The Ratanda Police Station is the closest to the Project site. The crime statistics published for the fourth quarter of the 2024/2025 financial year by the SAPS indicated that 236 crimes were committed. Assault with intent to inflict grievous bodily harm and burglary at residential premises are the most prevalent, representing 38.6% of crimes.

The Project will either provide or contract for security during construction and operation. These will be trained professionals who must sign a code of conduct to protect the local communities.

Gender-based violence

Regarding gender-based violence, i.e. Rape, Sexual assault, and contact sexual offences, one case was recorded at the Ratanda Police Station during the first quarter of the 2024/2025 financial year.

No organisation in the Project area offers GBV services to victims specifically for the area. However, the Department of Social Development established a GBV command centre in 2013, allowing survivors to contact the centre and be assigned a social worker nearby. Some national NGOs offer services to GBV victims: POWA, Sonke Gender Justice and Women for Change.

Schools

In 2016, approximately 7.8% of people aged 20 and older had no formal education, and about 77.1% had completed secondary education. About 9.1% had received higher educational training (Statistics South Africa, 2024).

Healthcare

There are three healthcare facilities close to the Project site, the largest being Heidelberg Hospital.

Water and sanitation

In the MLM, 87.1% of households have access to piped water inside their dwellings, and 97.5% have access to water through the municipality or other water service providers (Stats SA, 2024).

Electricity

As of 2022, 94.4% of households had access to electricity; however, 5.2% had no electrical connection (Stats SA, 2024).

Access to sanitation

Nearly 94% of MLM households have access to flush toilet facilities, while the remaining 6% use pit toilets, bucket toilets, and other sanitation facilities.

Access to waste removal

In 2022, the municipality removed refuse at least once weekly for 85.8% of households. Communal collection points are the second most common refuse disposal method, with 8.9% of households using them.

Telecommunications

Heidelberg, the largest town near the Project location, is serviced by all the major network providers in the country. It has access to 4G/LTE coverage and limited 5G networks via the service provider Rain.

7.3.5.3 Sensitive Social Receptors

Potential sensitive social receptors are local people within a 5 km radius of the proposed Project who may be influenced by the Project's activities due to their proximity to the proposed Project area (**Figure 7-144**).

PRIMARY RECEPTORS (WITHIN 1 KM)

The proposed project site is surrounded by farmland, and some hospitality establishments, such as guesthouses and lodges, are within 1 km.

SECONDARY RECEPTORS (WITHIN 3 KM)

There are beverage bottling facilities located within 3 km of the Project area. Farmlands and hospitality establishments largely characterise this region. The primary social receptors are the residents of the farms and workers at the hospitality establishments.

TERTIARY RECEPTORS (WITHIN 5 KM)

This region includes more farmland, the Grootvlei Power Station and Thaba-Kgwali, a residential area. The primary social receptors are the residents of Thaba-Kgwali. Examples of receptors include, but are not limited to, schools, shopping centres, residential areas, and, in more remote locations, individual farmhouses or farmsteads.

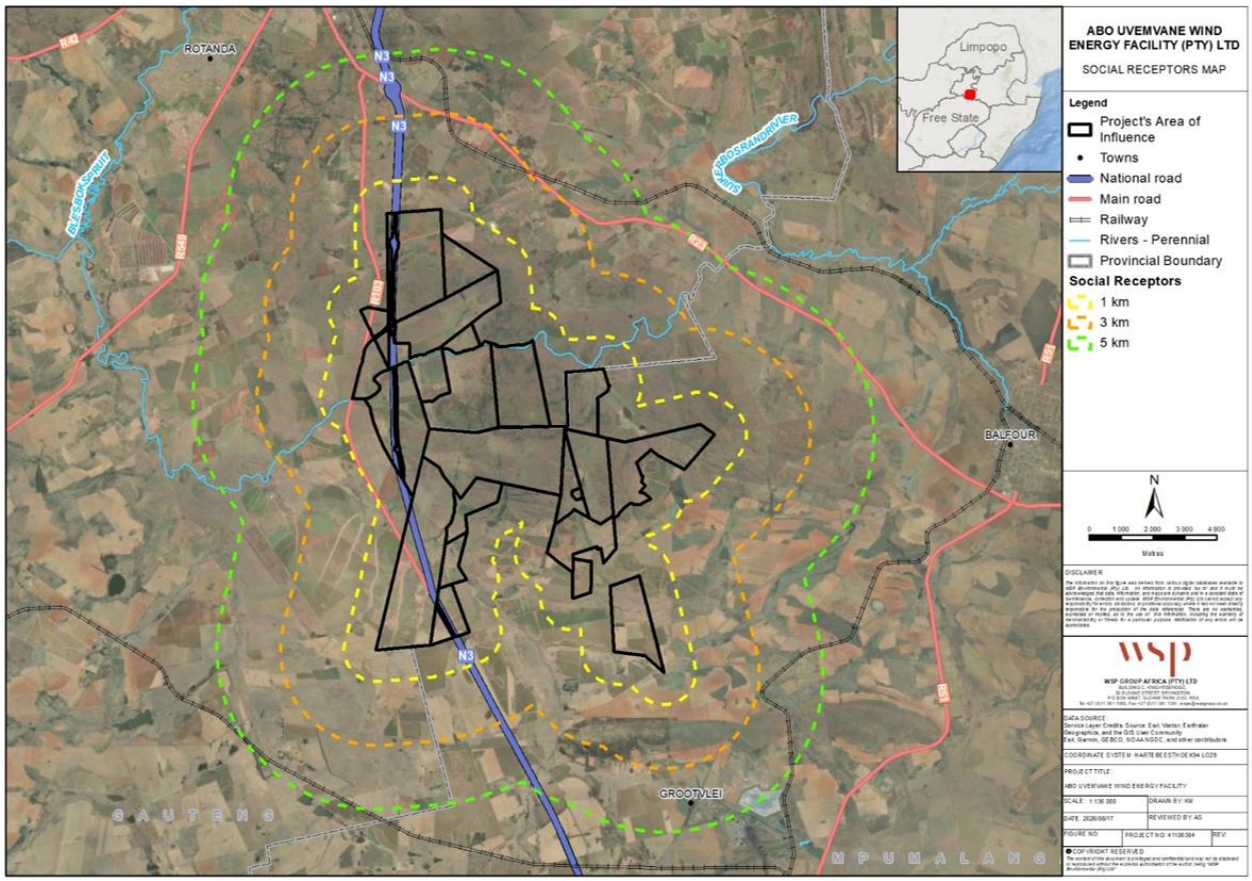

Figure 7-144 - Social receptors surrounding the proposed Project

7.3.6. HIGH-LEVEL SAFETY, HEALTH AND ENVIRONMENT RISK ASSESSMENT

The following is extracted from the High-level Safety, Health and Environment Risk Assessment compiled by ISHECONcc and included as Appendix G.15.

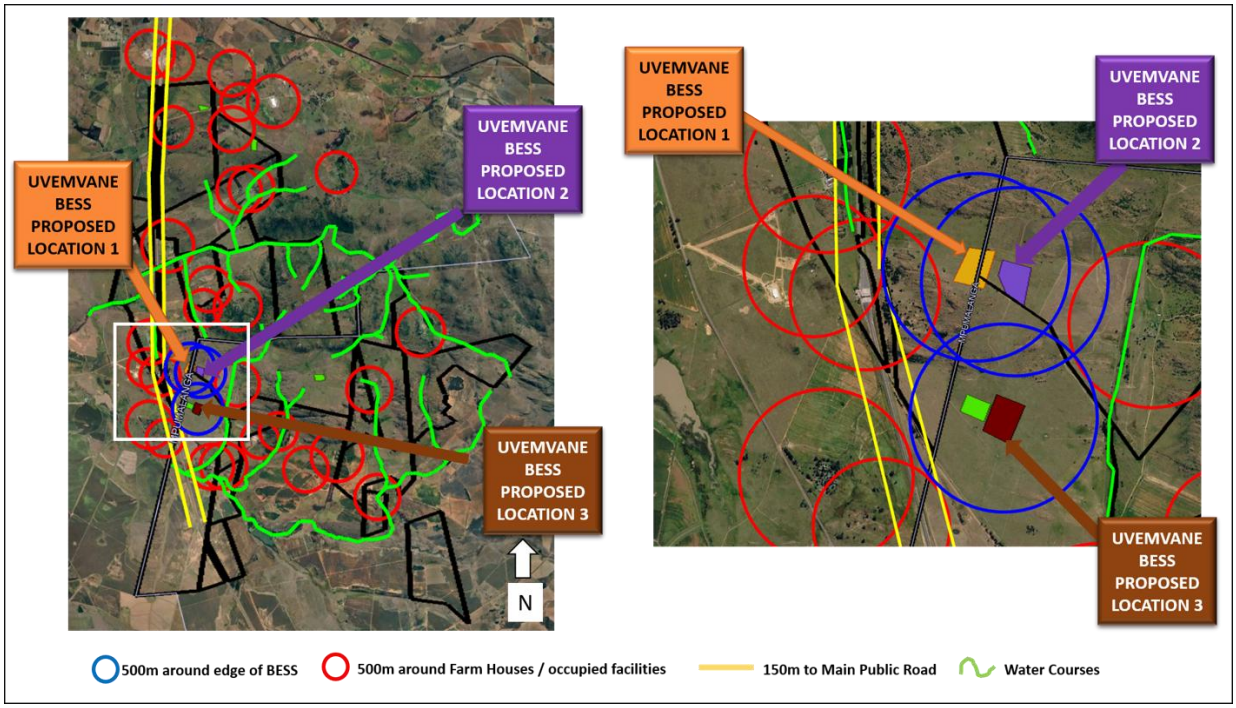

Figure 7-145 - 500m circles around the proposed electrical infrastructure hub where the BESS facility would be located within (Blue) and Location of Occupied Facilities (Red) and Nearby Water Courses/Bodies (Green) in the immediate vicinity of the BESS

7.3.6.1 LIthium batteries in general

One of the battery types being considered by the project proponent is lithium-ion based batteries.

Lithium-ion based battery systems are becoming one of the dominant technologies for utility systems in Europe and America. For this reason, this assessment assumes that lithium-based batteries will be used in the BESS facilities. Should sodium-based batteries be used, the hazards are likely to be similar at a high level but different in their details, and therefore the Risk Assessment may need to be reviewed.

Primary (non-rechargeable) batteries use lithium metal anodes. Lithium is one of the lightest and most reactive metallic elements and is highly reactive towards water and oxygen. Exposure of lithium metal to water even as humidity can decompose exothermically to produce flammable hydrogen gas and heat. These lithium metal batteries are not used in BESS systems. However, if secondary batteries discussed below are charged at temperatures below 0 °C, then lithium can plate out onto the anode surface and in this manner lithium metal could be present even in lithium-ion batteries.

Secondary, rechargeable lithium batteries, as used in bulk BESSs, use cathodes that contain lithium in the crystal structure of the cathode coating and/or lithium salts in an electrolyte that is in the battery. These are called lithium-ion batteries. Lithium-ion batteries operate at room temperature and have significant limitations outside the 0 – 50 °C range. The exact lithium-ion composition of the batteries can vary with suppliers. In addition, the technology allows for many combinations of chemistry to suit the particular application.

7.3.6.2 Lithium Battery Chemistry

Generally, for all lithium-ion based batteries the anode is made of solid carbon (graphite) and the cathode of a solid lithium metal oxide or phosphate. So the cathode can be for example lithium iron phosphate or lithium nickel manganese cobalt.

In between the cathode and anode is an electrolyte through which the electrons migrate. This electrolyte can come in many different forms.

Lithium-ion liquid batteries generally have a liquid electrolyte that is typically a lithium salt in an organic solvent. The electrolytes are typically ethylene carbonate or di-ethyl carbonate. The flash points of these carbonates can vary from 18 – 145 °C which means they can be highly flammable (FP < 60 °C) or merely combustible if involved in an external fire (FP > 60 °C). They may produce toxic and flammable gasses if involved in a fire.

Lithium-polymer batteries have a gel-like electrolyte that contains the lithium-ions in a flexible polymer, which is less flammable than the liquid solvent based system.

Lithium-solid state batteries have an electrolyte that contains the lithium-ions in a solid matrix that can be either an inorganic solid, solid polymer, polymer ceramic composite or a metal organic framework. These solid electrolyte have the advantage that they cannot leak out if the battery is damaged and that they can be made of non-flammable materials reducing the fire hazards. Some of the lithium compound in the electrolyte include lithium hexafluorophosphate, lithium perchlorate, lithium cobalt oxide etc.

7.3.6.3 Hazard - Thermal Decomposition

Upon heating of the contents of a battery due to shorting (e.g. due to dendrite formation, physical damage, water ingress etc), contaminants, external heat or exposure to water and reaction heat, the lithium salts in batteries can begin to break down exothermically to release either oxygen (oxidants) that enhances combustion, possibly leading to explosion, or fumes such as hydrogen fluoride or chlorine that are toxic.

These exothermic break down reactions are self-sustaining above a certain temperature (typically 70 °C for liquid batteries and) and can lead to thermal run away. In this process the battery gets hotter and hotter, the decomposition reactions happen faster and faster and excessive hot fumes are generated in the battery. Eventually the pressure in the battery builds up to the point where those gases need to be vented, usually via the weakest point in the system. These vented fumes can be flammable due to vaporization of the electrolyte (especially if liquid solvents but generally if hydrocarbon based) and can ignite as a flash fire or fire ball (if large amounts) leading to the fire spreading to any surrounding combustible materials, e.g., plastic insulation on cables, the electrolyte, the electrodes and possibly even the plastic parts of the battery casing etc. If the vented flammable vapours do not ignite immediately, they can accumulate within the surrounding structures. If this flammable mixture is ignited later, e.g., due to a spark, this can lead to a violent explosion of the module, cabinet, room, container etc.

In addition to being flammable the vented gases will contain toxic components. These could include:
the products of combustion such as carbon dioxide/monoxide, hydrogen cyanide,
VOCs like benzene and ethylene,
Depending on the exact battery chemical composition, decomposition products such as hydrogen fluoride, hydrogen chloride, phosphorous pentafluoride, phosphoryl fluoride and oxides of aluminium, cobalt, copper etc.

The temperature in the batteries and of these vented gases can be extremely high, e.g., > 600 °C.

In the situation where oxygen is released internally as part of the decomposition (e.g., lithium perchlorate) the oxygen is available to react with the combustible electrolyte and if all this happens extremely fast in a self-sustaining manner within the confines of the device, an explosion of the device can occur with only localized impacts.

7.3.6.4 Hazard – Propagation

A BESS is composed of individual batteries which are combined into different size packs such as modules and racks, as illustrated on the diagram below.

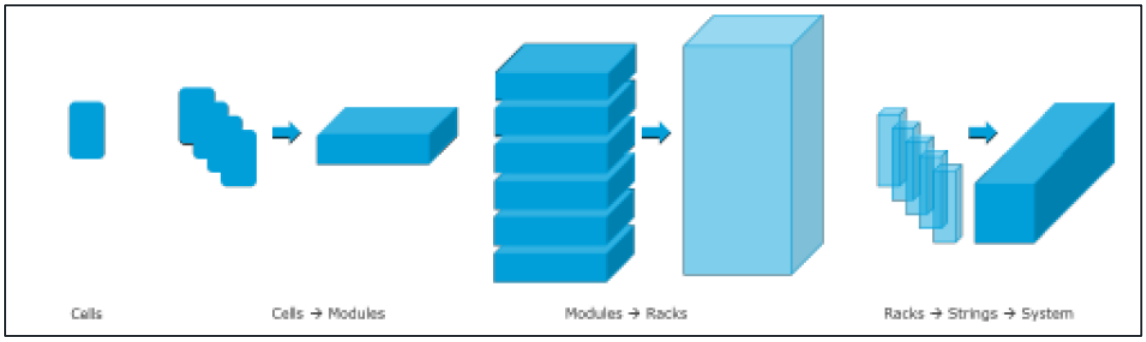

Figure 7-146 – Diagram 1 of battery structure

The very high temperature generated by one battery cell in thermal runaway could lead to overheating of adjacent cells. This cell in turn then starts thermal decomposition and so the process propagates through the entire system, as illustrated on the diagram below (**Figure 7-148**) In order to prevent propagation, there are separation requirements between cells, modules etc. Separation could be with physical space or insulating materials.

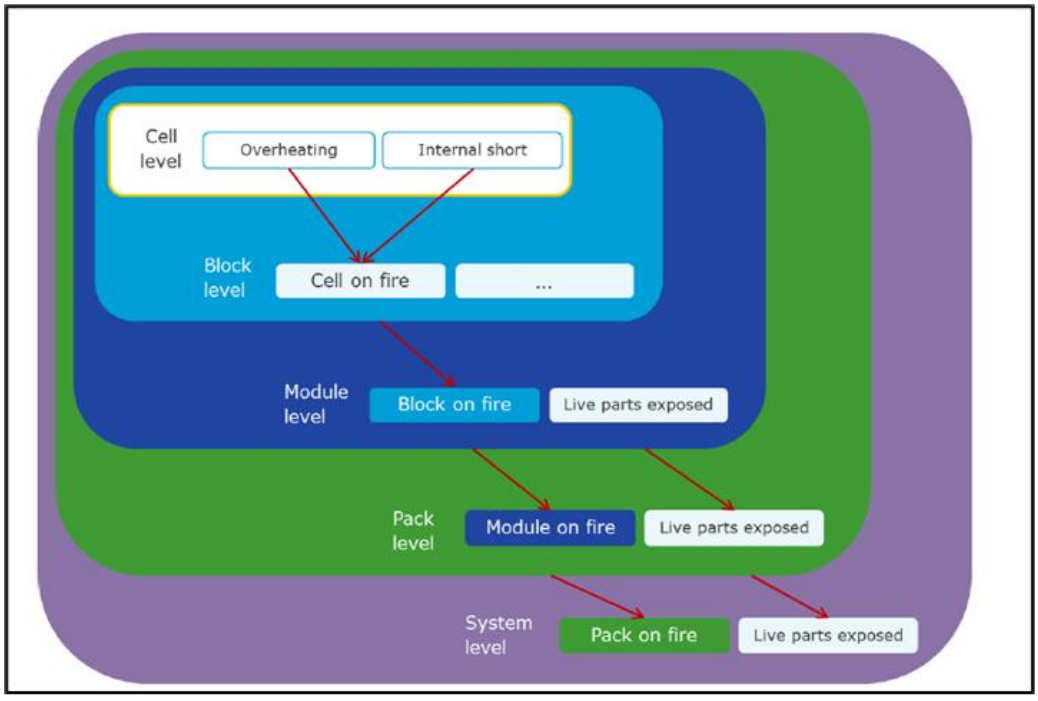

Figure 7-147 – Diagram 2 of battery structure

7.3.6.5 Hazard - Electrolyte Leaks from Liquid Phase Batteries

In the case of liquid or polymer batteries, although extremely unlikely due to the structure of the batteries, should electrolyte liquid leak out of the batteries, it can be potentially flammable as well as corrosive or toxic. If ignited as fire, or explosion, the smoke would contain toxic components. If unignited it can still be extremely harmful especially if its decomposition products include hydrofluoric acid.

One of the main safety advantages of solid state batteries is that flammable electrolyte leaks are not possible.

7.3.6.6 Hazard – Electrical Shock/Arc

Electrical shock presents a risk to workers and emergency responders, if the energy storage system cannot be “turned off”. This is referred to as “stranded energy” and presents unique hazards. Arc flash or blast is possible for systems operating above 100 V. Lithium-ion systems operate from 48 - 1000 V, depending on the battery design.

7.3.6.7 Vanadium Redox Flow Battery Hazards

Redox Flow Batteries in General

All electrochemical energy storage systems convert electrical energy into chemical energy when charging, and the process is reversed when discharging. With conventional batteries, the conversion and storage take place in closed cells. With redox flow batteries, however, the conversion and storage of energy are separated. Redox flow batteries differ from conventional batteries in that the energy storage material is conveyed by an energy converter. This requires the energy storage material to be in a flowable form. In redox flow batteries, charging and discharging processes can take place in the same cell. Redox flow batteries thus have the distinguishing feature that energy and power can be scaled separately. The power determines the cell size, or the number of cells and the energy is determined by the amount of the energy storage medium. In theory, there is no limit to the amount of energy that can be produced and/or stored thereby allowing for scalability of these systems.

Figure 7-148 shows the general operating principle of redox flow batteries. The energy conversion takes place in an electrochemical cell which is divided into two half cells. The half cells are separated from each other by an ion-permeable membrane or separator, so that the liquids of the half cells mix as little as possible. The separator ensures a charge balance between positive and negative half cells, ideally without the negative and positive active materials coming into direct contact with each other. In fact, however, separators are not perfect so some cross-over of the active materials always occurs and this leads to the self-discharge effect.

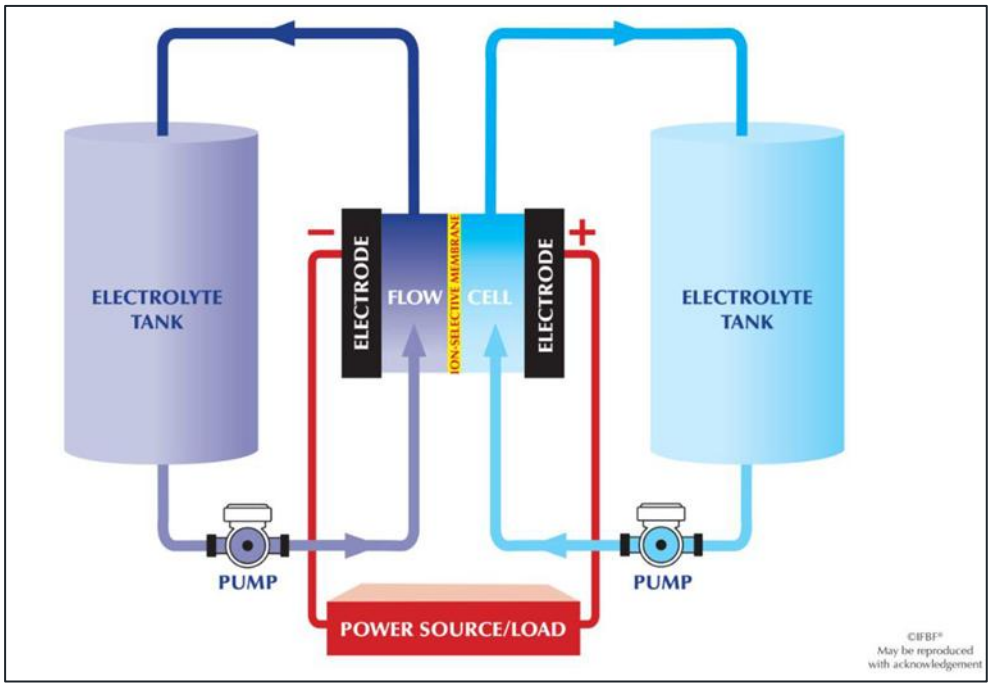

Figure 7-148 – Diagram 3 of battery structure

7.3.6.8 Vanadium Battery Chemistry

The vanadium redox battery (VRB), also known as the vanadium flow battery (VFB) or VRFB, is a type of rechargeable flow battery that employs vanadium ions in different oxidation states to store chemical potential energy. The vanadium redox battery exploits the ability of vanadium to exist in solution in four different oxidation states, and uses this property to make a battery that has just one electroactive element instead of two.

The possibility of creating a vanadium flow battery was explored by Pissoort in the 1930s, NASA researchers in the 1970s, and Pellegri and Spaziante in the 1970s, but none of them were successful in demonstrating the technology. The first successful demonstration of the all-vanadium redox flow battery which employed vanadium in a solution of sulfuric acid in each half was by Maria Skyllas-Kazacos at the University of New South Wales in the 1980s. In redox flow batteries, the electrodes should not participate in the reactions for energy conversion and should not cause any further side reactions (e.g., undesirable gas formation). Most redox flow batteries are therefore based on carbon electrodes.

The redox pair VO2+/VO2+ are at the positive electrode and the redox pair V2+/V3+ at the negative electrode. The use of the same ion in the positive and negative electrolytes permits relatively high concentrations of active material. It also overcomes the cross-contamination degradation issues which plague other flow type batteries. The energy storage solution consists primarily of vanadium sulphate in a diluted (2mol/L) sulphuric acid (possibly containing a low concentration of phosphoric acid) and is therefore roughly comparable to the acid of lead/acid batteries. The energy density is limited by the concentration of the pentavalent + VO2.

The vanadium redox flow battery is without doubt the best investigated and most installed redox flow battery for several reasons, including their relative bulkiness, most vanadium batteries are currently used for grid energy storage, i.e., attached to power plants or electrical grids. Currently, there are

over100 VRFB installations globally with an estimated capacity of over 209,800 kWh of energy and the use of vanadium in energy storage applications has doubled to 2.1% of the global vanadium consumption in 2018.

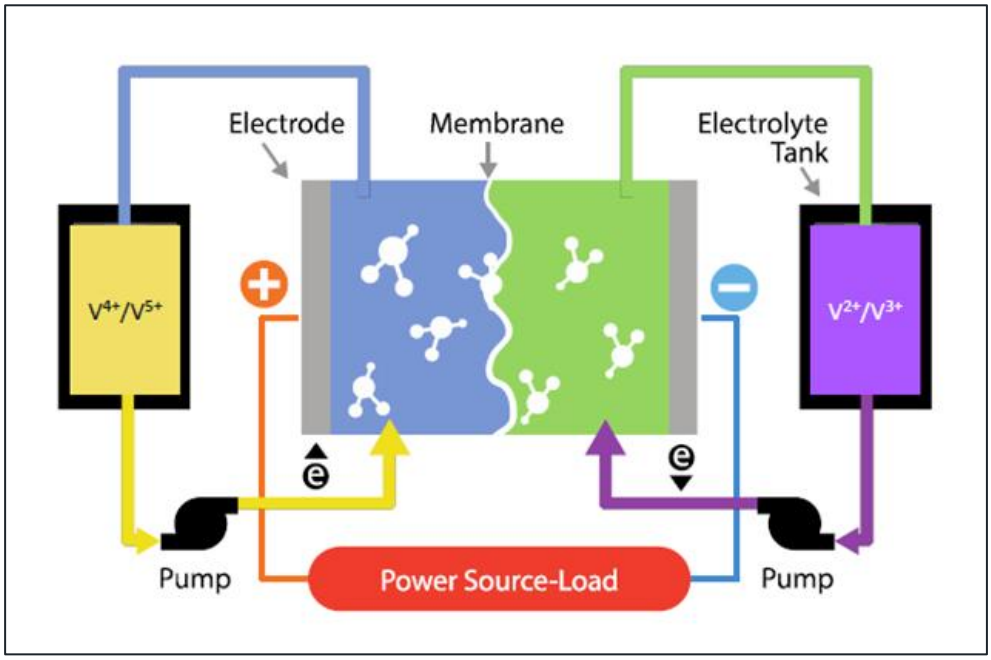

Figure 7-149 – Diagram 4 of battery structure

The electrolyte in the VRFB system is corrosive. It is composed of a sulphuric acid-based solution similar to common automotive lead acid batteries. Unlike traditional lead-acid batteries, VRBs do not include lead.

Therefore, VRBs do not have the toxicity issues of lead that conventional car batteries have. The only potential source of human toxicity in a VRB is Vanadium.

Vanadium in various physio-chemical states can have a relatively high aquatic and human toxicity. Acute oral exposure to high doses can lead to hemorrhaging, while chronic exposure leads to adverse effects on the digestive system, kidneys and blood (diarrhea, cramps etc.).

Inhalation hazards lead to irritation of the respiratory tract, bronchospasm, pulmonary congestion. There is little evidence that vanadium compounds are reproductive toxics or teratogens. There is also no evidence that it is carcinogenic (Source USA EPA Risk Assessment Information Systems, Toxicity Profiles, Vanadium 1998).

In the electrolyte the concentration levels of Vanadium are so low that when it is mixed into liquid form in the final product and put into operation, the VRB is deemed non-toxic. In addition, VRBs have a lower concentration of sulfuric acid than traditional lead-acid batteries. Vanadium poses a hazard when it is in powder form, i.e. when making up the electrolyte solution. The ABO Uvemvane WEF1 will purchase electrolyte already made up and there will be no solid vanadium powder on site.

Toxicity or corrosion risks may be present from off-gassing produced by over-heating aqueous or vaporized electrolytes. In addition, flow batteries in fire scenarios may generate toxic gas from the combustion of hydrocarbons, plastics, or acidic electrolytes. Refer to sections on fire below for mitigation measures.

7.3.6.9 Hazard – Electrical Shock/Arc

Electrical shock presents a risk to workers and emergency responders, if the energy storage system cannot be “turned off”. This is referred to as “stranded energy” and presents unique hazards. Arc flash or blast is possible for systems operating above 100 V.

In the area of shock hazard, a flow battery produces voltage only when electrolytes are in a cell stack. For most designs, if the motors are turned off and fluids drained from the cell stack, then the cell stacks have no measurable voltage at the terminals. This happens not only when the battery is forcible turned off but also in the standby mode as vanadium batteries do not include any metal plates to hold the chemical reactions / charges / voltages and can be fully drained when not in use.

If not fully drained, vanadium flow batteries are also unique in terms of short circuiting in that the internal dynamics of the battery are such that the energy discharge is limited to the fluid in the battery at any given time and the is typically less than 1% of the total stored energy. Therefore, together with the relatively low energy density of the vanadium electrolyte, the immediate release of energy, which occurs as a result of electrical shorting, is somewhat limited. The high heat capacity of the aqueous electrolyte is also beneficial in limiting the temperature rise.

Vanadium flow batteries have been tested under dead-short conditions resulting in normal operation with no danger to either equipment or personnel.

7.3.6.10 Hazard – Fire / Deflagration

Over 50% of the electrolyte solution is made up of water, which gives the electrolyte a non-flammable property. In the event of short circuiting, intense heat or high pressure, it is unlikely for the battery to catch fire. There is no “thermal runaway” risk when compared to other battery technologies.

Whilst some heat may be discharged from the battery, it will not be at a level that is deemed unsafe.

Like all other RFBs, VRFBs also have a battery management system. A battery management system ensures optimum and safe conditions for battery operation. Often a heat management system is integrated to avoid too high or too low temperatures.

7.3.6.11 Hazard - Hydrogen Generation

As with all other aqueous batteries, aqueous energy storage media from redox flow batteries are also subject to water limitations. In case of too high voltages or more precisely too high or too low half-cell potentials, the water is decomposed into its components, hydrogen and oxygen.

The generation of hydrogen in particular is often present as a very small but undesirable side reaction and causes a charge carrier imbalance between positive and negative half-cells, which leads to a slow loss of capacity. It also presents a fire / explosion hazard.

With VRFB, due to the flowability of the energy storage medium, the reaction products that would normally remain in the half-cell can be transported out of the cell and stored in separate tanks thus allowing the capability for a higher capacity than that attainable with conventional batteries. In addition, any deviations from safe operating parameter will trigger the shutdown of the system pumps ceasing to charge the electrolyte and thereby reducing the changes of accidental hydrogen generation. In addition, the thermal mass of the electrolyte tanks can provide an additional barrier to overcharging conditions by allowing ambient temperature during the discharge times to cool the VRFB for the next charge cycle.

7.3.6.12 Hazard – Waste Electrolyte

Unfortunately, pentavalent vanadium ions have a tendency to react with each other, which leads to the formation of larger molecules which precipitate as solids and can thus damage the system. The reaction depends on the temperature and the concentration of VO2+ (state of charge) but is also a function of the proton concentration. Temperature and concentrations therefore need to be controlled within specified ranges.

Should the concentration of undesirable components increase in the electrolyte, a part may need to be purged and replaced with fresh electrolyte. There may be facilities for regenerating purged electrolyte or it may have to be disposed of to a suitable hazardous waste facility.

7.3.6.13 Hazard - Electrolyte Leaks

Leaks must be expected in any hazardous-fluid handling equipment. Secondary containment is typically designed into the system and standard corrosive PPE is required for handling liquid. Reliable leak detection, warning alarms, and containment is paramount. As with any chemicals plant, a suitable design with detection, alarm and trip instrumentation that has been subject to thorough Hazop study should be in place, e.g., detection of dry running of pumps, detection of dead heading of pumps, prevention of reverse flow, detection of drop in tank levels etc.

7.3.6.14 Other Chemicals or Hazards

The BESS is composed not only of the batteries, but also electrical connections, switches, power converters, cooling systems etc. The diagram below shows a typical complex system for a lithium solid state facility.

7.3.6.15 Cooling Systems

Due to the need to keep the batteries within a specified temperature range most of the containerized modular system have built-in air-conditioning systems while the VRFB building systems may have cooling water systems. Some have only fans for air cooling with filters to remove dust prior to cooling. Others, particularly those in hot environments requiring more cooling, may have refrigerant-based systems. These would have a refrigerant circuit usually containing non-flammable non-toxic refrigerant such as R134a (simple asphyxiant) etc as well as a low hazard circulating medium such as an ethylene glycol-based coolant. At high temperatures above 250 °C R134 may decompose and may generate hydrogen fluoride and other toxic gases. Ethylene glycol is really only harmful if swallowed. In the environment it breaks down quickly and at low concentrations that would typically occur from occasional small spills, it has no toxicity

7.3.6.16 Fire Suppression Systems

Although these are only effective for some fire scenarios, some of the solid-state containerized systems come fitted with “Clean agent” fire suppressant systems. These are pressurized containers of powder/gases that are released into the container to snuff a fire and do not leave a residue on the equipment. Some containers have water sprinkler systems installed to quench thermal run-away reactions.

In general fire fighters may respond with water cannons/hydrants, foam systems etc. Such responses may generate large amount of contaminated and hazardous water runoff. A system to contain as much of this as possible should be in place.

7.3.6.17 General Electrical and Electronic Equipment

Whatever the configuration of the battery containers/ buildings there will be electrical and electronic equipment in the battery compartment, the battery building as well as outside. In some installations the main electrical equipment such as the power conversion system is in a separate compartment separated by a fire wall. In others it can be in a separate container.

Wherever there is electrical equipment there is a possibility of shorting and overheating and fire.

8 SITE SENSITIVITY AND VERIFICATION

8.1 DFFE WEB BASED ENVIRONMENTAL SCREENING TOOL

Specialist assessments were conducted in accordance with the Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes, which were promulgated in Government Notice No. 320 of 20 March 2020 and in Government Notice No. 1150 of 30 October 2020 (i.e. "the Protocols"), or Appendix 6 of the EIA Regulations, depending on which legislation apply to the assessment under consideration. A summary of the DFFE screening tool, the applicable legislation as well as the specialist sensitivity verification are detailed in **Table 8-1** below.

The complete Site Sensitivity Verification Report is included in **Appendix F.**

Table 8-1 - Assessment Protocols and Site Sensitivity Verifications

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification
Agricultural Impact Assessment	Protocol for the specialist assessment and minimum report content requirements of environmental impacts on agricultural resources by onshore wind and/or solar photovoltaic energy generation facilities where the electricity output is 20 megawatts or more.	High Sensitivity	**Medium to Low** The information received from the screening tool rates the Agricultural Sensitivity theme as 'Very High' citing "Pivot Irrigation; Land capability;09. Moderate-High/10. Moderate-High" as the main reason for the very high sensitivity. This rating is disputed by this assessment due to no evidence of pivot irrigation directly in the proposed WEF 1 project area. Such cultivation does, however, occur in areas adjacent to the WEF 1 area. Areas of high sensitivity rating by the screening tool are validated for category 1 soils but disputed for the other categories due to the mentioned restrictions to sustainable crop cultivation. The low sensitivity of the mountainous terrain in the central to northern parts of the project area is validated.
Animal Species Assessment	Protocol for the Specialist Assessment and Minimum Report Content Requirements	High Sensitivity	**Low to High Sensitivity** High in areas of undisturbed natural habitat.

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification
	for Environmental Impacts on Terrestrial Animal Species		Low in areas of modified habitat (e.g., cultivated fields and stands of alien trees).
Aquatic Biodiversity Impact Assessment	Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity	Very High Sensitivity	**Low to High Sensitivity** The Screening Tool indicated the site to be in an area mapped as being of Low Aquatic Biodiversity Sensitivity but with the aquatic features mapped as very high sensitivity. This assessment found the watercourses and wetlands on the site to be of high sensitivity. Buffer zones of 50m on either side of the watercourses and 100m from the wetlands are deemed sufficient to protect these aquatic ecosystems from any impact arising from the proposed WEF. Low for the widespread area and High for the watercourses and wetlands within the site. A medium sensitivity has been applied to the adjacent buffers.
Archaeological and Cultural Heritage Impact Assessment	Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed	Very High Sensitivity	**Very High Sensitivity** The cultural value of the broader area has significance in terms of its settler and agricultural history, with intact cultural landscape resources located within the development area. Furthermore, Significant Iron Age archaeological heritage was identified within the development area.
Avifauna Assessment	Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Avifaunal Species by Onshore Wind Energy Generation	Low Sensitivity	**High Sensitivity** The Site Inspection and one year of avifaunal pre-application/pre-construction monitoring confirmed that the site is of high sensitivity

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification
	Facilities where the Electricity Output is 20 Megawatts or more		for 12 SCC. No nests or breeding sites of SCC were identified on the site.
Bat Assessment	Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed	High Sensitivity	**High Sensitivity** The DFFE Screening Tool classified the area as a High Sensitive area for bats, and based on the desktop survey, ground truth and data obtained, the result could not be refuted. The rivers, open water and wetlands alone are highly sensitive areas, but there are also a large number of roosts in the area and mine shafts. These factors are the likely causes for the large number of bats recorded thus far during the monitoring period.
Civil Aviation Assessment	Protocol For The Specialist Assessment And Minimum Report Content Requirements For Environmental Impacts On Civil Aviation Installations	Medium Sensitivity	**Low Sensitivity** According to the DFFE Screening Tool Report, civil aviation is regarded as having medium sensitivity. due to the project being located between 8 and 15 km of other civil aviation aerodrome Therefore, a compliance statement is required as per the protocol specifications. The relevant Authorities have been included in the project stakeholder database including the Air Traffic and Navigation Services (ATNS) and the South African Civil Aviation Authority (SACAA). These stakeholders have been informed of the proposed Project, and comments have been sought from these authorities as applicable. Proof of notification of the stakeholder is included in the SER (Appendix E of the

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification
			DEIR) and no comments were received to date.
Defence Assessment	Protocol For the Specialist Assessment and Minimum Report Content Requirements For Environmental Impacts on Defence installations	Medium Sensitivity	**Low Sensitivity** ABO Energy South Africa (Pty) Ltd submitted a wayleave request in terms of Section 29 of the Electronic Communications Act (Act 36 of 2005) to SANDF on 16/02/2026. Correspondence received from the DoD confirmed that the department has no objection to the proposed project ,as the project is not located in proximity to military infrastructure, will not intrude into DoD communication installation buffers, and is not situated within aviation-related buffers that could affect South African Air Force operations. Refer to the comment letter included in the SER (**Appendix E**)
Flicker Assessment	Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed	Very High Sensitivity	**Very High Sensitivity** Development is located in close proximity to verified inhabited residences / homesteads and built-up / residential areas within the study area.
Landscape/Visual Impact Assessment		Very High Sensitivity	**High Sensitivity** Development is located within the buffer of a national road and on a topographical feature. In addition, numerous inhabited homesteads, hydrological features, as well as mountains and tall hills are situated in close proximity to the project site.

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification
Palaeontology Impact Assessment	Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed	Very High Sensitivity	**Medium Sensitivity** It is anticipated that the impact of the development will mainly be **Low to Moderate** as only small sections of the development area are underlain by the sensitive Vryheid Formation.
Noise Assessment	Protocol for Specialist Assessment and Minimum Report Content Requirements for Noise Impacts	Very High Sensitivity	**Very High Sensitivity** There are numerous permanent or temporary residential activities within the project area. These residential activities are considered to be noise-sensitive, and the areas are considered to have a “Very High” sensitivity to noise.
Plant Species Assessment	Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant Species	Medium Sensitivity	**Medium Sensitivity** Medium in areas of undisturbed natural habitat. Low in areas of modified habitat (e.g., cultivated fields and stands of alien trees).
RFI Assessment	Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed	High Sensitivity	**Low Sensitivity** ABO Energy South Africa (Pty) Ltd has engaged with SAWS and relevant telecommunications stakeholders prior to the S&IER application process regarding the proposed project. The Applicant received confirmation that the proposed project will not impact SAWS. All correspondence received to date for the project in Appendix D.
Terrestrial Biodiversity Impact Assessment	Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity	Very High Sensitivity	**Very High Sensitivity** Large areas of natural habitat are present on-site, and these maintain important ecosystem processes and support

Specialist Assessment	Assessment Protocol	DFFE Screening Tool Sensitivity	Specialist Sensitivity Verification
			many indigenous flora and fauna species. For natural habitat patches, the 'Very High' sensitivity rating for Terrestrial Biodiversity therefore is confirmed. For patches of modified habitat (cultivated fields and stands of alien trees), the sensitivity rating is considered Low.
Vulture Species Assessment	Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Cape Vultures by Onshore Wind Energy Generation Facilities where the Electricity Output is 20 Megawatts or more	Medium Sensitivity	**Medium Sensitivity** The Screening Tool's Vulture Species Theme identified the study area as of medium sensitivity for vulture species due to the area affecting between 5% - 10% of the population. The survey effort was in line with the Cape Vulture Guidelines; therefore, the Pre-application Avifaunal Monitoring Plan did not require further revision, as the collected data is deemed sufficient to represent the majority of vulture movement on site.
Traffic Impact Assessment	Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed	No sensitivity identified by the screening tool	N/A
Geotechnical Assessment	Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed	No sensitivity identified by the screening tool	N/A
Socio Economic Assessment	Site Sensitivity Verification Requirements where a specialist Assessment is required but no Specific Assessment Protocol has been prescribed.	No sensitivity identified by the screening tool	N/A

8.2 CONSOLIDATED SITE SENSITIVITY

The sensitivity input provided by specialists was utilised to compile Consolidated Site Sensitivity Maps (**Figure 8-1, Figure 8-2 , Figure 8-3 and Figure 8-4**).

The maps in **Figure 8-1** and **Figure 8-2** have been overlain by the **preliminary project** layout for WEF 1 and WEF 2, respectively. Based on the input received from the specialists during the Scoping Phase, the layout was then optimised and the number of WEFs reduced to one WEF.

The consolidated sensitivity map is overlain by the **optimised project layout** in **Figure 8-3**.

The consolidated sensitivity map is overlain by the **revised optimised project layout** in **Figure 8-4**.

Figure 8-5 illustrates both the preliminary and optimised layouts for comparison purposes.

This “optimised” layout was further refined to produce the **DEIR Assessed Layout** which formed the basis of the specialist assessments included in this report. **Figure 8-6** presents the combined environmental sensitivity map overlaid with the DEIR Assessed Layout (Final Layout). To improve readability, **Figure 8-7** presents the same combined sensitivity map with heritage sensitivities excluded, as the inclusion of heritage resources results in a highly congested map and makes it more difficult to interpret the underlying environmental sensitivities and layout considerations.

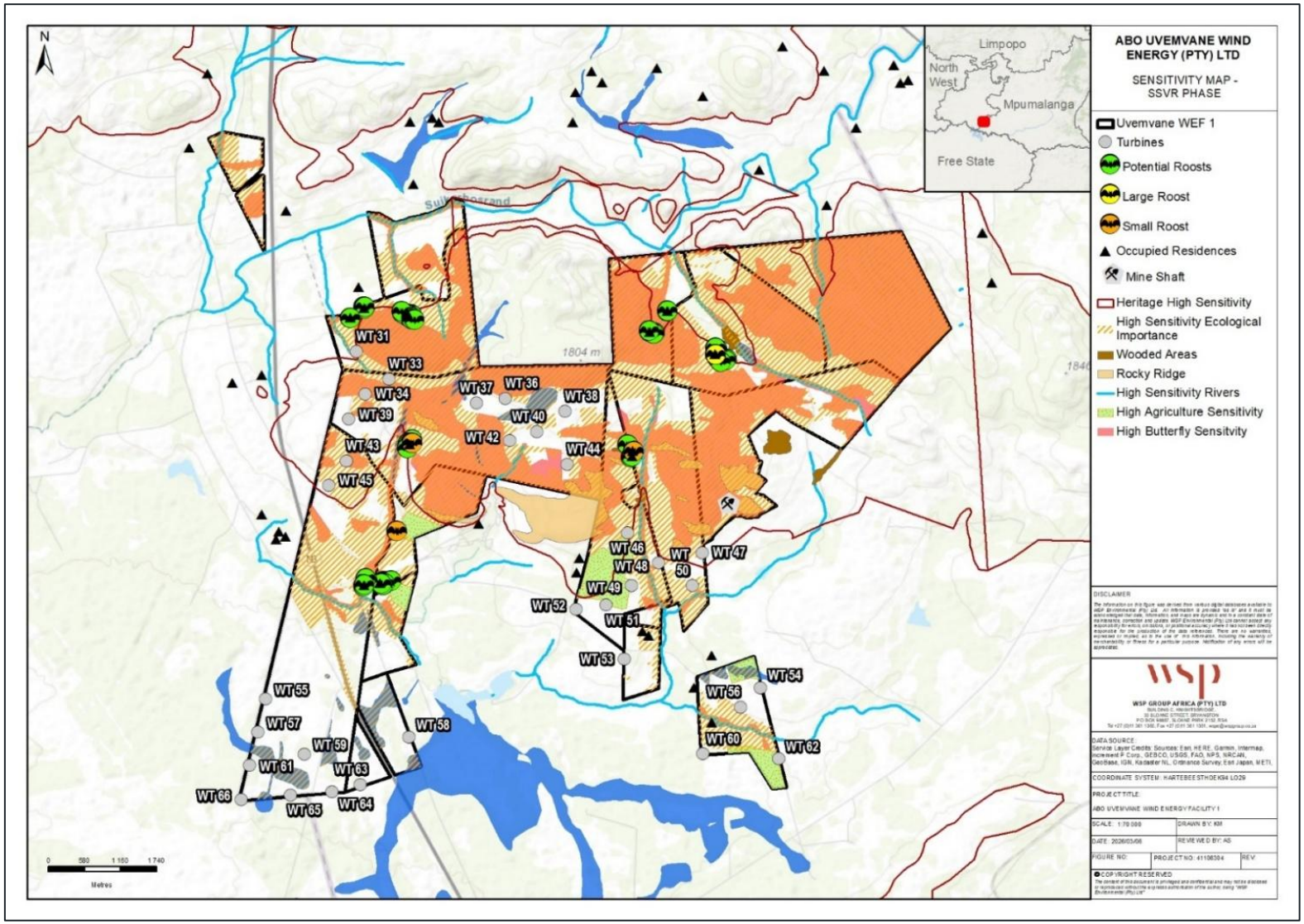

Figure 8-1 - WEF 1: Consolidated Site Sensitivity Map overlain by Preliminary Project Layout (SSVR Phase)

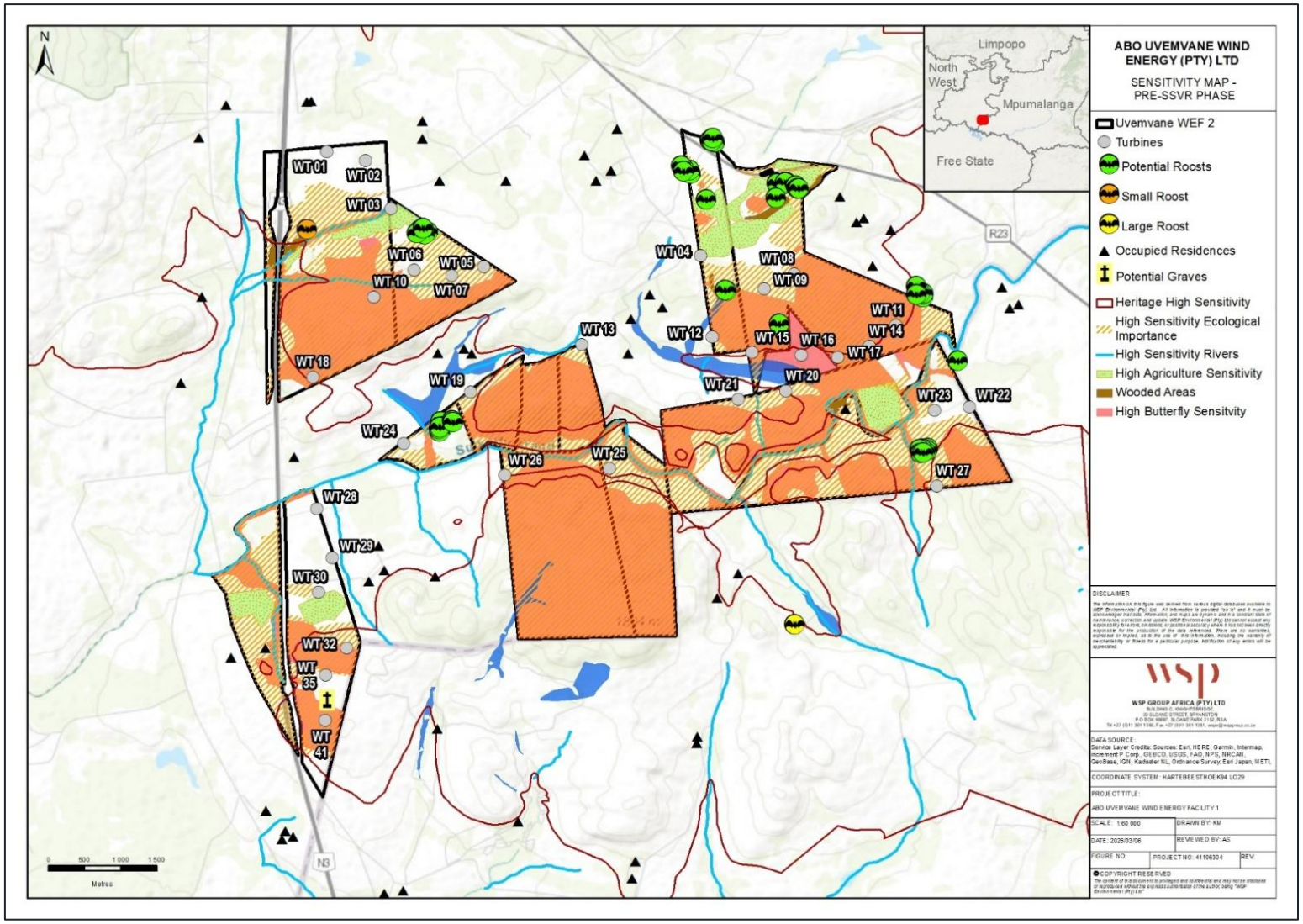

Figure 8-2 - WEF 2: Consolidated Site Sensitivity Map overlain by Preliminary Project Layout (SSVR Phase)

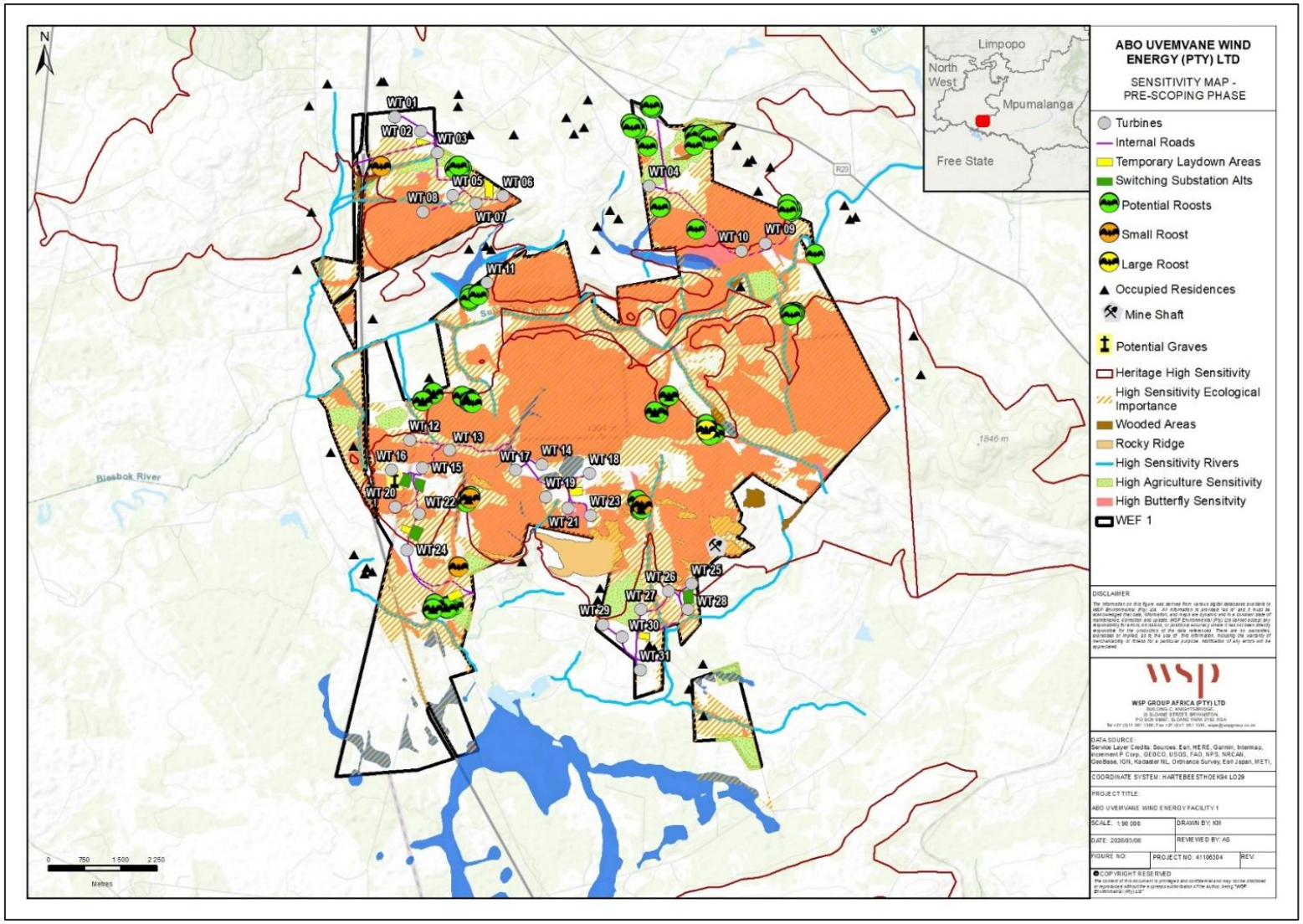

Figure 8-3 – WEF 1: Consolidated Site Sensitivity Map overlain by Optimised Project Layout (Pre-Scoping Phase - 31 turbines).

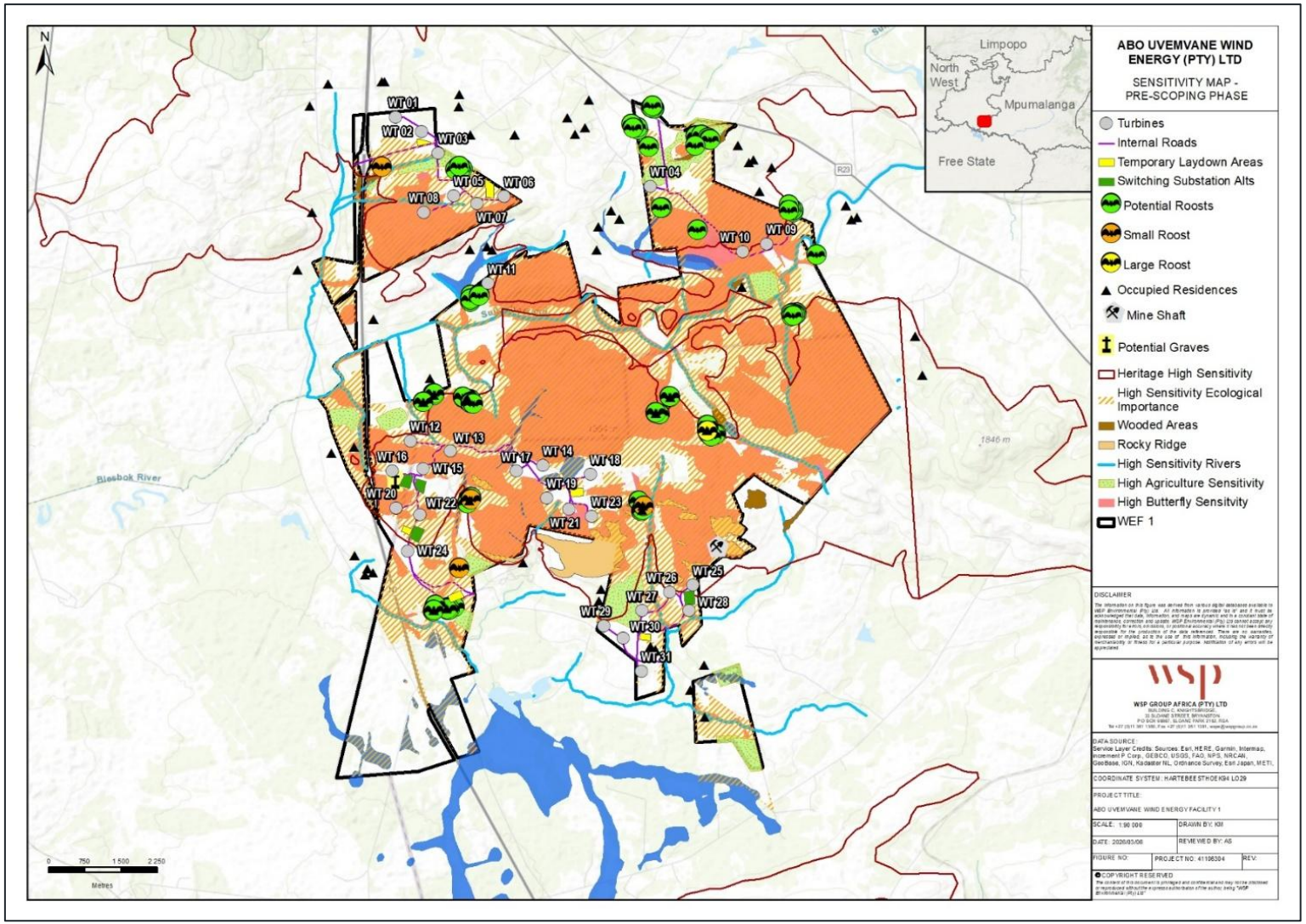

Figure 8-4 - WEF 1: Consolidated Site Sensitivity Map overlain by Revised Optimised Project Layout (Scoping Phase - 27 turbines)

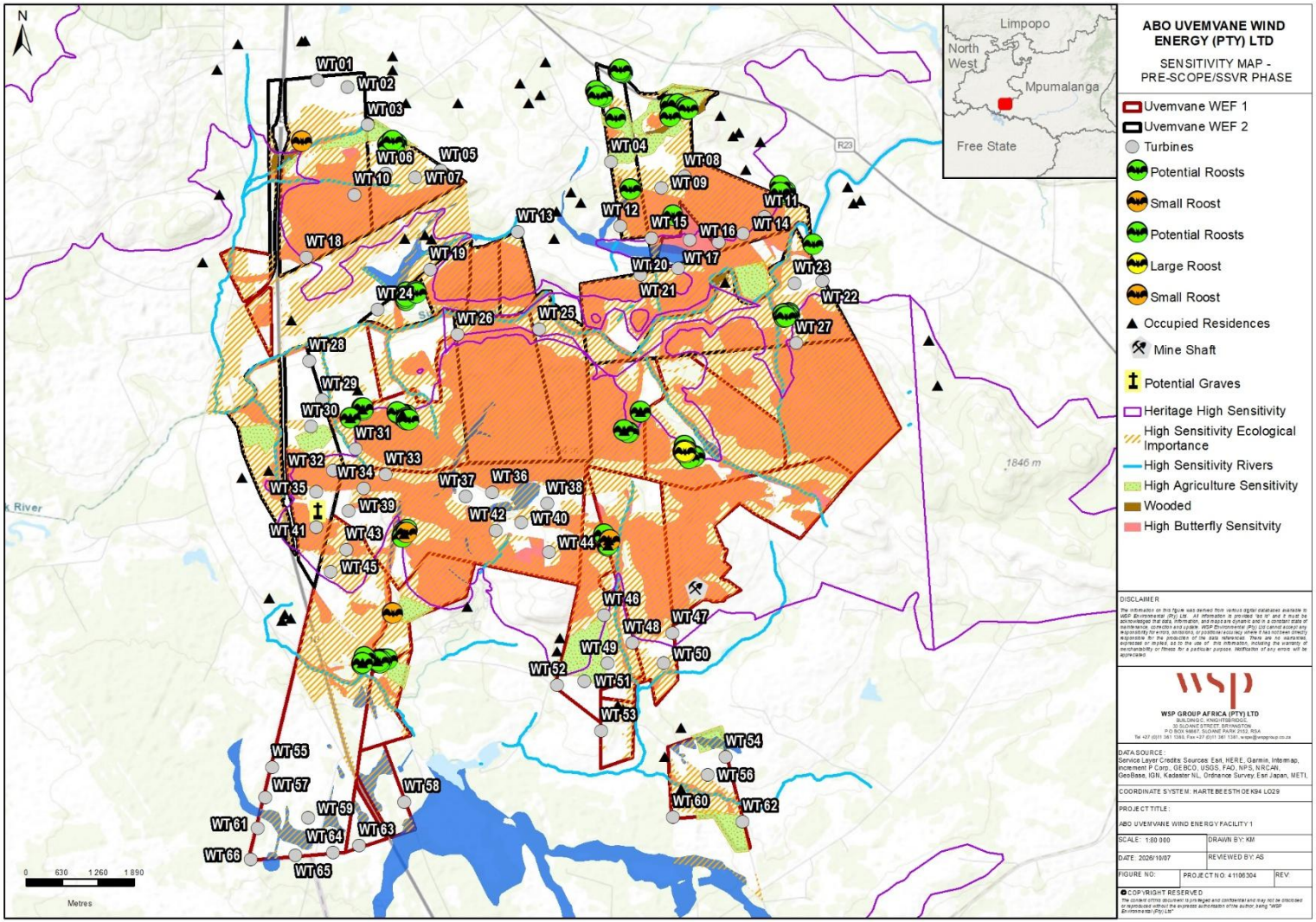

Figure 8-5 - WEF 1: Map illustrating the Preliminary and Optimised Layouts for comparison

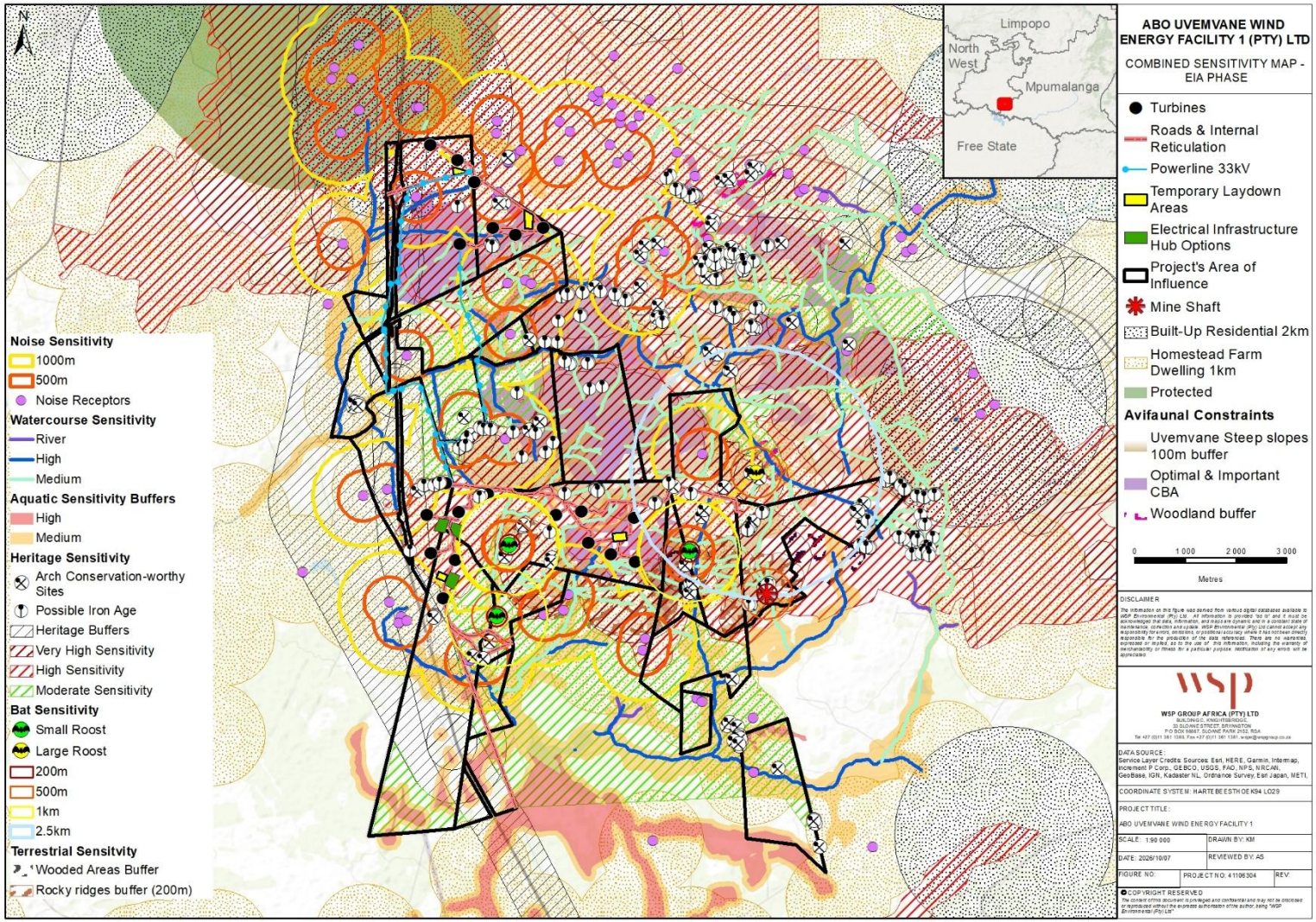

Figure 8-6 - WEF 1: <u>Consolidated sensitivity Map illustrating the ABO Uvemvane WEF 1 Final Layout.</u>

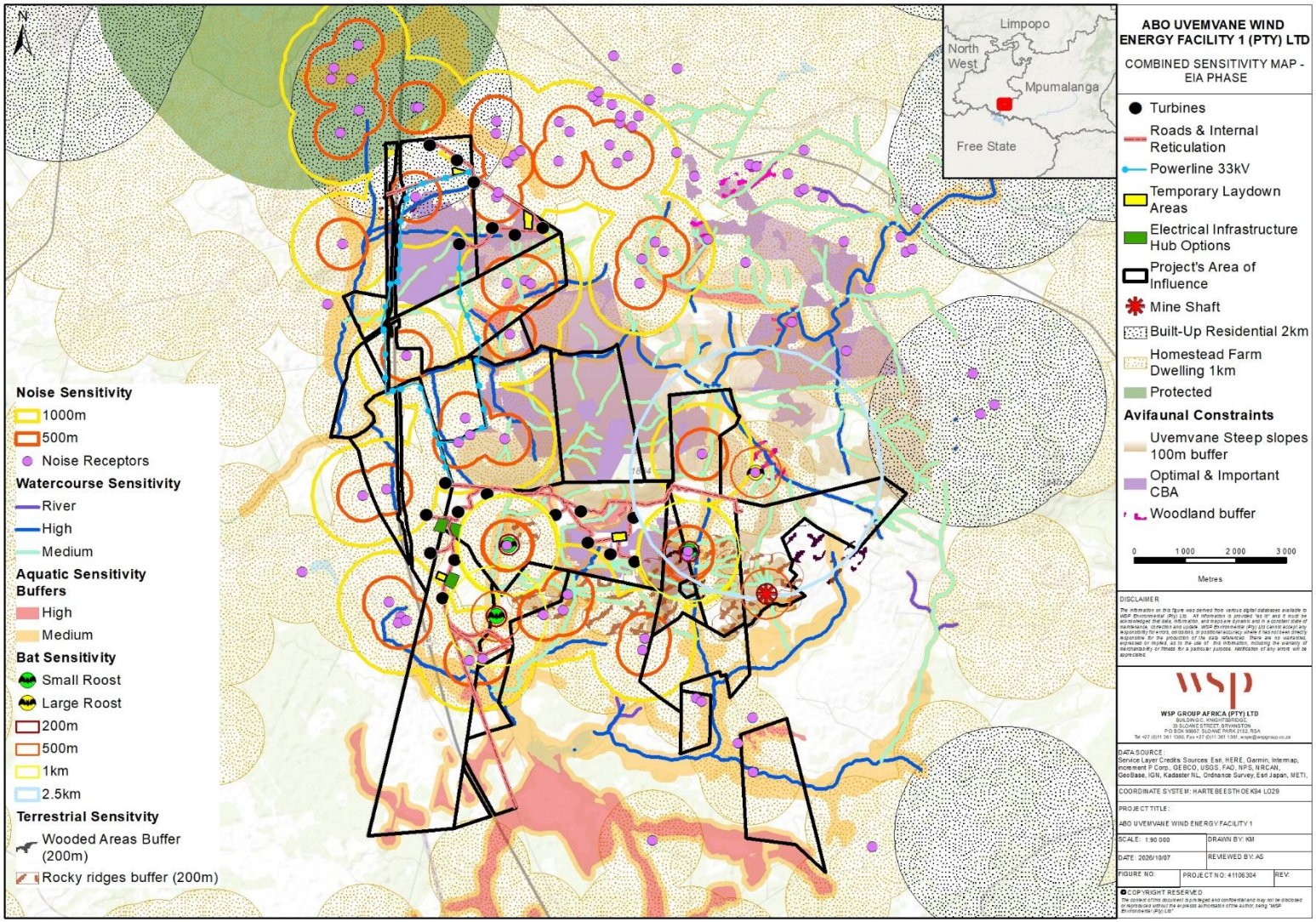

Figure 8-7 - WEF 1: Map illustrating the ABO Uvemvane WEF 1 Final Layout (without heritage sensitivities).

9 ENVIRONMENTAL IMPACT ASSESSMENT

This Chapter identifies the environmental and social impacts associated with the proposed Project. The assessment methodology is outlined in **Section 3.3**.The issues identified stem from those aspects presented in **Sections 7** and **8** of this document as well as the Project description provided in **Section 4**.The impact assessment in this section encompasses the geographical, physical, biological, social, economic, heritage and cultural aspects in accordance with Appendix 1 of GNR 326.

9.1 PHASE OF DEVELOPMENT

Potential impacts have been identified and preliminarily assessed according to the phases of the project's development. For the purpose of this project, these phases have been generically defined below.

- Construction Phase:
  - The construction phase includes the preparatory works/activities typically associated with the creation of surface infrastructure, access and electrical power. The activities most relevant to this phase include:
    - Topsoil stripping;
    - Cut and fill activities associated with site preparation (if required); and
    - Construction of the surface infrastructure including turbine foundations, turbines, invertors, access roads, site substation and internal powerlines/cabling.
- Operational Phase:
  - The operational phase includes the daily activities associated with the wind energy facility.
- Decommissioning:
  - The decommissioning phase includes the activities associated with the removal/dismantling of machinery/equipment/infrastructure no longer necessary to the operation

9.2 ACTIVITIES MATRIX

The impacts below have been assessed according to environmental categories. **Table 9-1** provides an indication of how these environments are linked to the various NEMA listed activities outlined in **Section 6**.

Table 9-1 – Activities Matrix (C – Construction, O – Operation, D – Decommissioning)

Listed Activity	Agriculture	Terrestrial Biodiversity	Aquatic	Heritage	Plant species	Animal species	Avifauna	Bats	Visual/Landscape	Noise	Traffic	Geotechnical	Social	Butterflies	SHE Risk
GNR 983- Listing Notice 1															
11 (i)	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD
12(ii)(a)(c)	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD
14	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD
19	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD
24 (ii)	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD
28 (ii)	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD
48(i)(a)(c)	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD
56(i)(ii)	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD
GNR 984- Listing Notice 2															
1	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD

Listed Activity	Agriculture	Terrestrial Biodiversity	Aquatic	Heritage	Plant species	Animal species	Avifauna	Bats	Visual/Landscape	Noise	Traffic	Geotechnical	Social	Butterflies	SHE Risk
15	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD
GNR 985 Listing Notice 3															
3(a)(b)(c)(iv)(f)(ee)	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD
4(c)(iv)(f)(i)(ee)	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD
10(c)(iv)(f)(i)(cc)(ee)(hh)	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD
12(c)(ii)(f)(i)(ii)	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD
14(ii)(a)(c)(c)(iv)(f)(i) (dd)(ff)	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD
18(c)(v)(f)(i)(cc)(ee)	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD
23(ii)(a)(c)(c)(iv)(f)(i) (cc)(ee)	COD	CD	COD	C	COD	COD	COD	COD	COD	COD	CD	C	COD	COD	COD

9.3 SOIL, LAND USE AND LAND CAPABILITY

9.3.1. Construction Phase

Table 9-2 – Agricultural land use change because of construction

Potential Impact: • Occupation of agricultural land for WTG and related WEF infrastructure construction leading to the loss of agricultural productivity • Fragmentation of croplands and other productive agricultural areas	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	2	1	2	2	4	**24**	**Low**	(-)
With Mitigation	2	1	2	2	1	**7**	**Very Low**	(-)
Mitigation and Management Measures	• WTG hardstands and other construction sites should be fenced off before construction commences and construction activities must be confined to the immediate footprint of the planned infrastructure. Access to the adjacent croplands or grazing rangelands should be strictly controlled to prevent unnecessary disturbance or destruction of agricultural potential. • Maximum use should be made of existing access and internal roads, and the construction of new roads should be kept to a minimum. Where new roads need to be constructed, locate such roads outside of cropland boundaries to mitigate possible production losses and cropland fragmentation. • Off-road driving should be strictly prohibited.							

Table 9-3 - Land and soil degradation-construction phase

Potential Impact: • Soil works, blasting, excavations and trenching for the development of WTG hardstands, access roads, cable networks and other project related infrastructure leading topsoil erosion and dust pollution of adjacent crops. • Pollution of agricultural resources due to dust effects, fuel- and chemical spills, poor sanitation- and waste practices • Disturbance of topsoil leading to altered habitats where Alien Invasive Plants (AIP) may establish and spread	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	3	3	3	3	**36**	**Moderate**	(-)
With Mitigation	3	2	2	2	2	**18**	**Low**	(-)
Mitigation and Management Measures	• Ensure that soil conservation and counter-erosion measures are implemented at all construction sites i.e. berms, soil traps, hessian curtains, and storm water diversion away from areas susceptible to erosion. A							

Potential Impact: • Soil works, blasting, excavations and trenching for the development of WTG hardstands, access roads, cable networks and other project related infrastructure leading topsoil erosion and dust pollution of adjacent crops. • Pollution of agricultural resources due to dust effects, fuel- and chemical spills, poor sanitation- and waste practices • Disturbance of topsoil leading to altered habitats where Alien Invasive Plants (AIP) may establish and spread	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	system of storm water management, which will prevent erosion, will be an inherent part of the road engineering on site. • As part of storm water management, the integrity of any contour bank systems or other erosion control on nearby croplands, must be kept intact. Any occurrences of erosion must be attended to immediately and the integrity of the erosion control system at that point must be amended to prevent further erosion from occurring there. • Ensure that dust suppression mitigation measures are implemented on construction sites • Construction vehicles should be well maintained to prevent oil and other chemically based materials entering the area. Refuelling and/or servicing points should be well managed and if any soil is contaminated, it should be stripped and disposed of at a registered hazardous waste dumping site. • Speed limits on project related roads must be kept to a minimum. No unnecessary off-road driving is to be allowed. • Close and rehabilitate excavations and trenches immediately after completion of activity • Proliferation of AIP species is expected within any disturbed areas. If observed species should be eradicated and controlled to prevent their spread beyond the construction footprint. Alien plant seed dispersal within the top layers of the soil within construction footprint areas, which will have an impact on future rehabilitation, must be controlled. A management plan and proper follow-up strategy for the prevention of the establishment and/or further spread of new populations of such species should be developed and enforced • Removal of all AIP species encountered in the project area must take place to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983; Section 28 of the National Environmental Management Act, 1998; NEMBA, 2004). Care should be taken with the choice of herbicides to ensure that no additional impact and loss of indigenous plant species occur due to the use of herbicides. Proper training should be given to contractors/applicators to avoid spraying non-target vegetation						

Table 9-4 – Disruption or prevention of farming operations construction phase

Potential Impact: • Construction activities are likely to cause some degree of interference with farming activities when large bulky Wind Turbine Generator (WTG) components are delivered to the different hardstands • Prevention of crop spraying by aircraft over cultivated land where WTGs are being developed.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	2	3	3	3	**22**	**Low**	(-)
With Mitigation	1	1	1	1	1	**4**	**Low**	(-)
Mitigation and Management Measures	• Plan the delivery of WTG components in collaboration with land users and avoid high activity seasons on the farm such as harvest and planting season if possible. This will avoid road congestion and frustration for both the developer and local farmers. • Ground based spraying or the use of drones for spraying are effective and provide alternative methods that can be used without implications for crop production or profitability							

9.3.2. OPERATION PHASE

Table 9-5 – Land and soil degradation operational phase

Potential Impact: • Denuded areas within WTG hardstands, poor maintenance of access roads leading to uncontrolled storm water flows causing soil erosion and siltation of adjacent croplands and other areas. • Pollution of agricultural resources due to dust effects, fuel- and chemical spills, poor sanitation- and waste practices, etc. • Proliferation of Alien Invasive Plants (AIP).	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	2	3	3	3	**22**	**Low**	(-)
With Mitigation	3	1	2	3	1	**9**	**Very Low**	(-)
Mitigation and Management Measures	• Ensure that soil conservation and counter-erosion measures are well maintained and regularly monitored for degradation or failures • Ensure that dust suppression mitigation measures are implemented on operational sites where applicable • Operational/maintenance vehicles should be well maintained to prevent oil and other chemically based materials entering the area • Speed limits on project related roads must be kept to a minimum. No unnecessary off-road driving is to be allowed • Monitoring AIP populations on project related areas must be regularly done and the AIP management plan concisely followed							

Table 9-6 – Disruption or prevention of farming operations – operational phase

Potential Impact: Prevention of crop spraying by aircraft over land where operational WTGs are positioned.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	2	3	2	**20**	**Low**	(-)
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
Mitigation and Management Measures	• Ground based spraying or the use of drones for spraying are effective and provide alternative methods that can be used without implications for crop production or profitability.							

Table 9-7 – Positive impacts project lifetime (All Phases)

Potential Impact: • Landowners are compensated financially through fixed rental income and other incentives. This income supersedes the income that is obtainable trough crop or livestock production on areas affected by the development. The rental income diversifies the landowner's revenue streams, which can be especially valuable in times where agricultural production may be variable or less stable. • Local infrastructure improvements – an improved road network, with associated storm water handling system. The WEF will construct turbine access roads of a higher standard than the existing farm roads which will give farming vehicles better access to farmlands. This will be especially relevant during wet periods when access to croplands for spraying etc is limited by the current farm roads. • Improved local security due to the increased presence of security at the WEF construction sites and in the general area of WTG for the lifetime of the project	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	4	**52**	**Moderate**	(+)
Mitigation and Management Measures	No mitigation needed.							

9.3.3. DECOMMISSIONING PHASE

Table 9-8 – Land and soil degradation – decommissioning phase

Potential Impact: • Denuded areas of deconstructed WTG hardstands, cessation of maintenance to access roads leading to uncontrolled storm water flows causing soil erosion and siltation of adjacent croplands and other areas. • Pollution of agricultural resources due to dust effects, fuel- and chemical spills, poor sanitation- and waste practices, etc • Proliferation of Alien Invasive Plants (AIP) after decommissioning.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	2	3	3	3	**22**	**Low**	(-)
With Mitigation	3	1	2	3	1	**9**	**Very Low**	(-)
Mitigation and Management Measures	• Ensure that soil conservation and counter-erosion measures are well maintained and regularly monitored for degradation or failures during and after decommissioning. • Facilitate the re-vegetation of denuded project related areas to stabilize disturbed soil against erosion. • Ensure that dust suppression mitigation measures are implemented during the decommissioning phase. • Vehicles involved during this phase should be well maintained to prevent oil and other chemically based materials entering the area. Refuelling and/or servicing points should be well managed and if any soil is contaminated, it should be stripped and disposed of at a registered hazardous waste dumping site. • All waste and components generated by the deconstruction of project infrastructure must be handled with care to avoid environmental pollution. All waste / components should be removed to an approved recycling or disposal site in line with the project EMPr. • Speed limits on project related roads must be kept to a minimum. No unnecessary off-road driving is to be allowed. • Post-decommissioning monitoring of AIP populations on project related areas must be done and the AIP management plan developed to cover the decommissioning phase and a suitable period thereafter.							

Table 9-9 - Disruption or prevention of farming operations – decommissioning phase

Potential Impact: • Decommissioning activities are likely to cause some degree of interference with farming activities when large bulky Wind Turbine Generator (WTG) components are removed from the different hardstands. • Prevention of crop spraying by aircraft over land where WTGs are being developed.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**	**Character**

Without Mitigation	3	2	2	3	2	**20**	**Low**	(-)
With Mitigation	1	1	1	1	1	**4**	**Very Low**	(-)
Mitigation and Management Measures	• Plan the removal of project related waste and components in collaboration with land users and avoid high activity seasons on the farm such as harvest and planting season if possible. This will avoid road congestion and frustration for both the developer and local farmers. • Ground based spraying or the use of drones for spraying are effective and provide alternative methods that can be used without implications for crop production or profitability.							

9.4 TERRESTRIAL BIODIVERSITY

9.4.1.1 Construction Phase

Table 9-10 – Terrestrial habitat

Potential Impact: Direct loss and disturbance of natural habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	3	5	5	**75**	**High**	(-)
With Mitigation	4	1	3	3	2	**24**	**Low**	(-)
Mitigation and Management Measures	• Avoidance: – As far as possible, proposed Project infrastructure should be located outside of land designated CBA 1 and CBA 2 and natural habitat classified as Vulnerable and Endangered; – The proposed maintenance road in the east of PAOI that intersects CBA Irreplaceable land must not be upgraded. It should be used in its current condition, with all vehicle related disturbance strictly controlled and rehabilitated to avoid negative impacts; – Wind Turbines 05, 06 and 07 should be oriented in a manner that ensures the majority of their disturbance footprints are contained within the designated ridge buffer; – If feasible, the existing farm roads linked to informal water crossing points 4 and 6 should be formalised and upgraded rather than constructing the proposed northern route requiring water crossing point 3; – As far as possible proposed permanent Project infrastructure should be located in areas of modified habitat (i.e., Cultivated Fields and Secondary Grassland); and							

Potential Impact: Direct loss and disturbance of natural habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character

- It is recommended that Substation Site 220 is selected as the preferred site. This site is entirely located within Secondary Grassland (old lands).
- All temporary construction footprints, (e.g., construction camps, laydown areas), should only be located in areas of modified habitat:
- It is recommended that Temporary Laydown Area 2 should be relocated to a nearby cultivated field or confined entirely within the Secondary Grassland patch that comprises the northern portion of its current footprint;
- A pre-construction walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform the micro-siting of Project infrastructure to already disturbed sites and other relevant management measures.

- Minimisation:
  - All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these footprints;
  - The footprints to be cleared of vegetation should be clearly demarcated, prior to construction, to prevent unnecessary clearing outside of these areas;
  - No heavy vehicles should travel beyond the marked/demarked work zones;
  - Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas.
- Rehabilitation:
  - A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that have been disturbed by construction activities. The protocol should include:
  - The correct stockpiling of topsoil that was cleared from development footprints during site preparation;
  - The correct contouring of the post-construction landform to limit potential erosion;
  - Compacted soils should be ripped and loosened to facilitate vegetation establishment;

[20] From a terrestrial biodiversity perspective, of the three proposed site options Substation Site 2 is preferred. This proposed site is situated entirely within a patch of Secondary Grassland (old lands) that is designated as 'Heavily Modified' by the MBSP (2024). The development of this site would therefore result in the lowest impact on natural habitat. Substation Site 3 is the next most preferred option, as it is located within grassland classified as 'Moderately Modified' by the MBSP (2024). Substation Site 1 intersects a small patch of Natural Dry Grassland mapped as 'Other Natural Areas' by the MBSP (2024) and is therefore the least preferred location for this facility.

Potential Impact: Direct loss and disturbance of natural habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	– Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and – Active revegetation should be conducted using grass species that are indigenous, locally-occurring and perennial.						

Table 9-11 – Terrestrial habitat

Potential Impact: Fragmentation reducing natural habitat connectivity and integrity	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	5	4	56	Moderate	(-)
With Mitigation	3	2	3	4	2	24	Low	(-)
Mitigation and Management Measures	• Avoidance and Minimisation – See mitigation measures for Direct loss and disturbance of natural habitat, and – All proposed access roads and powerlines should be aligned, as far as possible, with existing linear infrastructure (roads/tracks), and wherever possible micro-sited to already disturbed sites. • Rehabilitation – See rehabilitation measures for Direct loss and disturbance of natural habitat.							

Table 9-12 – Terrestrial habitat

Potential Impact: Establishment and spread of alien invasive species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	4	52	Moderate	(-)
With Mitigation	2	1	3	2	2	16	Low	(-)
Mitigation and Management Measures	• An AIS control and eradication plan must be developed for the Project that focuses on controlling and eradicating AIS							

	occurring at sites disturbed by proposed Project activities. It is recommended that the plan should be developed with input and guidance from an invertebrate specialist regarding the management of threatened butterfly species. Operationally, the plan should include: • Identification of AIS management units • Prioritisation of sites and species requiring control; • Targets and indicators of success; • Scheduling of AIS control; • Species-specific control methods, using a combined approach of both chemical and mechanical control methods; and • Provision for follow-up treatments, as informed by regular AIS monitoring.

Table 9-13 – Terrestrial habitat

Potential Impact: Increased soil erosion and sedimentation	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	4	**52**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	• All sites disturbed by construction activities should be contoured, stabilised and actively revegetated, as per the rehabilitation/ landscaping protocol; and • Erosion and sedimentation prevention and control measures (e.g., brush-packing, gabions and silt-traps) should be implemented at any sites of erosion or sedimentation.							

9.4.2. OPERATION PHASE

Table 9-14 – Terrestrial habitat

Potential Impact: Establishment and spread of alien invasive species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	3	**39**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	• Active alien invasive species control should continue throughout the operational phase, as per the approved AIS control and eradication programme.							

Table 9-15 – Terrestrial habitat

Potential Impact: Increase in wildfires from Project workers or faulty infrastructure	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	4	3	**36**	**Moderate**	(-)
With Mitigation	2	2	1	2	1	**7**	**Very Low**	(-)
Mitigation and Management Measures	• As a component of the pre-operational planning phase, the Project proponent should engage all relevant farmers and the local Fire Protection Association (FPA) to explore the development of a coordinated Grassland Burning Management Programme. This programme should be informed by specialist guidance concerning maintaining and protecting habitat for the threatened butterfly species; • As required, firebreaks should be maintained around infrastructure that are susceptible to faults/shorts that may cause accidental wildfires; and • Construction- and maintenance workers should be trained on the dangers of wildfire and the need to actively prevent unplanned/accidental fires.							

9.4.3. DECOMMISSIONING PHASE

Table 9-16 – Terrestrial biodiversity

Potential Impact: Establishment and spread of alien invasive species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	4	**52**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	• Active alien invasive species control should continue on an annual basis during the decommissioning phase and annual follow-up control should be carried out for a five-year period following decommissioning.							

Table 9-17 – Terrestrial biodiversity

Potential Impact: Increased soil erosion and sedimentation	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character

Without Mitigation	4	2	3	4	4	**52**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	• All sites disturbed by decommissioning activities should be stabilised and actively revegetated, as per the rehabilitation/ landscaping protocol; and • Erosion prevention and control measures (e.g., brush-packing, gabions, silt-traps) should be implemented at any sites of erosion and sedimentation.							

9.5 PLANT SPECIES

9.5.1. CONSTRUCTION PHASE

Table 9-18 – Flora habitat

Potential Impact: Direct loss and disturbance of natural habitat	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	5	2	3	5	5	**75**	**High**	(-)
With Mitigation	4	1	3	4	2	**24**	**Low**	(-)
Mitigation and Management Measures	• Avoidance – As far as possible proposed permanent Project infrastructure should be located in areas of modified habitat (i.e., Cultivated Fields and Secondary Grassland); – It is recommended that Substation Site 2 is selected as the preferred site. This site is entirely located within Secondary Grassland (old lands). – All temporary construction footprints, (e.g., construction camps, laydown areas), should only be located in areas of modified habitat: – It is recommended that Temporary Laydown Area 2 should be relocated to a nearby cultivated field or confined entirely within the Secondary Grassland patch that comprises the northern portion of its current footprint; – A pre-construction walkdown of the approved development footprints should be conducted during both the wet/summer season and dry/winter season to identify sensitive biodiversity and inform the micro-siting of Project infrastructure to already disturbed sites and other relevant management measures. • Minimisation – All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these footprints;							

Potential Impact: Direct loss and disturbance of natural habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	– The footprints to be cleared of vegetation should be clearly demarcated, prior to construction, to prevent unnecessary clearing outside of these areas; – No heavy vehicles should travel beyond the marked/demarked work zones; – Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas. • Rehabilitation – A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that have been disturbed by construction activities. The protocol should include: – The correct stockpiling of topsoil that was cleared from development footprints during site preparation; – The correct contouring of the post-construction landform to limit potential erosion; – Compacted soils should be ripped and loosened to facilitate vegetation establishment; – Topsoil removed during construction should be applied to all non-operational sites that were disturbed during – construction and require revegetation; and – Active revegetation should be conducted using grass species that are indigenous, locally-occurring and perennial.						

Table 9-19 – Flora habitat

Potential Impact: Fragmentation reducing natural habitat connectivity and integrity	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	5	4	**56**	**Moderate**	(-)
With Mitigation	3	2	3	4	2	**24**	**Low**	(-)
Mitigation and Management Measures	• Avoidance and Minimisation – See mitigation measures for Direct loss and disturbance of natural habitat, and – All proposed access roads and powerlines should be aligned, as far as possible, with existing linear infrastructure (roads/tracks), and wherever possible micro-sited to already disturbed sites. • Rehabilitation – See rehabilitation measures for Direct loss and disturbance of natural habitat.							

Table 9-20 – Flora SCC

Potential Impact: Loss of flora of conservation concern	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	5	1	4	**52**	**Moderate**	(-)
With Mitigation	3	1	5	1	2	**20**	**Low**	(-)
Mitigation and Management Measures	• Avoidance and Minimisation – Additional targeted walkdown surveys of the proposed development footprints should be conducted during the pre-construction planning phase in both the wet/summer season and the dry/winter season to confirm the presence/absence of any potentially impacted flora SCC and protected flora species; – Data from the walkdown surveys should then be used to inform: – Additional micro-siting requirements for proposed Project infrastructure, including avoiding a 200 m buffer around Red List species locations, as prescribed by SANBI (2026); and. – The need for, and scope of a Flora SCC Management Plan. If a plan is required, it should be developed during the pre-construction planning phase and include: – Species specific management and monitoring actions for any flora SCC recorded on-site; and – Procedure for rescuing and relocating provincial Protected flora species occurring within infrastructure footprints							

Table 9-21 – Flora habitat

Potential Impact: Establishment and spread of alien invasive species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	4	**52**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	• An AIS control and eradication plan must be developed for the Project that focuses on controlling and eradicating AIS occurring at sites disturbed by proposed Project activities. It is recommended that the plan should be developed with input and guidance from an invertebrate specialist regarding the management of threatened butterfly species. Operationally, the plan should include: • Identification of AIS management units • Prioritisation of sites and species requiring control; • Targets and indicators of success;							

Potential Impact: Establishment and spread of alien invasive species	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	• Scheduling of AIS control; • Species-specific control methods, using a combined approach of both chemical and mechanical control methods; and • Provision for follow-up treatments, as informed by regular AIS monitoring.						

9.5.2. OPERATION PHASE

Table 9-22 – Flora habitat

Potential Impact: Establishment and spread of alien invasive species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	3	**39**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	• Active alien invasive species control should continue throughout the operational phase, as per the approved AIS control and eradication programme.							

9.5.3. Decommissioning Phase

Table 9-23 – Flora habitat

Potential Impact: Establishment and spread of alien invasive species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	4	**52**	**Moderate**	(-)
With Mitigation	2	1	3	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	• Active alien invasive species control should continue during the decommissioning phase and annual follow up control should be carried out for a five- year period following decommissioning.							

9.6 ANIMAL SPECIES BIODIVERSITY

9.6.1. CONSTRUCTION PHASE

Table 9-24 – Fauna habitat

Potential Impact: Direct loss and disturbance of natural habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	3	5	5	75	High	(-)
With Mitigation	4	1	3	4	2	24	Low	(-)
Mitigation and Management Measures	• Avoidance: – As far as possible proposed permanent Project infrastructure should be located in areas of modified habitat (i.e., Cultivated Fields and Secondary Grassland); – It is recommended that Substation Site 2 is selected as the preferred site. This site is entirely located within Secondary Grassland (old lands). – All temporary construction footprints, (e.g., construction camps, laydown areas), should only be located in areas of modified habitat; – It is recommended that Temporary Laydown Area 2 should be relocated to a nearby cultivated field or confined entirely within the Secondary Grassland patch that comprises the northern portion of its current footprint; – A pre-construction walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform the micro-siting of Project infrastructure to already disturbed sites and other relevant management measures. – Minimisation: – All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these footprints; – The footprints to be cleared of vegetation should be clearly demarcated, prior to construction, to prevent unnecessary clearing outside of these areas; – No heavy vehicles should travel beyond the marked/demarked work zones; – Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas. • Rehabilitation: – A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that have been disturbed by construction activities. The protocol should include: – The correct stockpiling of topsoil that was cleared from development footprints during site preparation; – The correct contouring of the post-construction landform to limit potential erosion;							

Potential Impact: Direct loss and disturbance of natural habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	– Compacted soils should be ripped and loosened to facilitate vegetation establishment; – Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and – Active revegetation should be conducted using grass species that are indigenous, locally-occurring and perennial.						

Table 9-25 – Fauna habitat

Potential Impact: Fragmentation reducing natural habitat connectivity and integrity	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	5	4	**56**	**Moderate**	(-)
With Mitigation	3	2	3	4	2	**24**	**Low**	(-)
Mitigation and Management Measures	• Avoidance and Minimisation: – See mitigation measures for Direct loss and disturbance of natural habitat, and – All proposed access roads and powerlines should be aligned, as far as possible, with existing linear infrastructure (roads/tracks), and wherever possible micro-sited to already disturbed sites. • Rehabilitation: – See rehabilitation measures for Direct loss and disturbance of natural habitat.							

Table 9-26 – Fauna SCC – Mountain Reedbuck

Potential Impact: Loss of fauna species of conservation concern - Mountain Reedbuck	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	5	2	3	**42**	**Medium**	(-)
With Mitigation	4	2	3	1	2	**20**	**Low**	(-)
Mitigation and Management Measures	• Avoidance and Minimisation							

Potential Impact: Loss of fauna species of conservation concern - Mountain Reedbuck	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	– An Environmental Control Officer (ECO) should be on-site during vegetation clearing to monitor and manage any wildlife-human interactions; – As appropriate, temporary barriers should be erected around construction trenches and excavations to prevent fauna becoming trapped; – Any fauna species trapped in construction areas, should be safely and correctly relocated to an adjacent area of natural habitat; – A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions; – No fauna may be intentionally killed or injured by on-site contractors and workers. Handling, poisoning, snaring and killing of on-site fauna by contractors and workers must be strictly prohibited; – Access to the WEF's interior access road network should be strictly controlled to limit the potential for illegal hunters to gain easy access to the area; – General noise abatement equipment should be fitted to all construction machinery and vehicles; – Dust suppression using water bowsers should be undertaken on all roads and other sites where dust entrainment occurs; – The rules and regulations concerning fauna should be communicated to contractors – through on-site signage and awareness training; and – An incidence register should be maintained throughout all phases of the Project detailing any fauna mortalities/injuries caused by on-site activities. The register should be used to identify additional biodiversity management requirements.						

Table 9-27 – Fauna SCC – Grey Rhebok

Potential Impact: Loss of fauna species of conservation concern - Grey Rhebok	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	3	2	3	**36**	**Moderate**	(-)
With Mitigation	3	2	3	1	2	**18**	**Low**	(-)
Mitigation and Management Measures	• See mitigation measures for Loss of fauna species of conservation concern - *Mountain Reedbuck*							

Table 9-28 – Fauna SCC - Serval

Potential Impact: Loss of fauna species of conservation concern - Serval	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	3	2	2	**24**	**Low**	(-)
With Mitigation	3	2	3	1	1	**9**	**Very Low**	(-)
Mitigation and Management Measures	• See mitigation measures for Loss of fauna species of conservation concern - *Mountain Reedbuck*							

Table 9-29 – Fauna SCC – Cape Clawless Otter

Potential Impact: Loss of fauna species of conservation concern - Cape Clawless Otter	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	3	2	2	**24**	**Low**	(-)
With Mitigation	3	2	3	1	1	**9**	**Very Low**	(-)
Mitigation and Management Measures	• See mitigation measures for Loss of fauna species of conservation concern - *Mountain Reedbuck*							

Table 9-30 – Fauna SCC – Southern African Hedgehog

Potential Impact: Loss of fauna species of conservation concern - Southern African Hedgehog	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	3	2	2	**24**	**Low**	(-)
With Mitigation	3	1	3	1	1	**8**	**Very Low**	(-)
Mitigation and Management Measures	• See mitigation measures for Loss of fauna species of conservation concern - *Mountain Reedbuck*							

Table 9-31 – Fauna SCC – Vlei Rat

Potential Impact: Loss of fauna species of conservation concern - Vlei Rat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	3	2	2	**24**	**Low**	(-)
With Mitigation	3	1	3	1	1	**8**	**Very Low**	(-)
Mitigation and Management Measures	• See mitigation measures for Loss of fauna species of conservation concern - *Mountain Reedbuck*							

9.6.2. OPERATION PHASE

Table 9-32 – Fauna SCC

Potential Impact: Direct impact on fauna SCC from operating wind turbines	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	5	3	4	3	**42**	**Moderate**	(-)
With Mitigation	3	2	3	3	2	**22**	**Low**	(-)
Mitigation and Management Measures	• Minimisation – The Project proponent must keep actively informed about new research in the field of vibration impacts on fauna and potential mitigation options; and – Based on the findings of new research, the biodiversity management plan for the proposed Project should be updated to include additional mitigation measures and these should be implemented on-site.							

Table 9-33 – Fauna SCC

Potential Impact: Direct impact on fauna SCC from supporting operational activities	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	3	4	3	**42**	**Moderate**	(-)
With Mitigation	3	2	3	3	2	**22**	**Low**	(-)

Potential Impact: Direct impact on fauna SCC from supporting operational activities	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
Mitigation and Management Measures	• Avoidance and Minimisation – No off-road driving is permitted for vehicles and mobile machinery used during operations and for maintenance purposes. – A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions; – Access to the WEF's interior access road network should be strictly controlled to limit the potential for illegal hunters to gain easy access to the area; – No fauna may be intentionally killed or injured by on-site contractors and workers. Handling, poisoning, snaring and killing of on-site fauna by contractors and workers must be strictly prohibited; – The rules and regulations concerning fauna should be communicated to maintenance personnel through on-site signage and awareness training.						

9.6.3. DECOMMISSIONING PHASE

Table 9-34 – Fauna, incl. SCC

Potential Impact: Injury and mortality of fauna, including SCC	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	2	3	2	3	**36**	**Moderate**	(-)
With Mitigation	3	2	3	2	2	**20**	**Low**	(-)
Mitigation and Management Measures	• Avoidance and Minimisation – No off-road driving is permitted for vehicles and mobile machinery used during decommissioning phases activities; – A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions; – Access to the WEF's interior access road network should be controlled to limit the potential for illegal hunters to gain easy access to the area; – The handling, poisoning and killing of on-site fauna by on-site workers must be strictly prohibited; and – The rules and regulations concerning fauna should be communicated to maintenance personnel through on-site signage and awareness training.							

9.7 AQUATIC BIODIVERSITY

9.7.1. CONSTRUCTION PHASE

Table 9-35 – Aquatic ecosystems

Potential Impact: Aquatic habitat disturbance /loss and short-term water quality and flow impacts.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	3	3	**30**	**Low**	(-)
With Mitigation	2	1	1	2	2	**12**	**Very Low**	(-)
Mitigation and Management Measures	• A buffer of 50m from the delineated edge of larger watercourses and wetland corridors should be maintained to protect these aquatic habitats. • Clearing of indigenous vegetation should be avoided and should not take place within the aquatic features and the recommended buffers. • Any disturbed areas should be revegetated with suitable vegetation to minimise the risk of erosion and sedimentation of aquatic habitats following rainfall events. • The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance. There are ten (10) watercourse crossings associated with the internal roads for the final proposed layout. Six (6) of these crossings are associated with existing informal farm roads, and three (3) new watercourse crossings are proposed. In terms of the proposed new crossings: • The crossing to WT08 is over a minor seasonal watercourse in the northern section. A small low-water crossing over this small watercourse would be acceptable. • There are two proposals for a crossing to WT14 and WT17. Both crossings are on a small stream, located between an upstream and downstream dam. There is an existing road crossing near the upstream point. It is recommended that this road and crossing be realigned to the new proposed road. This crossing would have less impact than the downstream one as it is close to the existing disturbance at the road and a fenceline. The downstream road alignment alternative is in a wider wetland area. • Two alternative crossings are proposed over a small watercourse to access WT 24. The downstream (southern) one aligns with an existing road over a small dam wall but will need upgrading. Use of this road alignment is preferred as the watercourse is already disturbed at this location. • During the construction phase, proper site management must be undertaken to address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities, such as hydrocarbon spills. Any stormwater that does arise within the construction site must be handled appropriately to trap sediments and reduce flow velocities. Where feasible, the water supply, sanitation services, as well as solid waste management services required for the							

Potential Impact: Aquatic habitat disturbance /loss and short-term water quality and flow impacts.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
	proposed project should preferably be provided by an off-site service provider.							

9.7.2. OPERATION PHASE

Table 9-36 – Aquatic ecosystems

Potential Impact: Aquatic habitat disturbance and degradation of the ecological condition of aquatic ecosystems; modification of low and water quality	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	3	3	**30**	**Low**	(-)
With Mitigation	2	1	1	2	2	**12**	**Very Low**	(-)
Mitigation and Management Measures	• Any disturbance during the operation phase should be limited to the approved footprint and disturbance of the soil and natural vegetation cover should be avoided. • Stormwater run-off infrastructure must be designed to mitigate both the flow and water quality impacts of any stormwater leaving the developed areas. The runoff should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate channels and swales. • Invasive alien plant growth and signs of erosion within the project area should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants. Should any erosion features develop, they should be stabilised as soon as possible.							

9.7.3. DECOMMISSIONING PHASE

Table 9-37 – Aquatic ecosystems

Potential Impact: Degradation of the ecological condition of aquatic ecosystems; modification of flow and water quality	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	2	3	**27**	**Low**	(-)

With Mitigation	1	1	1	1	2	**8**	**Very low**	(-)
Mitigation and Management Measures	• During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible. Disturbed areas may need to be rehabilitated and revegetated. • Proper site management must be undertaken to address on-site stormwater management and prevention of pollution measures from any potential pollution sources during decommissioning activities, such as hydrocarbon spills. Any stormwater that does arise within the works must be handled appropriately to trap sediments and reduce flow velocities. • Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required.							

9.8 HERITAGE

9.8.1. CONSTRUCTION PHASE

Table 9-38 – Archaeological impacts

Potential Impact: Impacts of the proposed development to archaeological resources	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	5	5	3	**42**	**Moderate**	(-)
With Mitigation	1	1	5	5	1	**12**	**Very Low**	(-)
Mitigation and Management Measures	• The buffers recommended **Table 11-1** in are adhered to. • The identified very high sensitivity archaeology areas are not impacted by the development of any new infrastructure. • Archaeological monitoring takes place for all construction activities located within the very high sensitivity areas identified. • If any archaeological resources or unmarked human remains are uncovered or exposed during construction operations these must immediately be reported to SAHRA.							

9.9 PALAEONTOLOGICAL IMPACTS

9.9.1. CONSTRUCTION PHASE

Table 9-39 – Palaeontological impacts

Potential Impact: Impacts of the proposed development to palaeontological resources	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	5	5	2	**26**	**Low**	(-)

With Mitigation	1	1	5	5	1	12	Very Low	(-)
Mitigation and Management Measures	• The Chance Fossil Finds Protocol (Appendix 1) must be implemented throughout the construction phase, particularly in areas underlain by the Vryheid Formation. • Existing gravel and access roads should be used as far as possible to minimise unnecessary ground disturbance in sensitive areas.							

9.10 AVIFAUNA

9.10.1. CONSTRUCTION

Table 9-40 – Displacement through disturbance

Potential Impact: Displacement through disturbance	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	5	65	High	(-)
With Mitigation	2	1	1	4	3	24	Low	(-)
Mitigation and Management Measures	• Disturbance can be managed and mitigated most effectively at the design stage by avoiding important nesting, roosting and foraging areas of sensitive species during site selection and layout design. The disturbance footprint can be minimised by restricting activities to the smallest possible footprint and demarcating this area, with outside areas declared no-go areas during all phases. A pre-construction avifaunal walkthrough conducted within the month prior to commencement of construction can mitigate residual impacts by identifying areas that require additional mitigation during construction and limit negative impacts on sensitive species. • With the above avoidance, minimisation and mitigation, the extent of the impact can be restricted to the site only, the probability can be reduced to probable, with no irreplaceable resources lost. As no breeding SCC would be affected, the magnitude of the impact would likely be low. The impact of disturbance on avifauna is rated as high negative significance without mitigation, which can be reduced to a low negative significance with mitigation.							

Table 9-41 – Displacement through habitat loss

Potential Impact: Displacement through habitat loss	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	5	65	High	(-)
With Mitigation	2	1	3	4	5	50	Moderate	(-)
Mitigation and Management Measures	• Mitigation of habitat loss from construction of the facility is mainly achieved through site selection and the avoidance of sensitive areas. Following site selection (avoidance), minimisation is only marginally possible by retaining as much of the indigenous vegetation as possible, minimising the footprint of all associated infrastructure, including buildings, electrical infrastructure and the width and length of roads. Residual impacts can be mitigated by rehabilitating as many disturbed areas as possible following construction. Before construction and decommissioning an avifaunal walkthrough can identify any active nesting and breeding sites, which must be protected until the breeding has concluded. Installed infrastructure should be of a bird-friendly design with antiperching structures installed and electricity pylons that do not offer nesting opportunities. • The impact of displacement from habitat loss on avifauna during construction is rated as of potentially high negative significance without mitigation which can be reduced to a moderate negative impact significance with mitigation if areas with irreplaceable resources are avoided during the construction phase.							

9.10.2. OPERATION PHASE

Table 9-42 – Displacement through disturbance

Potential Impact: Displacement through disturbance	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	5	65	High	(-)
With Mitigation	2	1	1	4	3	24	Low	(-)
Mitigation and Management Measures	• Disturbance can be managed and mitigated most effectively at the design stage by avoiding important nesting, roosting and foraging areas of sensitive species during site selection and layout design. The disturbance footprint can be minimised by restricting activities to the smallest possible footprint and demarcating this area, with outside areas declared no-go areas during all phases. A pre-construction avifaunal walkthrough conducted within							

Potential Impact: Displacement through disturbance	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
	the month prior to commencement of construction can mitigate residual impacts by identifying areas that require additional mitigation during construction and limit negative impacts on sensitive species. • With the above avoidance, minimisation and mitigation, the extent of the impact can be restricted to the site only, the probability can be reduced to probable, with no irreplaceable resources lost. As no breeding SCC would be affected, the magnitude of the impact would likely be low. The impact of disturbance on avifauna is rated as high negative significance without mitigation, which can be reduced to a low negative significance with mitigation.							

Table 9-43 – Mortality from collisions with turbines

Potential Impact: Mortality from collisions with turbines	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	4	5	4	4	72	High	(-)
With Mitigation	5	2	5	4	3	48	Moderate	(-)
Mitigation and Management Measures	• The main mitigation measure for the avoidance of collisions is the placement of turbines outside of areas likely to be frequented by collision-prone bird species (avoidance mitigation). Avifaunal pre-application monitoring in line with all applicable Best Practice Guidelines is therefore completed to inform the turbine layout. Two raptor nest surveys, a specialist site inspection and one year of avifaunal pre-construction monitoring in line with all applicable Best Practice Guidelines, were completed, and recommendations were made in the Final Monitoring & Site Sensitivity Verification Report (Annexure B of the study) to inform the design of the turbine layout for this project. • The proposed turbine layout and its rotor-swept area avoids all areas identified as no-turbine areas, which significantly lowers the risk of collisions. One small section of the rotorswept zone of one turbine slightly protrudes into a scarp and ridge buffer, which was identified as an area in which development should be minimised, and this is deemed acceptable. • Recommended proactive minimising mitigation measures include habitat management measures, such as removing artificial rock piles used by eagle prey, minimising perching and nesting opportunities within the facility, blade							

Potential Impact: Mortality from collisions with turbines	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	patterning of all turbines, and implementing postconstruction monitoring for the lifetime of the facility. • The painting of one turbine blade in a different colour has shown to lower collisions by raptors successfully (May et al. 2020), and this is currently being implemented retrospectively (in-situ) at one WEF in South Africa. Initial results indicate that painting a pattern on a blade is effective in South Africa, if conducted in line with the Blade Patterning Guidelines, and that patterning on all blades may be more beneficial than pattering a single blade (R. Simmons, pers.comm). As this mitigation is potentially highly effective, proactively patterning all turbine blades prior to construction, at a fraction of the cost instead of a reactive approach, is highly recommended. Post-construction and operational phase monitoring according to Best Practice Guidelines applicable at the time of commencement of construction is required, in order to determine what mortalities are occurring, and if any additional adaptive (reactive) management mitigation measures are required, such as curtailment of certain turbines (shutting down during certain times/seasons/conditions) or Shut-down-on-demand when flight activity by SCC is observed by observers or automated camera and/or radar devices. • The impact of collisions with wind turbines on avifauna is rated as of potentially high negative significance without mitigation, which can be reduced to a moderate negative impact significance with mitigation						

Table 9-44 - Mortality from collisions with Overhead Powerlines

Potential Impact: Mortality from collisions with Overhead Powerlines	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	4	5	4	4	72	High	(-)
With Mitigation	5	2	5	4	3	48	Moderate	(-)
Mitigation and Management Measures	• The impact could be completely avoided by burying all overhead powerlines. To minimise collisions with overhead powerlines, the length of powerlines should be the minimum distance that avoids identified no-overhead powerline buffers. To mitigate residual impacts, line markers such as dynamic and static bird flight diverters (BFDs) are being widely used with some success, and dynamic models are believed to be more likely to increase visibility for a range of species (Silva, et al., 2022).							

Potential Impact: Mortality from collisions with Overhead Powerlines	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	• Overhead powerlines should be placed parallel to existing infrastructure as far as practically possible, with wires as low and thick as the current Eskom Technical Standard allows (Silva, et al., 2022). Some evidence has emerged that suggests that the staggering of pylons could reduce mortality. In one study in Namibia and South Africa of 134 bustard collisions, 87.3% were confirmed as having occurred away from towers, in the intermediate and mid-span sections of the powerline (Pallett, et al., 2022). Therefore, the pylons should be staggered against existing or other proposed pylons to increase the powerline visibility, where technically possible. • All pylons must be of a vulture-friendly design as per Eskom Technical Standards with antiperching devices installed. A single monopole pylon that does not allow nest-building should be used where technically possible. Diagonal braces on horizontal insulators can prevent birds from perching on the monopoles and reduce the risk of collisions. • The impact of collisions with overhead powerlines on avifauna is rated as potentially high negative significance without mitigation which can be reduced to a moderate negative impact significance with mitigation						

Table 9-45 - Mortality from electrocutions with overhead powerlines and electrical infrastructure

Potential Impact: Mortality from electrocutions with overhead powerlines and electrical infrastructure	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	4	5	4	4	72	High	(-)
With Mitigation	2	1	1	4	1	8	Very Low	(-)
Mitigation and Management Measures	• The impact could be completely avoided by burying all overhead powerlines. To minimise collisions with overhead powerlines, the length of powerlines should be the minimum distance that avoids identified no-overhead powerline buffers. To mitigate residual impacts, line markers such as dynamic and static bird flight diverters (BFDs) are being widely used with some success, and dynamic models are believed to be more likely to increase visibility for a range of species (Silva, et al., 2022). • Overhead powerlines should be placed parallel to existing infrastructure as far as practically possible, with wires as low and thick as the current Eskom Technical Standard allows (Silva, et al., 2022). Some evidence has emerged							

Potential Impact: Mortality from electrocutions with overhead powerlines and electrical infrastructure	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	that suggests that the staggering of pylons could reduce mortality. In one study in Namibia and South Africa of 134 bustard collisions, 87.3% were confirmed as having occurred away from towers, in the intermediate and mid-span sections of the powerline (Pallett, et al., 2022). Therefore, the pylons should be staggered against existing or other proposed pylons to increase the powerline visibility, where technically possible. • All pylons must be of a vulture-friendly design as per Eskom Technical Standards with antiperching devices installed. A single monopole pylon that does not allow nest-building should be used where technically possible. Diagonal braces on horizontal insulators can prevent birds from perching on the monopoles and reduce the risk of collisions. • The impact of collisions with overhead powerlines on avifauna is rated as potentially high negative significance without mitigation which can be reduced to a moderate negative impact significance with mitigation.						

9.10.3. DECOMMISSIONING PHASE

Table 9-46 – Displacement through disturbance

Potential Impact: Displacement through disturbance	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	4	5	65	High	(-)
With Mitigation	2	1	1	4	3	24	Low	(-)
Mitigation and Management Measures	• Disturbance can be managed and mitigated most effectively at the design stage by avoiding important nesting, roosting and foraging areas of sensitive species during site selection and layout design. The disturbance footprint can be minimised by restricting activities to the smallest possible footprint and demarcating this area, with outside areas declared no-go areas during all phases. A pre-construction avifaunal walkthrough conducted within the month prior to commencement of construction can mitigate residual impacts by identifying areas that require additional mitigation during construction and limit negative impacts on sensitive species. • With the above avoidance, minimisation and mitigation, the extent of the impact can be restricted to the site only, the probability can be reduced to probable, with no irreplaceable resources lost. As no breeding SCC would be							

Potential Impact: Displacement through disturbance	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	affected, the magnitude of the impact would likely be low. The impact of disturbance on avifauna is rated as high negative significance without mitigation, which can be reduced to a low negative significance with mitigation.						

Table 9-47 – Displacement through habitat loss

Potential Impact: Displacement through habitat loss	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	4	5	**55**	**Moderate**	(-)
With Mitigation	2	1	3	4	5	**50**	**Moderate**	(-)
Mitigation and Management Measures	• Mitigation of habitat loss from construction of the facility is mainly achieved through site selection and the avoidance of sensitive areas. Following site selection (avoidance), minimisation is only marginally possible by retaining as much of the indigenous vegetation as possible, minimising the footprint of all associated infrastructure, including buildings, electrical infrastructure and the width and length of roads. Residual impacts can be mitigated by rehabilitating as many disturbed areas as possible following construction. Before construction and decommissioning an avifaunal walkthrough can identify any active nesting and breeding sites, which must be protected until the breeding has concluded. Installed infrastructure should be of a bird-friendly design with antiperching structures installed and electricity pylons that do not offer nesting opportunities. • The impact of displacement from habitat loss on avifauna during construction is rated as of potentially high negative significance without mitigation which can be reduced to a moderate negative impact significance with mitigation if areas with irreplaceable resources are avoided during the construction phase.							

9.11 BUTTERFLY HABITAT

9.11.1. CONSTRUCTION PHASE

Table 9-49 **and** Table 9-50

Table 9-50 below presents the change in impact significance from the original DEIR to this resubmitted DEIR. The revision follows the specialist's consideration of stakeholder comments received during the public review period. However, the post-mitigation significance of the impact remains rated as Low.

Table 9-48 – Direct losses of sensitive species (Threatened, Near Threatened, Rare, Declining or Protected species)

Potential Impact: Direct losses of sensitive species	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	10	3	-	5	3	**54**	**Moderate**	(-)
With Mitigation	4	2	-	5	2	**22**	**Low**	(-)
Mitigation and Management Measures	• Mitigation will entail avoiding losses of, and providing protection buffers around highly sensitive habitat, limiting development to areas of lower sensitivity. Extent of impact should be limited to areas of lower sensitivity. • Ensuring absence of sensitive species through final walkdown and periodic monitoring.							

Table 9-49 – Loss of habitat/areas that are considered suitable/highly suitable for sensitive butterfly species

Potential Impact: Loss of habitat/areas that are considered suitable/highly suitable for sensitive butterfly species	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	10	2	n/a	5	4	**68**	**High**	(-)
With Mitigation	10	2	n/a	5	4	**28**	**Low**	(-)
Mitigation and Management Measures	• Only minor and localised losses are anticipated considering the proposed design. Habitat types of elevated sensitivity/importance on a local/regional scale were already excluded from the development since the scoping phase. General mitigation measures include preventing, or strict control of construction/operational activities within/proximal to these parts of the landscape, while							

Potential Impact: Loss of habitat/areas that are considered suitable/highly suitable for sensitive butterfly species	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
	development and implementation of biodiversity monitoring and mitigation programme will guide activities.							

Table 9-50 - Persistent and exacerbated deterioration of sensitive, natural, range restricted, or untransformed habitat that may be present in the immediate or near vicinity to the development footprints, road fringes

Potential Impact: Persistent and exacerbated deterioration of sensitive, natural, range restricted, or untransformed habitat	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	8	2	-	5	4	60	High	(-)
With Mitigation	4	1	-	4	3	27	Low	(-)
Mitigation and Management Measures	• Sensitive areas were already largely excluded from the development, also with reference to the implementation of a suitable buffer around these parts of the landscape – no construction/operational activity should be allowed within these areas. • Losses of (sensitive, untransformed) habitat outside development footprints should be avoided. • Decline in habitat status of surrounding areas should be avoided through containment of activities. • Erosion and pollution prevention. • Restrict development to footprint areas only. • Development and implementation of biodiversity monitoring and mitigation programme.							

Table 9-51 - Disruption of ecological processes, services, ecological functionality

Potential Impact: Disruption of ecological processes, services, ecological functionality	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	6	3	-	5	3	42	Moderate	(-)
With Mitigation	4	2	-	4	2	20	Low	(-)

Mitigation and Management Measures	• Ensure continued and normal ecological functionality of remaining natural habitat surrounding the development. Ensure that no unintended impacts occur, e.g. changed fire regimes. • Minimise disruption of ecological functions, e.g. surface water flow, prevent erosion and fires, ensure continued ecological corridor functionality.

Table 9-52 - Increased disruption of local movement and migration patterns, ecological interaction, and ecological processes

Potential Impact: Increased disruption of local movement and migration patterns, ecological interaction, and ecological processes	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	6	3	-	5	3	**42**	**Moderate**	(-)
With Mitigation	2	1	-	2	2	**10**	**Low**	(-)
Mitigation and Management Measures	• Ensuring minimal loss of high sensitivity areas, natural habitat. • Ensure ecological connectivity and functionality. Develop and implement a biodiversity monitoring programme. • Employ immediate and comprehensive rehabilitation of impacts outside development footprints.							

9.12 BATS

9.12.1. CONSTRUCTION PHASE

Table 9-53 – Habitat loss or roost disturbance

Potential Impact: The construction of access roads, turbines or infrastructure may lead to foraging habitat and sensitive bat features being removed.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	3	3	3	**33**	**Moderate**	(-)
With Mitigation	1	2	1	2	2	**12**	**Very Low**	(-)
Mitigation and Management Measures	• No construction of new roads in sensitive areas and avoid upgrading of existing roads in sensitive areas. • If upgrading of existing roads is to go ahead a bat specialist must be present during the construction of these to ensure that the impact is kept to a minimum and construction must be done during the winter months.							

9.12.2. OPERATION PHASE

Table 9-54 – Bat mortality

Potential Impact: Bats killed due to barometric trauma or being struck by blades of the turbines during the operational phase.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	3	5	5	5	90	Very High	(-)
With Mitigation	3	3	3	4	3	39	Moderate	(-)
Mitigation and Management Measures	• Hub height at maximum as stated in the project description • Blade length at minimum as stated in the project description • Automated smart curtailment must be employed as mitigation measure, and the devices must be deployed in such a manner to provide maximum coverage across the WEF. These devices must be installed prior to the facility becoming operational. No devices are currently recommended, but should be based on the technology available at the time of installation • Post-construction monitoring in consultation with a bat specialist including carcass searching and acoustic monitoring.							

Table 9-55 – Artificial lights

Potential Impact: Artificial lights can have a negative effect on bat behaviour by affecting flight paths used or attracting them to lights due to higher insect abundance and elevating the likelihood of collision mortality.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	3	3	36	Moderate	(-)
With Mitigation	2	2	3	3	1	10	Very Low	(-)
Mitigation and Management Measures	Use only minimal compulsory civil aviation lighting Use non-UV emitting lights							

9.13 VISUAL

9.13.1. CONSTRUCTION PHASE

Table 9-56 - Residents of homesteads, visitors to tourist accommodation and Protected Areas (within 5km of the proposed WEF)

Potential Impact: Visual impact of construction activities on residents of homesteads, visitors to tourist accommodation and Protected Areas within 5km to the proposed WEF.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	10	4	1	2	5	80	High	(-)
With Mitigation	8	4	1	2	4	60	Moderate	(-)
Mitigation and Management Measures	• Planning: – Retain and maintain natural vegetation in all areas outside of the development footprint, but within the project site. – Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements. Construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems. – In terms of onsite ancillary buildings and structures, it is recommended that it be planned so that the clearing of vegetation is minimised. This implies consolidating this infrastructure as much as possible and making use of already disturbed areas rather than undisturbed sites wherever possible. • Construction: – Ensure that vegetation is not unnecessarily cleared or removed during the construction period. – Reduce the construction period through careful logistical planning and productive implementation of resources. – Ensure that the placement of laydown areas and any potential temporary construction camps are within the areas planned in order to minimise vegetation clearing (i.e. in already disturbed areas). – Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. – Ensure that rubble, litter, and disused construction materials are appropriately stored and then disposed of regularly at licensed waste facilities. – Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent). – Restrict construction activities to daylight hours whenever possible in order to reduce the visual impacts associated with lighting. • Rehabilitate all disturbed areas immediately after the completion of construction works. If necessary, an							

Potential Impact: Visual impact of construction activities on residents of homesteads, visitors to tourist accommodation and Protected Areas within 5km to the proposed WEF.	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	ecologist should be consulted to assist or give input into rehabilitation specifications.						

Table 9-57 - Observers travelling along roads (within 5km of the proposed WEF)

Potential Impact: Visual impact of construction activities on observers travelling along roads within 5km of the proposed WEF.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	10	4	1	2	5	**70**	**High**	(-)
With Mitigation	8	4	1	2	4	**52**	**Moderate**	(-)
Mitigation and Management Measures	• Planning: – Retain and maintain natural vegetation in all areas outside of the development footprint, but within the project site. – Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements. Construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems. – In terms of onsite ancillary buildings and structures, it is recommended that it be planned so that the clearing of vegetation is minimised. This implies consolidating this infrastructure as much as possible and making use of already disturbed areas rather than undisturbed sites wherever possible. • Construction: – Ensure that vegetation is not unnecessarily cleared or removed during the construction period. – Ensure that the placement of laydown areas and any potential temporary construction camps are within the areas planned in order to minimise vegetation clearing (i.e. in already disturbed areas). – Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. – Ensure that rubble, litter, and disused construction materials are appropriately stored and then disposed of regularly at licensed waste facilities. – Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).							

Potential Impact: Visual impact of construction activities on observers travelling along roads within 5km of the proposed WEF.	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	– Restrict construction activities to daylight hours whenever possible in order to reduce the visual impacts associated with lighting. • Rehabilitate all disturbed areas immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.						

9.13.2. OPERATION PHASE

Table 9-58 - Residents of homesteads and visitors to tourist accommodation (if present) (within 5km of the proposed WEF)

Potential Impact: Visual impact on residents of homesteads and visitors to tourist accommodation (if present) within 5 km to the proposed WEF.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	10	4	1	4	5	85	Very High	(-)
With Mitigation	10	4	1	4	5	85	Very High	(-)
Mitigation and Management Measures	*Generic best practise mitigation/management measures:* • Planning: – Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. – Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements. Construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems. – In terms of onsite ancillary buildings and structures, it is recommended that it be planned so that the clearing of vegetation is minimised. This implies consolidating this infrastructure as much as possible and making use of already disturbed areas rather than undisturbed sites wherever possible. • Operations: – Ensure that the maintenance of the turbines and ancillary structures and infrastructure must be undertaken to ensure that the facility does not degrade, therefore aggravating the visual impact.							

Potential Impact: Visual impact on residents of homesteads and visitors to tourist accommodation (if present) within 5 km to the proposed WEF.	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	– Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required. – Monitor rehabilitated areas for rehabilitation failure or concerns and implement remedial action as and when required. – Decommissioning: – Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.						

Table 9-59 - Observers travelling along roads within 5km of the proposed wind turbine structures

Potential Impact: Visual impact on observers travelling along the roads within 5 km to the proposed WEF	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	10	4	1	4	5	75	High	(-)
With Mitigation	10	4	1	4	5	75	High	(-)
Mitigation and Management Measures	*Generic best practise mitigation/management measures:* • Planning: – Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. – Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements. Construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems. – In terms of onsite ancillary buildings and structures, it is recommended that it be planned so that the clearing of vegetation is minimised. This implies consolidating this infrastructure as much as possible and making use of already disturbed areas rather than undisturbed sites wherever possible. • Operations: – Ensure that the maintenance of the turbines and ancillary structures and infrastructure must be							

Potential Impact: Visual impact on observers travelling along the roads within 5 km to the proposed WEF	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	undertaken to ensure that the facility does not degrade, therefore aggravating the visual impact. – Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required. – Monitor rehabilitated areas for rehabilitation failure or concerns and implement remedial action as and when required. • Decommissioning: – Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.						

Table 9-60 - Residents of homesteads/tourist accommodation (if present) (within 5 – 10km of the proposed WEF)

Potential Impact: Visual impact on residents of homesteads and visitors to tourist accommodation (if present) within 5-10 km to the proposed WEF.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	8	3	1	4	5	77	High	(-)
With Mitigation	8	3	1	4	5	77	High	(-)
Mitigation and Management Measures	*Generic best practise mitigation/management measures:* • Planning: – Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. – Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements. Construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems. – In terms of onsite ancillary buildings and structures, it is recommended that it be planned so that the clearing of vegetation is minimised. This implies consolidating this infrastructure as much as possible and making use of already disturbed areas rather than undisturbed sites wherever possible.							

	• Operations: – Ensure that the maintenance of the turbines and ancillary structures and infrastructure must be undertaken to ensure that the facility does not degrade, therefore aggravating the visual impact. – Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required. – Monitor rehabilitated areas for rehabilitation failure or concerns and implement remedial action as and when required. • Decommissioning: – Remove infrastructure not required for the post-decommissioning use.

Table 9-61 - Observers travelling along roads (within 5 – 10km of the proposed WEF)

Potential Impact: Visual impact on observers travelling along roads within 5-10 km to the proposed WEF.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	8	3	1	4	5	68	High	(-)
With Mitigation	8	3	1	4	5	68	High	(-)
Mitigation and Management Measures	• Generic best practise mitigation/management measures: • Planning: – Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. – Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements. Construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems. – In terms of onsite ancillary buildings and structures, it is recommended that it be planned so that the clearing of vegetation is minimised. This implies consolidating this infrastructure as much as possible and making use of already disturbed areas rather than undisturbed sites wherever possible. • Operations: – Ensure that the maintenance of the turbines and ancillary structures and infrastructure must be undertaken to ensure that the facility does not degrade, therefore aggravating the visual impact. – Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required.							

	– Monitor rehabilitated areas for rehabilitation failure or concerns and implement remedial action as and when required. • Decommissioning: – Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.

Table 9-62 - Residents of homesteads and visitors to tourist accommodation (within a 10 – 20km radius of the proposed turbine structures)

Potential Impact: Visual impact on residents of homesteads and visitors to tourist accommodation within 10-20 km to the proposed WEF.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	6	2	1	4	3	**39**	**Moderate**	(-)
With Mitigation	6	2	1	4	3	**39**	**Moderate**	(-)
Mitigation and Management Measures	• Generic best practise mitigation/management measures: • Planning: – Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. – Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements. Construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems. – In terms of onsite ancillary buildings and structures, it is recommended that it be planned so that the clearing of vegetation is minimised. This implies consolidating this infrastructure as much as possible and making use of already disturbed areas rather than undisturbed sites wherever possible. • Operations: – Ensure that the maintenance of the turbines and ancillary structures and infrastructure must be undertaken to ensure that the facility does not degrade, therefore aggravating the visual impact. – Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required. – Monitor rehabilitated areas for rehabilitation failure or concerns and implement remedial action as and when required. • Decommissioning:							

	– Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.

Table 9-63 - Visitors to Protected Areas (within a 10 – 20km radius of the proposed WEF)

Potential Impact: Visual impact on visitors to Protected Areas within 10-20 km to the proposed WEF.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	6	2	1	4	4	**56**	**Moderate**	(-)
With Mitigation	6	2	1	4	4	**56**	**Moderate**	(-)
Mitigation and Management Measures	*Generic best practise mitigation/management measures:* • Planning: – Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. – Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements. Construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems. – In terms of onsite ancillary buildings and structures, it is recommended that it be planned so that the clearing of vegetation is minimised. This implies consolidating this infrastructure as much as possible and making use of already disturbed areas rather than undisturbed sites wherever possible. • Operations: – Ensure that the maintenance of the turbines and ancillary structures and infrastructure must be undertaken to ensure that the facility does not degrade, therefore aggravating the visual impact. – Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required. – Monitor rehabilitated areas for rehabilitation failure or concerns and implement remedial action as and when required. • Decommissioning: – Remove infrastructure not required for the post-decommissioning use. – Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.							

Table 9-64 - Observers travelling along roads (within a 10 – 20km radius of the proposed WEF)

Potential Impact: Visual impact on observers travelling along roads within 10 - 20km to the proposed WEF.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	6	2	1	4	3	**36**	**Moderate**	(-)
With Mitigation	6	2	1	4	3	**36**	**Moderate**	(-)
Mitigation and Management Measures	*Generic best practise mitigation/management measures:* • Planning: – Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. – Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements. Construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems. – In terms of onsite ancillary buildings and structures, it is recommended that it be planned so that the clearing of vegetation is minimised. This implies consolidating this infrastructure as much as possible and making use of already disturbed areas rather than undisturbed sites wherever possible. • Operations: – Ensure that the maintenance of the turbines and ancillary structures and infrastructure must be undertaken to ensure that the facility does not degrade, therefore aggravating the visual impact. – Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required. – Monitor rehabilitated areas for rehabilitation failure or concerns and implement remedial action as and when required. • Decommissioning: – Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.							

Table 9-65 - Residents of homesteads and visitors to tourist accommodation (if present) (located beyond the 20km radius of the proposed WEF)

Potential Impact: Visual impact on residents of homesteads and visitors to tourist accommodation (if present) located beyond the 20km radius to the proposed WEF.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	1	1	4	2	**23**	**Low**	(-)
With Mitigation	4	1	1	4	2	**23**	**Low**	(-)
Mitigation and Management Measures	*Generic best practise mitigation/management measures:* • Planning: – Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. – Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements. Construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems. – In terms of onsite ancillary buildings and structures, it is recommended that it be planned so that the clearing of vegetation is minimised. This implies consolidating this infrastructure as much as possible and making use of already disturbed areas rather than undisturbed sites wherever possible. • Operations: – Ensure that the maintenance of the turbines and ancillary structures and infrastructure must be undertaken to ensure that the facility does not degrade, therefore aggravating the visual impact. – Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required. – Monitor rehabilitated areas for rehabilitation failure or concerns and implement remedial action as and when required. • Decommissioning: – Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.							

Table 9-66 – Shadow Flicker

Potential Impact: Visual impact of shadow flicker on sensitive visual receptors located outside of the development site who are located within the zone of visual shadows of a proposed turbine.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	8	4	1	4	4	64	High	(-)
With Mitigation	4	4	1	4	2	28	Low	(-)
Mitigation and Management Measures	• Generic best practise mitigation/management measures: • Planning: – Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. – It is recommended that no homesteads should be located in the zone of visible shadows of any of the proposed turbine, unless otherwise agreed upon by the affected landowner, if the landowner is located within the development site. Proof of such agreement is required. – Should a homestead be located within the zone of visible shadows of a proposed turbine and its fall outside the development site boundary, it is recommended that the EAP/Applicant provide documented proof of a concerted and meaningful effort to specifically contact the affected landowner, informing them of the potential shadow flicker impacts identified through this desktop-level assessment and the resultant implications thereof. This documentation should further demonstrate that the I&AP was afforded sufficient opportunity to review and comment on the anticipated impacts, in line with standard public participation requirements, and should include proof of acknowledgment of receipt of this notification by the I&AP. Should the I&AP associate with the homestead formally object to the anticipated shadow flicker impacts, the recommendations and mitigation measures as outlined in Section 12 should be followed. • Operations: – Consider planting of screening vegetation at the affected homestead to limit the effect of shadow flicker, should it be required. • Decommissioning: – Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.							

Table 9-67 - lighting at night on residents/ visitors to homesteads, tourist accommodation and Protected Areas (within 0-5km and potentially up to 10km of the proposed WEF)

Potential Impact: Visual impact of lighting at night on residents and visitors to homesteads, tourist accommodation and Protected Areas within 10km from the proposed WEF	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	10	3	1	4	5	83	Very High	(-)
With Mitigation	8	3	1	4	4	62	High	(-)
Mitigation and Management Measures	*Generic best practise mitigation/management measures:* • Planning & operation: – Implement needs-based night lighting if available and considered acceptable by the CAA. – Limit aircraft warning lights to the turbines on the perimeter according to CAA requirements, thereby reducing the overall impact. – Shield the sources of light by physical barriers (walls, vegetation, or the structure itself). – Limit mounting heights of lighting fixtures or alternatively use footlights or bollard level lights. – Make use of minimum lumen or wattage in fixtures. – Make use of down-lighters or shielded fixtures. – Make use of Low-Pressure Sodium lighting or other types of low impact lighting. – Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes. • Decommissioning: – Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.							

Table 9-68 - Lighting at night on observers travelling along roads (within 0-5km and potentially up to 10km of the proposed WEF)

Potential Impact: Visual impact of lighting at night on observers travelling along roads within 10km from the proposed WEF	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	10	3	1	4	4	58	Moderate	(-)
With Mitigation	8	3	1	4	3	41	Moderate	(-)

Potential Impact: Visual impact of lighting at night on observers travelling along roads within 10km from the proposed WEF	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
Mitigation and Management Measures	*Generic best practise mitigation/management measures:* • Planning & operation: – Implement needs-based night lighting if available and considered acceptable by the CAA. – Limit aircraft warning lights to the turbines on the perimeter according to CAA requirements, thereby reducing the overall impact. – Shield the sources of light by physical barriers (walls, vegetation, or the structure itself). – Limit mounting heights of lighting fixtures or alternatively use footlights or bollard level lights. – Make use of minimum lumen or wattage in fixtures. – Make use of down-lighters or shielded fixtures. – Make use of Low-Pressure Sodium lighting or other types of low impact lighting. – Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes. • Decommissioning: – Remove infrastructure not required for the post-decommissioning use. – Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.						

Table 9-69 - Ancillary infrastructure

Potential Impact: Visual impact of the ancillary infrastructure on observers in close proximity to the structures.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	8	3	1	4	4	62	High	(-)
With Mitigation	6	3	1	4	3	44	Moderate	(-)
Mitigation and Management Measures	Generic best practise mitigation/management measures: • Planning: – Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. – Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements. Construction/upgrade of roads should be undertaken							

Potential Impact: Visual impact of the ancillary infrastructure on observers in close proximity to the structures.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
	properly, with adequate drainage structures in place to forego potential erosion problems. – In terms of onsite ancillary buildings and structures, it is recommended that it be planned so that the clearing of vegetation is minimised. This implies consolidating this infrastructure as much as possible and making use of already disturbed areas rather than undisturbed sites wherever possible. • Operations: – Ensure that the maintenance of the turbines and ancillary structures and infrastructure must be undertaken to ensure that the facility does not degrade, therefore aggravating the visual impact. – Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required. – Monitor rehabilitated areas for rehabilitation failure or concerns and implement remedial action as and when required. • Decommissioning: – Remove infrastructure not required for the post-decommissioning use. • Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.							

Table 9-70 – Blade painting

Potential Impact: Visual impact of blade painting on the overall perception of the WEF by sensitive receptors especially within 0-5km and potentially up to 10km radius of the wind turbine structures.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	4	1	4	2	**28**	**Low**	(-)
With Mitigation	4	4	1	4	2	**28**	**Low**	(-)
Mitigation and Management Measures	• Generic best practise mitigation/management measures: • Planning: – Apply blade painting only where justified by avifaunal risk assessments and in accordance with SACAA-approved patterns and the SAWEA/BLSA/BARESG guidelines. – As far as possible, limit blade painting to one blade per turbine or simple broad bands (e.g., two broad stripes							

	or ¾ solid blade) rather than multiple thin stripes to reduce visual clutter. If multiple blades are patterned, use asymmetrical placement to preserve avian conspicuity without repeating pattern symmetry that increases human noticeability. – Commit to consistent pattern application across the facility (or defined subsets) to avoid patchwork appearance and public confusion. – Prioritise painting on turbines located in low-sensitivity visual zones (i.e. behind ridgelines, out of primary viewer corridors) and avoid (or apply minimal treatment to) turbines sited on visually exposed ridgelines or within close proximity (<1–2 km) to sensitive receptors unless avifaunal risk compels it. – Specify durable, non-reflective paints formulated for turbine use (UV-stable, abrasion resistant) to avoid patchiness, gloss/shine changes or uneven weathering that would attract visual attention. – Ensure the application of blade painting is undertaken during the manufacturing process and not as an after application during the construction phase. – Apply paint under controlled conditions with trained applicators, measured coverage, documented pattern placement, to ensure uniform visual appearance across turbines and avoid visible inconsistencies. • Construction: – Apply paint patterns uniformly and consistently across turbines to avoid irregular visual effects. – Use non-reflective, durable paint finishes to prevent glare, fading, or patchiness that may increase visibility. • Operations: – Implement post-construction monitoring to evaluate both avifaunal effectiveness and public perception of painted blades. It is suggested that this is implemented via two complementary monitoring programmes: (a) avifaunal collision monitoring to quantify mortality reduction (as specified by the avifaunal specialist), and (b) visual perception monitoring (stakeholder surveys/photo points) to assess community responses and any unforeseen visual intrusion. Use agreed metrics (e.g., raptor fatalities, local resident perception scores). – Use monitoring results to adjust paint coverage (e.g., reduce/alter patterns where visual impacts are unacceptable or expand where avifaunal benefit is insufficient). Maintain decision-making records (trigger thresholds, remedial actions). – Schedule periodic repainting to maintain uniform colour/contrast and avoid patchy or faded blades that increase attention. Use non-gloss finishes to avoid glare. – Keep local communities and stakeholders informed of monitoring outcomes and any planned adjustments to painting strategy to maintain public confidence and transparency. • Decommissioning: – Remove infrastructure not required for the post-decommissioning use.

	– Restore the site to pre-construction conditions, ensuring no residual long-term visual impacts linked to painted blades.

9.13.3. DECOMMISSIONING PHASE

Table 9-71 - Sensitive visual receptors (within 5km to the proposed WEF)

Potential Impact: Visual impact of decommissioning activities on sensitive visual receptors within 5km to the proposed WEF.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	8	4	1	1	4	**58**	**Moderate**	(-)
With Mitigation	6	4	1	1	3	**41**	**Moderate**	(-)
Mitigation and Management Measures	• Decommissioning: – Reduce the decommissioning period through careful logistical planning and productive implementation of resources. – Plan the placement of laydown areas and temporary equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) where possible. – Restrict the activities and movement of workers and vehicles to the immediate site and existing access roads. – Ensure that rubble, litter, and disused materials are appropriately stored and then disposed of regularly at licensed waste facilities. – Reduce and control dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent). – Restrict activities to daylight hours whenever possible in order to reduce the visual impacts associated with lighting. – Remove infrastructure not required for the post-decommissioning use of the site. – Rehabilitate all areas as per the rehabilitation plan undertaken. Consult an ecologist regarding rehabilitation specifications. – Monitor rehabilitated areas post-decommissioning and implement remedial actions as required.							

9.14 NOISE

9.14.1. CONSTRUCTION PHASE

Table 9-72 - Daytime activities relating to the construction of access roads

Potential Impact: Construction of roads during the day may increase ambient sound levels temporarily, though this impact is mainly limited to NSR staying within 100m from future access roads.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	1	1	1	2	**16**	**Low**	(-)
With Mitigation	5	1	1	1	2	**16**	**Low**	(-)
Mitigation and Management Measures	Significance of road construction activities is low for the scenario as conceptualized and additional mitigation measures are not required.							

Table 9-73 - Daytime construction traffic passing NSR

Potential Impact: Various construction vehicles passing close to potential NSR may increase ambient sound levels and create disturbing noises for a portion of the construction period. Construction traffic passing within 50m from the identified NSR could result in noise levels exceeding 50dBA (depending on the speed and number of vehicles), higher than the IFC recommended noise limits for daytime residential use, though there are no NSR staying this close to the access roads.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	2	1	2	2	**16**	**Low**	(-)
With Mitigation	3	2	1	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	Significance of the construction traffic noise impacts would be low for the scenario as conceptualized and additional mitigation measures will not be required.							

Table 9-74 - Daytime Impact Assessment: Daytime WTG construction activities

Potential Impact: Various construction activities (development of the hard standing areas, excavation and concreting of foundations and the erection of the wind turbines) taking place simultaneously during the day will increase ambient sound levels due to air-borne noise.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	1	1	2	1	**6**	**Very Low**	(-)
With Mitigation	1	1	1	2	1	**6**	**Very Low**	(-)
Mitigation and Management Measures	Significance of the construction noise impact is low for daytime construction activities and additional mitigation measures are not required.							

Table 9-75 - Night-time WTG construction activities

Potential Impact: Various construction activities (likely limited to the pouring of concrete as well as erection of WTG components) taking place simultaneously night will increase ambient sound levels due to air-borne noise.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	1	2	1	**7**	**Very Low**	(-)
With Mitigation	2	2	1	2	1	**7**	**Very Low**	(-)
Mitigation and Management Measures	Significance of the construction noise impact is low for night-time construction activities and additional mitigation measures are not required.							

9.14.2. Operation Phase

Table 9-76 - Impact Assessment: Daytime operation of WTG considering a PWL *of 110.5 dBA re 1 pW (relevant for the average expected and worst-case noise levels)*

Potential Impact: Wind turbines operating simultaneously during the day. Increases in residual noise levels due to air-borne noise from the WTG.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	1	4	1	**11**	**Very Low**	(-)
With Mitigation	4	2	1	4	1	**11**	**Very Low**	(-)
Mitigation and Management Measures	Significance of the operational noise impact is low for scenario as conceptualised and additional mitigation measures are not required.							

Table 9-77 - Impact Assessment: Night-time operation of WTG considering a PWL of 110.5 dBA re 1 pW (Average expected noise levels)

Potential Impact: Wind turbines operating simultaneously at night and there would be an increase in the residual noise levels due to air-borne noise from the WTG.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	3	1	4	4	48	Moderate	(-)
With Mitigation	2	3	1	4	3	30	Low	(-)
Mitigation and Management Measures	• Significance of the operational noise impact could be medium for the worst-case scenario as conceptualised (use of a WTG with a PWL of 110.5 dBA re 1 pW); additional mitigation measures are required which could include a combination of the following: – The developer can implement serrated trailing edges (STE) on the blades of selected WTG (WTG within 2,000m from NSR08 [WT01, WT02, WT03, WT05, WT06, WT07, WT08]); – The developer to develop and implement a noise monitoring programme; and – The developer can design a noise abatement programme (NAP) – operating the WTG such as WT03 and WT05 in a reduced noise mode during certain times at night, during certain wind speeds/directions or operating conditions.							

Table 9-78 below presents the change in impact significance from the original DEIR to this resubmitted DEIR. The revision follows the specialist's consideration of stakeholder comments received during the public review period. However, the post-mitigation significance of the impact remains rated as Low.

Table 9-78 - Impact Assessment: Night-time operation of WTG *considering a PWL of 110.5 dBA re 1 pW (Potential worst-case noise levels)*

Potential Impact: Wind turbines operating simultaneously at night and there would be an increase in the residual noise levels due to air-borne noise from the WTG.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	5	3	1	4	4	60	Moderate	(-)
With Mitigation	2	3	1	4	3	30	Low	(-)
Mitigation and Management Measures	Significance of the operational noise impact could be medium for the worst-case scenario as conceptualised (use of a WTG with a PWL of 110.5 dBA re 1 pW); additional mitigation measures are required which could include a combination of the following:							

Potential Impact: Wind turbines operating simultaneously at night and there would be an increase in the residual noise levels due to air-borne noise from the WTG.	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	• The developer can implement serrated trailing edges (STE) on the blades of selected WTG (WTG within 2,000m from NSR08 [WT01, WT02, WT03, WT05, WT06, WT07, WT08]); • The developer to develop and implement a noise monitoring programme; and • The developer can design a noise abatement programme (NAP) – operating the WTG such as WT03 and WT05 in a reduced noise mode during certain times at night, during certain wind speeds/directions or operating conditions.						

9.14.3. DECOMMISSIONING PHASE

Table 9-79 - Potential future decommissioning activities

Potential Impact: Various infrastructure decommissioning activities may increase ambient sound levels due to air-borne noise.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	2	1	2	1	**6**	**Very Low**	(-)
With Mitigation	1	2	1	2	1	**6**	**Very Low**	(-)
Mitigation and Management Measures	Significance of the noise impact is low for decommissioning activities and additional mitigation measures are not required.							

9.15 TRAFFIC

9.15.1. Construction Phase

Table 9-80 – Traffic impact

Potential Impact: Increase in development trips for the duration of the construction/decommissioning phase.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	2	4	**44**	**Moderate**	(-)
With Mitigation	2	3	2	2	3	**27**	**Low**	(-)
Mitigation and Management Measures	• Stagger component delivery to site.							

Potential Impact: Increase in development trips for the duration of the construction/decommissioning phase.	Magnitude	Extent	Reversibility	Duration	Probability	Significance	Character
	• Stagger the construction phase. • Use of licensed quarries in close proximity to the site to decrease the impact on the surrounding network if possible. • Staff and general trips to occur outside of peak traffic periods as much as possible. • Monitoring and maintenance of haulage routes. • Maintenance of internal roads. • Provide several access points to the site to split construction vehicle trips and reduce the risk of congestion at a single access. • Maintenance and repairs of any road sections of the district roads being used by construction vehicles. • Any road surface damage needs to be closely monitored to decide on the responsible party to repair it.						

Table 9-81 - Noise and dust pollution

Potential Impact: Construction associated noise and dust pollution.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	4	3	2	4	**48**	**Moderate**	(-)
With Mitigation	2	4	2	2	3	**30**	**Low**	(-)
Mitigation and Management Measures	• Stagger component delivery to site. • Stagger the construction phase. • Use of licensed quarries in close proximity to the site to decrease the impact on the surrounding network if possible. • Staff and general trips to occur outside of peak traffic periods as much as possible. • Monitoring and maintenance of haulage routes. • Maintenance of internal roads. • Provide several access points to the site to split construction vehicle trips and reduce the risk of congestion at a single access. • Maintenance and repairs of any road sections of the district roads being used by construction vehicles. • Any road surface damage needs to be closely monitored to decide on the responsible party to repair it.							

Table 9-82 - Damage to road surfaces

Potential Impact: Possible damage to road surfaces caused by construction vehicles.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	4	3	2	3	**36**	**Moderate**	(-)
With Mitigation	2	4	2	2	3	**30**	**Low**	(-)
Mitigation and Management Measures	• Stagger component delivery to site. • Stagger the construction phase. • Use of licensed quarries in close proximity to the site to decrease the impact on the surrounding network if possible. • Staff and general trips to occur outside of peak traffic periods as much as possible. • Monitoring and maintenance of haulage routes. • Maintenance of internal roads. • Provide several access points to the site to split construction vehicle trips and reduce the risk of congestion at a single access. • Maintenance and repairs of any road sections of the district roads being used by construction vehicles. • Any road surface damage needs to be closely monitored to decide on the responsible party to repair it.							

9.15.2. OPERATION PHASE

Table 9-83 – Traffic impact

Potential Impact: Slight increase in trips due to permanent staff travelling to and from site; irregular periodical maintenance trips.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	2	1	4	2	**16**	**Low**	(-)
With Mitigation	1	2	1	4	2	**16**	**Low**	(-)
Mitigation and Management Measures	No mitigation required							

9.15.3. DECOMMISSIONING PHASE

The impacts associated with the decommissioning phase will be the same as that of the construction phase.

9.16 GEOTECHNICAL

9.16.1. CONSTRUCTION AND OPERATION PHASE

Geotechnical impacts need to be taken into account as part of the proposed project development. The identified risks can typically be mitigated by the implementation of an appropriate and effective plan. Mitigation measures must be implemented to avoid or reduce negative impacts during the construction, operation and decommissioning phases.

The proposed WEF was found to have an impact significance level range of "Negative Low to Negative High" without mitigation. With mitigation measures impact significance of potential impacts decreases to "Negative Low to Negative Very Low

Table 9-84 – Slope stability

Potential Impact: Slope instability around structures. Steeply dipping joints in rock or boulders in soil mass may prove treacherous in cuttings and deep foundation excavation leading to collapse of sidewalls.	Magnitude	Extent	Reversibility		Duration	Probability	Significance		Character
Without Mitigation	2	1	3		3	2	**18**	**Low**	(-)
With Mitigation	1	1	3		2	2	**14**	**Very Low**	(-)
Mitigation and Management Measures	• Avoid steep slopes areas, as far as practicably possible. • Design cut slopes according to detailed geotechnical analysis and adopt appropriate support mechanisms.								

Table 9-85 – Seismic activity

Potential Impact: Damage of proposed development.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	1	3	4	3	**36**	**Moderate**	(-)
With Mitigation	2	1	3	3	3	**27**	**Low**	(-)
Mitigation and Management Measures	• Design according to expected peak ground acceleration. • Ensure the proposed development meets the minimum requirements for infrastructure in a seismic zone.							

Table 9-86 - Soil erosion from clearing of sites for drilling and test pitting

Potential Impact: Increase stormwater velocity. Increase in soil and wind erosion due to cleared vegetation. Creation of drainage paths along access tracks and side slopes. Sedimentation of non-perennial features and excessive dust.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	3	4	**48**	**Moderate**	(-)
With Mitigation	2	1	1	2	2	**12**	**Very Low**	(-)
Mitigation and Management Measures	• Rehabilitation of affected areas (such as revegetation). • Construction of temporary berms and drainage channels to divert surface water. • Minimize earthworks and fills. • Use existing road network and access tracks. • Correct engineering design and construction of gravel roads and water crossings. • Control stormwater flow. • Dust suppression measures for wind erosion.							

Table 9-87 - Potential hydrocarbon (including oil, fuels, chemicals) spillages

Potential Impact: Potential groundwater and drainage feature contamination from geotechnical heavy machinery.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	3	4	**48**	**Moderate**	(-)
With Mitigation	2	2	1	1	2	**12**	**Very Low**	(-)
Mitigation and Management Measures	• Vehicle and construction machinery repairs to be undertaken in designated areas with proper soil protection (i.e. on impermeable surfaces or with the use of drip trays). • Spill kit to be maintained on site, spills and contaminated soils to be collected and disposed appropriately. • Frequent checks and conditional monitoring.							

Table 9-88 - Disturbance of fauna and flora from clearing of sites

Potential Impact: The displacement of natural earth material and overlying vegetation leading to erosion and displacement of natural ecosystems.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	3	3	**30**	**Low**	(-)
With Mitigation	2	1	1	2	2	**12**	**Very Low**	(-)
Mitigation and Management Measures	Limit excavations to developmental areas.							

Table 9-89 - Subsidence

Potential Impact: The existing informal mine shaft are of unknown conditions including depths and how far across they go. This creates a high risk of sinkholes and ground collapse	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	1		4	5	**75**	**High**	(-)
With Mitigation	2	1	3	4	3	**30**	**Low**	(-)
Mitigation and Management Measures	• Geophysical studies (approximately 4 to 6 weeks):. • During the planning and pre-construction phase, conduct geophysical studies to map the extent of the mine. This can be followed by drilling to determine the structural layout of the shaft. Numerical modelling and monitoring should then be undertaken to assess the risks and potential effects on the surface. Numerical modelling and monitoring to assess the risk and effects on the surface. • No structures within a 100m radius of the mine shaft.							

9.16.2. DECOMMISSIONING PHASE

Table 9-90 – Slope stability

Potential Impact: Slope instability around structures.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	1	3	3	2	**18**	**Low**	(-)
With Mitigation	1	1	3	2	2	**14**	**Very Low**	(-)

Mitigation and Management Measures	• Adopt appropriate support mechanisms in excavation. • Design cut slopes according to detailed geotechnical analysis.

Table 9-91 - Soil erosion

Potential Impact: Increase in soil and wind erosion due to clearance of structures. Displacement of soil and damage to vegetation by vehicles	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	2	3	3	4	**48**	**Moderate**	(-)
With Mitigation	2	1	1	2	2	**12**	**Very Low**	(-)
Mitigation and Management Measures	• Use existing road network and access tracks. • Use of temporary berms and drainage channels to divert surface water. • Minimize earthworks and demolishing footprints. • Rehabilitation of affected areas (such as revegetation). • Reinstate channelized drainage features. • Strip, stockpile and re-spread topsoil. • Dust suppression measures for wind erosion.							

Table 9-92 - Potential hydrocarbon (including oil, fuels, chemicals) spillages

Potential Impact: Potential hydrocarbon spillages in machinery due to clearance of structures.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	3	4	**48**	**Moderate**	(-)
With Mitigation	2	1	3	1	2	**12**	**Very Low**	(-)
Mitigation and Management Measures	• Vehicle and construction machinery repairs to be undertaken in designated areas with proper soil protection (i.e. on impermeable surfaces or with the use of drip trays). • Spill kit to be maintained on site, spills and contaminated soils to be collected and disposed appropriately. • Frequent checks and conditional monitoring.							

Table 9-93 - Disturbance of fauna and flora

Potential Impact: The displacement of natural earth material and overlying vegetation leading to erosion and displacement of natural ecosystems.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	1	3	3	3	**30**	**Low**	(-)
With Mitigation	2	1	1	2	2	**12**	**Very Low**	(-)
Mitigation and Management Measures	Limit excavations to decommissioning areas.							

Table 9-94 - Subsidence

Potential Impact: The existing informal mine shaft are of unknown conditions including depths and how far across they go. This creates a high risk of sinkholes and ground collapse	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	4	1	5	5	5	**75**	**High**	(-)
With Mitigation	2	1	3	4	3	**30**	**Low**	(-)
Mitigation and Management Measures	• Geophysical studies. • Numerical modelling and monitoring to assess the risk and effects on the surface. • No structures within a 100m radius of the mine shaft.							

9.17 SOCIAL

9.17.1. CONSTRUCTION PHASE

Table 9-95 – Job creation

Potential Impact: • The construction phase is estimated to be 24 months for the 170 MW wind farm. The Project undertakes to employ predominantly local South Africans during construction. Most workers will be low-skilled, with approximately 60% low-skilled and 30–40% semi-skilled and skilled, respectively. • There will be a localised social benefit to the communities in the area, considering the relatively high unemployment levels and few employment opportunities. Potential for local businesses is probably constrained due to the regional financial diversification. Therefore, it is likely that contractors and engineering firms based outside of the municipality will reap most of the benefits. The development phase will also be advantageous to the area's service industry. The potential prospects would be related to the site's transportation, security, cleaning, catering, and lodging for the construction employees.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	4	3	3	3	3	**39**	Moderate	(+)
With Mitigation	5	4	3	4	4	**64**	**High**	(+)
Mitigation and Management Measures	• Preparation and implementation of a Stakeholder Engagement Plan (SEP) and Grievance Mechanism before and during construction. • Where reasonable and practical, the Project should apply a 'locals first' policy, especially for semi and un-skilled jobs. The majority of skilled positions, however, are likely to be filled by individuals from outside the area due to the low skill levels in the area. • Communities near the Project should be given special consideration regarding the benefits arising from it, as they will be most affected. • The engineering, procurement, and construction contractor should prefer appropriate subcontractors in the surrounding communities, followed by those in the municipal area and those outside the province. • Resources required during construction should be sourced, preferably from local businesses. Accommodation needed for contractors should favour local guesthouses and hotels. • Wherever possible, the hiring process should promote gender equality and women's employment. • The proponent should liaise with the municipality regarding establishing a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g., construction companies, catering companies, waste collection companies, security							

Potential Impact: • The construction phase is estimated to be 24 months for the 170 MW wind farm. The Project undertakes to employ predominantly local South Africans during construction. Most workers will be low-skilled, with approximately 60% low-skilled and 30–40% semi-skilled and skilled, respectively. • There will be a localised social benefit to the communities in the area, considering the relatively high unemployment levels and few employment opportunities. Potential for local businesses is probably constrained due to the regional financial diversification. Therefore, it is likely that contractors and engineering firms based outside of the municipality will reap most of the benefits. The development phase will also be advantageous to the area's service industry. The potential prospects would be related to the site's transportation, security, cleaning, catering, and lodging for the construction employees.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**	**Character**
	companies, etc.) before the commencement of the tender process for construction service providers. These companies should be notified of the tender process and invited to bid for project-related work.							

Table 9-96 – Population influx

Potential Impact: • According to a 2023 Statistics South Africa report, the unemployment rate in the first quarter of the year stood at 32.9% This unemployment rate poses a significant challenge for job seekers, who may feel compelled to relocate to areas experiencing growth to secure employment. However, such a move can potentially negatively affect the local community. There will also be added pressure on the existing municipal infrastructure and services. This pressure includes increases in traffic, water use, and housing demand. Additionally, the influx of people from different cultures and languages may impact local culture and family structures, leading to a sense of displacement among locals. • The influx of labour could result in the development of informal dwellings and possibly informal settlements in the area. It is unlikely that all these people will be employed during construction, thus resulting in increased unemployment. The increased number of unemployed people may lead to increased social ills such as crime, alcohol abuse, Gender Based Violence (GBV), and growing pressure on local resources, infrastructure and social services	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	3	3	3	4	**48**	**Moderate**	(-)
With Mitigation	2	2	2	2	2	**16**	**Low**	(-)
Mitigation and Management Measures	• A community awareness campaign will be implemented in the surrounding communities to sensitise community members to traffic safety risks and infectious disease awareness. • As part of onboarding workers, training should be provided on preventing GBV, Sexual Assault (SEA) and Sexual Harassment (SH). • The Project must engage with communities using a dedicated community liaison officer and have an effective SEP, including a grievance mechanism for communities to access and lodge complaints. • Local employment should be a priority for the construction contractor to lessen the number of workers away from their homes. • Training programmes must be implemented to enable local participants to take advantage of employment opportunities. • No recruitment should occur at the Project gate to prevent informal settlements around the Project site. • Increased security in the Project area should be provided to regulate access to the site and prevent informal settlements.							

Table 9-97 – Procurement from local business

Potential Impact: The Project and its employees will require various goods and services to support construction activities. Goods and services will include construction supplies and contracting services like transportation, equipment rental, and skilled labour The Project will bolster the local economy by involving local suppliers and service providers. Involving local suppliers and service providers will stimulate economic growth by creating job opportunities, increasing demand for local products and services, and enabling the development of small and medium-sized enterprises. Additionally, the increased economic activity can lead to improved infrastructure, enhanced community services, and overall economic growth in the region.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	2	2	2	**16**	**Low**	(+)
With Mitigation	2	2	3	4	3	**33**	**Moderate**	(+)
Mitigation and Management Measures	• The Project could partner with local suppliers through procurement programmes to develop local suppliers. • Procurement programmes should prioritise local procurement for locally available goods and services.							

Table 9-98 – Community health, safety and security

Potential Impact: The Project workers could damage farm fences and buildings, increase crime, theft or killing of livestock, and theft of farm produce. While the creation of jobs is positive, it may also introduce changes in lifestyle, such as multiple sexual relations, which could lead to a higher infection rate of HIV/STIs within the Project area. The goal will be to hire as many un-skilled and semi-skilled people locally as possible. These employees will be local community members, and family networks will be kept intact—this task will lower the risks of social ills.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	3	3	1	2	**18**	**Low**	(-)
With Mitigation	2	2	1	2	2	**14**	**Very Low**	(-)
Mitigation and Management Measures	• The Project should employ security personnel onsite during construction to implement security. The Project should include monthly health talks and coordinate health and safety campaigns to educate personnel and the community on general health, safety and security issues. • The proponent and the contractor should implement an HIV/AIDS and Tuberculosis (TB) awareness programme for all construction workers at the outset of the construction phase.							

	• The proponent and the contractor should implement an HIV/AIDS and Tuberculosis (TB) awareness programme for all construction workers at the outset of the construction phase. • The contractor should transport workers to and from the site daily. • The contractor should supervise and manage the entrance and exit of the construction site to ensure no interaction with communities at the site. • No construction workers, except security personnel, should be permitted to stay overnight on the site.

9.17.2. OPERATION PHASE

Table 9-99 – Job creation

Potential Impact: The facility's operation will create employment opportunities. It is assumed that unskilled labour will be sourced from the local community, and as far as possible, skilled labour will also be sourced from the local community	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	4	3	3	4	3	**42**	**Moderate**	(+)
With Mitigation						**56**	**Moderate**	(+)
Mitigation and Management Measures	• Where reasonable and practical, the Project should apply a 'locals first' policy, especially for semi and low-skilled jobs. The majority of skilled positions, however, are likely to be filled by individuals from outside the area due to the low skill levels in the area. • Communities near the Project should be given special consideration regarding the benefits arising from it, as they will be most affected. • The proponent should liaise with the municipality regarding establishing a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g., maintenance companies, catering companies, waste collection companies, security companies, etc.) before the commencement of the tender process for construction service providers. These companies should be notified of the tender process and invited to bid for project-related work.							

Table 9-100 – Population influx

Potential Impact: As discussed in the construction phase, there will also likely be an influx of job seekers during the operational phase. An increase in job seekers may increase pressure on the existing municipal infrastructure and	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**	**Character**

services. An influx of job seekers includes increased road traffic, water usage and housing demands. The influx of people from different cultures and languages may impact the local culture, language, and family structures, leading to a sense of displacement for the locals. The influx of job seekers can potentially affect the local community negatively.								
Without Mitigation	4	3	3	4	3	**42**	**Moderate**	(-)
With Mitigation	2	2	3	3	2	**20**	**Low**	(-)
Mitigation and Management Measures	• A community awareness campaign will be implemented in the surrounding communities to sensitise community members to traffic safety risks and infectious disease awareness. • As part of onboarding workers, training should be provided on preventing GBV, SEA and SH. • The Project must engage with communities using a dedicated community liaison officer and have an effective SEP, including a grievance mechanism for communities to access and lodge complaints. • Local employment should be a priority for the operations contractor to lessen the number of workers away from their homes. • Training programmes must be implemented to enable local participants to take advantage of employment opportunities. • No recruitment should occur at the Project gate to prevent informal settlements around the Project site. • Increased security in the Project area should be provided to regulate access to the site and prevent informal settlements.							

Table 9-101 – Procurement from local businesses

Potential Impact: The Project and its employees will require procurement of goods and services for operations. It increases local economic growth when local entrepreneurs and businesses are procured for supplies and services.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	2	2	2	**16**	**Low**	(+)
With Mitigation	2	2	3	4	3	**33**	**Moderate**	(+)
Mitigation and Management Measures	• The Project could partner with local suppliers through procurement programmes to develop local suppliers. • Procurement programmes should prioritise local procurement for locally available goods and services.							

Table 9-102 – Community, Health, Safety and Security

Potential Impact: The movement of vehicles and increased human activity may damage infrastructure and increase crime, livestock theft, and farm produce theft or death. It could have a Low negative impact on the community's health, safety and security.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	2	2	3	4	2	**22**	**Low**	(-)
With Mitigation	2	2	3	3	2	**20**	**Low**	(-)
Mitigation and Management Measures	• The Project should employ security personnel onsite during operations to implement security. • The Project should include monthly health talks and coordinate health and safety campaigns to educate personnel and the community on general health, safety and security issues related to the Project. • The workers should be transported to and from the site daily. • The contractor should efficiently supervise and manage the entrance and exit of the site to ensure no interaction with communities at the site. • No workers, except security personnel, should be permitted to stay overnight on the site							

Table 9-103 – Energy generation

Potential Impact: The facility's operation will allow the renewable energy facility to produce electricity without waste or emissions during the operational phase. South Africa's per capita greenhouse emissions are the highest in Africa (Jainb, 2017). The Project will aid in reducing the carbon footprint and emissions	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	1	2	3	4	2	**20**	**Low**	(+)
With Mitigation	4	3	3	4	4	**56**	**Moderate**	(+)
Mitigation and Management Measures	• The power generated from the proposed project should be used to provide for homes, farms, and businesses in the surrounding communities. • The proposed Project should be used to encourage more renewable sources of energy.							

9.17.3. DECOMMISSIONING PHASE

Table 9-104 – Loss of employment

Potential Impact: • During this phase, the operational workforce will lose their jobs, and it may lead to adverse social consequences in the municipality, such as: • Increase or return the unemployment rate to previous levels within the Project area. • Financial hardship. • Family tensions and breakdown. • Unemployment can result in alienation, shame and stigma. • Crime. • It should be noted. However, wind energy facilities usually employ two maintenance employees per 30 wind turbines (Wind Energy The Facts,n.d) or, depending on capacity, seven to eleven personnel per 100 MW (Adelman).	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	4	4	3	4	3	**45**	**Moderate**	(-)
With Mitigation	2	1	2	4	3	**27**	**Low**	(-)
Mitigation and Management Measures	• Timely and adequate consultation with employees dependent on the Project for employment should occur. • Assisting employees seeking alternative employment at other wind power plants or related facilities. • Training, educating and re-skilling employees to equip them with skills that could benefit them in other industries should occur.							

Table 9-105 – Reduced community investment

Potential Impact: There will be reduced local spending by the Project and its staff and contractors. Consequently, local business revenue may be affected, and tax payments will decrease.	**Magnitude**	**Extent**	**Reversibility**	**Duration**	**Probability**	**Significance**		**Character**
Without Mitigation	3	4	4	4	4	**39**	**Moderate**	(-)
With Mitigation	2	1	2	4	3	**27**	**Low**	(-)
Mitigation and Management Measures	• Engage local and regional government concerning the decommissioning phase. • Develop alternative projects which can support the local economy.							

Table 9-106 – Associated infrastructure

Potential Impact: Structures used during operation will be abandoned and might attract criminal activity or house social ills. Maintenance of these structures might decrease after the Project operation, leading to hazards to the health and welfare of the community.	Magnitude	Extent	Reversibility	Duration	Probability	Significance		Character
Without Mitigation	3	3	3	3	4	**48**	**Moderate**	(-)
With Mitigation	2	2	1	3	2	**16**	**Low**	(-)
Mitigation and Management Measures	• An end-of-life shutdown procedure must be undertaken, including a risk assessment of the activities involved. • End-of-life, which is affected by temperature and time, cycles, etc., should be predefined, and monitoring should be in place to determine if it has been reached. • The proponent shall develop exit strategies for all its community development initiatives.							

9.18 HEALTH, SAFETY AND ENVIRONMENT RISK

Table 9-107 - Potential impacts for Health, Safety and Environment Risk - Solid State Lithium-Ion Battery Energy Storage Systems

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
High Level Safety, Health and Environmental Risk Assessment	Human Health - chronic exposure to toxic chemical or biological agents	C	(-)	Moderate	Low
	Human Health - exposure to noise	C	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	C	(-)	Low	Very Low
	Human Health - exposure to psychological stress	C	(-)	Low	Low
	Human Health - exposure to ergonomic stress	C	(-)	Low	Low
	Human and Equipment Safety - exposure to fire radiation (a)	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to fire radiation (b)	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to explosion over pressures	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents (a)	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents (b)	C	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	C	(-)	High	Low
	Human and Equipment Safety - exposure to electromagnetic waves	C	(-)	Moderate	Low
	Environment - emissions to air	C	(-)	Low	Very Low
	Environment - emissions to water	C	(-)	Low	Low
	Environment - emissions to earth	C	(-)	Low	Low
	Environment - waste of resources e.g., water, power etc	C	(-)	Low	Very Low
	Public - Aesthetics	C	(-)	Low	Low
	Investors - Financial	C	(-)	Moderate	Low
	Employees and investors - Security	C	(-)	Moderate	Low
	Emergencies	C	(-)	Moderate	Low
	Investors - Legal	C	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents (a)	O	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents (b)	O	(-)	Moderate	Low
	Human Health - exposure to noise	O	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	O	(-)	Low	Very Low
	Human Health - exposure to psychological stress	O	(-)	Low	Very Low
	Human Health - exposure to ergonomic stress	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to fire radiation (a)	O	(-)	High	Low
	Human and Equipment Safety - exposure to fire radiation (b)	O	(-)	High	Low
	Human and Equipment Safety - exposure to explosion over pressures	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents (a)	O	(-)	Low	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents(a)	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to electromagnetic waves	O	(-)	Moderate	Low
	Environment - emissions to air	O	(-)	Low	Very Low
	Environment - emissions to water	O	(-)	Low	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Environment - emissions to earth	O	(-)	Low	Very Low
	Environment - waste of resources e.g., water, power etc	O	(-)	Low	Very Low
	Public - Aesthetics	O	(-)	Low	Low
	Investors - Financial	O	(-)	Moderate	Low
	Employees and investors – Security (a)	O	(-)	Moderate	Low
	Employees and investors – Security (b)	O	(-)	Moderate	Low
	Emergencies	O	(-)	Moderate	Low
	Investors - Legal	O	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	D	(-)	Moderate	Low
	Human Health - exposure to noise	D	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	D	(-)	Low	Very Low
	Human Health - exposure to psychological stress	D	(-)	Low	Low
	Human Health - exposure to ergonomic stress	D	(-)	Low	Low
	Human and Equipment Safety - exposure to fire radiation	D	(-)	Moderate	Low
	Human and Equipment Safety - exposure to explosion over pressures	D	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	D	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to electromagnetic waves	D	(-)	Moderate	Low
	Environment - emissions to air	D	(-)	Low	Very Low
	Environment - emissions to water	D	(-)	Low	Low
	Environment - emissions to earth	D	(-)	Moderate	Low
	Environment - waste of resources e.g., water, power etc	D	(-)	Low	Very Low
	Public - Aesthetics	D	(-)	Low	Low
	Investors - Financial	D	(-)	Moderate	Low
	Employees and investors - Security	D	(-)	Moderate	Low
	Emergencies	D	(-)	Moderate	Low
	Investors - Legal	D	(-)	Moderate	Low

Table 9-108 - Potential impacts for Health, Safety and Environment Risk - Vanadium redox flow battery energy storage systems

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
High Level Safety, Health and Environmental Risk Assessment	Human Health - chronic exposure to toxic chemical or biological agents	C	(-)	Moderate	Low
	Human Health - exposure to noise	C	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	C	(-)	Low	Very Low
	Human Health - exposure to psychological stress	C	(-)	Low	Low
	Human Health - exposure to ergonomic stress	C	(-)	Low	Low
	Human and Equipment Safety - exposure to fire radiation	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to explosion over pressures	C	(-)	N/A	N/A
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents (a)	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	C	(-)	High	Low
	Human and Equipment Safety - exposure to electromagnetic waves	C	(-)	Moderate	Low
	Environment - emissions to air	C	(-)	Low	Very Low
	Environment - emissions to water	C	(-)	Low	Low
	Environment - emissions to earth	C	(-)	Low	Low
	Environment - waste of resources e.g., water, power etc	C	(-)	Low	Very Low
	Public - Aesthetics	C	(-)	Low	Low
	Investors - Financial	C	(-)	Moderate	Low
	Employees and investors - Security	C	(-)	Moderate	Low
	Emergencies	C	(-)	Moderate	Low
	Investors - Legal	C	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents (a)	O	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents (b)	O	(-)	Moderate	Low
	Human Health - exposure to noise	O	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	O	(-)	Low	Very Low
	Human Health - exposure to psychological stress	O	(-)	Low	Very Low
	Human Health - exposure to ergonomic stress	O	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Human and Equipment Safety - exposure to fire radiation (a)	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to fire radiation (b)	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to explosion over pressures	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents (a)	O	(-)	Low	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents (b)	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to electromagnetic waves	O	(-)	Moderate	Low
	Environment - emissions to air	O	(-)	Low	Very Low
	Environment - emissions to water	O	(-)	Low	Low
	Environment - emissions to earth	O	(-)	Low	Very Low
	Environment - waste of resources e.g., water, power etc	O	(-)	Low	Very Low
	Public - Aesthetics	O	(-)	Moderate	Low
	Investors - Financial	O	(-)	Moderate	Low
	Employees and investors – Security (a)	O	(-)	Moderate	Low
	Employees and investors – Security (b)	O	(-)	Moderate	Low
	Emergencies	O	(-)	Moderate	Low
	Investors - Legal	O	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents	D	(-)	Moderate	Low
	Human Health - exposure to noise	D	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	D	(-)	Low	Very Low
	Human Health - exposure to psychological stress	D	(-)	Low	Low
	Human Health - exposure to ergonomic stress	D	(-)	Low	Low
	Human and Equipment Safety - exposure to fire radiation	D	(-)	Moderate	Low
	Human and Equipment Safety - exposure to explosion over pressures	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	D	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	D	(-)	High	Low
	Human and Equipment Safety - exposure to electromagnetic waves	D	(-)	Moderate	Low
	Environment - emissions to air	D	(-)	Low	Very Low
	Environment - emissions to water	D	(-)	Low	Low
	Environment - emissions to earth	D	(-)	Moderate	Low
	Environment - waste of resources e.g., water, power etc	D	(-)	Low	Very Low
	Public - Aesthetics	D	(-)	Low	Low
	Investors - Financial	D	(-)	Moderate	Low
	Employees and investors - Security	D	(-)	Moderate	Low
	Emergencies	D	(-)	Moderate	Low
	Investors - Legal	D	(-)	Moderate	Low

10 CULMULATIVE IMPACT ASSESSMENT

Cumulative impacts refer to the successive, incremental, and/or combined effects of a project, activity, or action when considered alongside other existing, planned, or reasonably foreseeable developments. The assessment and management of cumulative impacts focus on those impacts that are scientifically significant or of concern to affected communities. While this assessment primarily addresses South African regulatory requirements, elements of internationally recognized standards, such as the IFC Performance Standards, provide valuable context for identifying and mitigating cumulative impacts. These standards will guide alignment during later stages of the project lifecycle.

Cumulative impacts are evaluated within the project's **area of influence**, which includes:

Areas directly impacted by the project;
Surrounding regions influenced by other existing and planned projects; and
Broader geographic and temporal scales where unplanned but predictable impacts may emerge.

While compliance with IFC Performance Standards is not a requirement under South African EIA regulations, their guidance on addressing cumulative impacts is acknowledged. This includes analyzing the interaction of project impacts with other human activities and natural drivers affecting Valued Environmental and Social Components (VECs). During financial close and subsequent phases, the project will incorporate additional measures to align with international standards where necessary.

This cumulative impact assessment (CIA) provides a foundation for understanding the broader environmental and social context of the project. It evaluates the additive effects of the project in conjunction with other renewable energy developments within the region, with the goal of proposing actionable measures to mitigate cumulative impacts where feasible. These measures will be detailed in the Environmental and Social Management Plans (ESMPs) and broader Environmental and Social Management System (ESMS) as the project progresses.

Cumulative impacts with existing and approved facilities may occur during construction and operation of the project. While one project may not have a significant negative impact on sensitive resources or receptors, the collective impact of the projects may increase the severity of the potential impacts.

The CIA evaluates the incremental contribution of the proposed Project to the combined effects of existing and approved (reasonably foreseeable impacts) within the broader region. The aim is to determine whether the project, when considered together with other activities, may result in significant cumulative impacts exceeding acceptable thresholds or environmental limits. Only approved or constructed projects have been included in the cumulative impact assessment as refused or in process applications cannot lawfully initiate their scope and thus incur resultant potential impacts that can be considered as reasonably foreseeable impacts. Notwithstanding the above, should any specialist determine, based on specific impact pathways, receptor sensitivities, or species-specific risks, that a larger assessment radius is warranted to adequately assess potential impacts, the applicable cumulative assessment footprint may be expanded accordingly, with appropriate motivation provided in the specialist study.

Although the proposed grid connection will be subject to a separate application process, it has been included in the cumulative impact assessment, as its impacts must be considered in combination with those of the proposed facility.

While a broader regional context (up to 100 km) was identified in the DSR, individual specialist assessments for the EIA phase focused on smaller areas (i.e. 30–50 km) based on standard methods and data availability. Therefore, the spatial extent of the CIA has been defined per specialist discipline. In line with accepted methodology for environmental impact assessment and as per the radius applied by the DFFE Screening tool, the application of a 30km radius for the cumulative impact assessment for all specialist themes apart from Agriculture, which will consider projects within 50km of the proposed WEF, in line with the relevant Agricultural Protocol for renewable energy development, has been applied in the CIA. This methodology was presented in the POS included in the final Scoping Report approved by the DFFE. The proposed project is not located within one of the promulgated Renewable Energy Development Zones (REDZ). All approved and existing projects located within a 50km radius of the site have been identified for regional context, included in **Table 10-1** illustrated in **Figure 10-1.** The projects considered are from the latest REEA database from the DFFE (2026, Quarter 2) and Mpumalanga Tourism & Parks Agency (MTPA) database. It is important to note that the existence of an approved EA does not directly equate to actual development of the project. It is noted that all projects are solar (PV) projects. Five of the thirteen identified projects are within 30km of the proposed WEF while the remainder fall within a 30km-50km radius. **All cumulative impacts have been assessed and found to be acceptable with the implementation of the recommended mitigation measures.**

Table 10-1 - Projects within 50km of the project 1

Project Name	Applicant	Status	Reference Number	Distance away (KM)
Proposed construction of a 75 MW Solar (PV) electricity installation on various portions of the Farm Grootvlei No 453 IR Dipaleseng Local Municipality, Mpumalanga Province	Clare Energy and Habitat Pty Ltd	Approved	12/12/20/2060	3
The Proposed Suikerbos PV 1 and Associated Infrastructure in the Midvaal Local Municipality and the Sedibeng District Municipality, near Vereeniging, Gauteng Province.	Suikerbos PV 1 (Pty) Ltd	Approved	14/12/16/3/3/2/2599	26
The Proposed Suikerbos PV 2 and Associated Infrastructure in the Midvaal Local Municipality and the Sedibeng District Municipality, near Vereeniging, Gauteng Province.	Suikerbos PV 2 (Pty) Ltd	Approved	14/12/16/3/3/2/2600	27
The Proposed Suikerbos PV 3 and Associated	Suikerbos PV 3 (Pty) Ltd	Approved	14/12/16/3/3/2/2601	27

Project Name	Applicant	Status	Reference Number	Distance away (KM)
Infrastructure in the Midvaal Local Municipality and the Sedibeng District Municipality, near Vereeniging, Gauteng Province.				
The proposed Suikerbos PV 4 Photovoltaic Solar Energy Facility and Associated Infrastructure near Vereeniging, Gauteng Province.	Suikerbos PV 4 (Pty) Ltd	Approved	14/12/16/3/3/2/2624	30
Proposed construction of a 3MW PV solar power facility on Farm Villa Liza No. 675IR in Mapelton	BNM Technology and Associates	Approved	14/12/16/3/3/1/569	31
Proposed CSP RE Capital 12 (Pty) Ltd development within !kai Garib Local Municipality	RE Capital 12 (Pty) Ltd	In process	14/12/16/3/3/2/706	32
The 100 MW Waterval Solar Park including solar glass manufacturing, metallurgical silicone manufacturing plant and module manufacturing plant near Meyerton, Gauteng Province	TFS Solar (Pty) Ltd	Approved	14/12/16/3/3/2/825	35
The Proposed Villiers Solar Power Plant near Villiers, Free State Province	Villiers Solar Power Plant (RF) Pty Ltd	Approved	14/12/16/3/3/2/2549	36
Proposed Kynoch Rooftop Energy Installation in Endicott Gauteng Province	Building Energy (Pty) Ltd	In process	14/12/16/3/3/1/1234	37
Proposed 75 MW Solar PV facility at Lethabo Power Station, Free State Province	Eskom Holdings SOC Limited	Approved	14/12/16/3/3/2/753	38
The Proposed Construction Of A 75mw Solar Energy Generation Facility And Its Associated Infrastructure On Portion 1 Of The Farm Putfontein 26 Ir, Ekurhuleni Metropolitan Municipality, Gauteng Province	Clyde Brickfields (Pty) Ltd	Approved	14/12/16/3/3/2/375	40
The Proposed Construction Of A 75mw Solar Energy Generation Facility And Its Associated Infrastructure On Portion 1 Of The Farm	Clyde Brickfields (Pty) Ltd	Approved	14/12/16/3/3/2/375/AM1	40

Project Name	Applicant	Status	Reference Number	Distance away (KM)
Putfontein 26 Ir, Ekurhuleni Metropolitan Municipality, Gauteng Province				
The proposed establishment of a 115MW solar photovoltaic (PV) facility in Springs, within the Ekurhuleni Metropolitan Municipality, Gauteng Province	Calodex (Pty) Ltd	Approved	14/12/16/3/3/1/2358	43
Proposed Kynoch Rooftop Energy Installation in Endicott Gauteng Province	Building Energy (Pty) Ltd	In process	14/12/16/3/3/1/1233	47
Camco clean energy 100KW PV solar system at Thaba Eco Lodge	Camco Clean Energy Pty Ltd	Approved	002/15-16/E0152	48

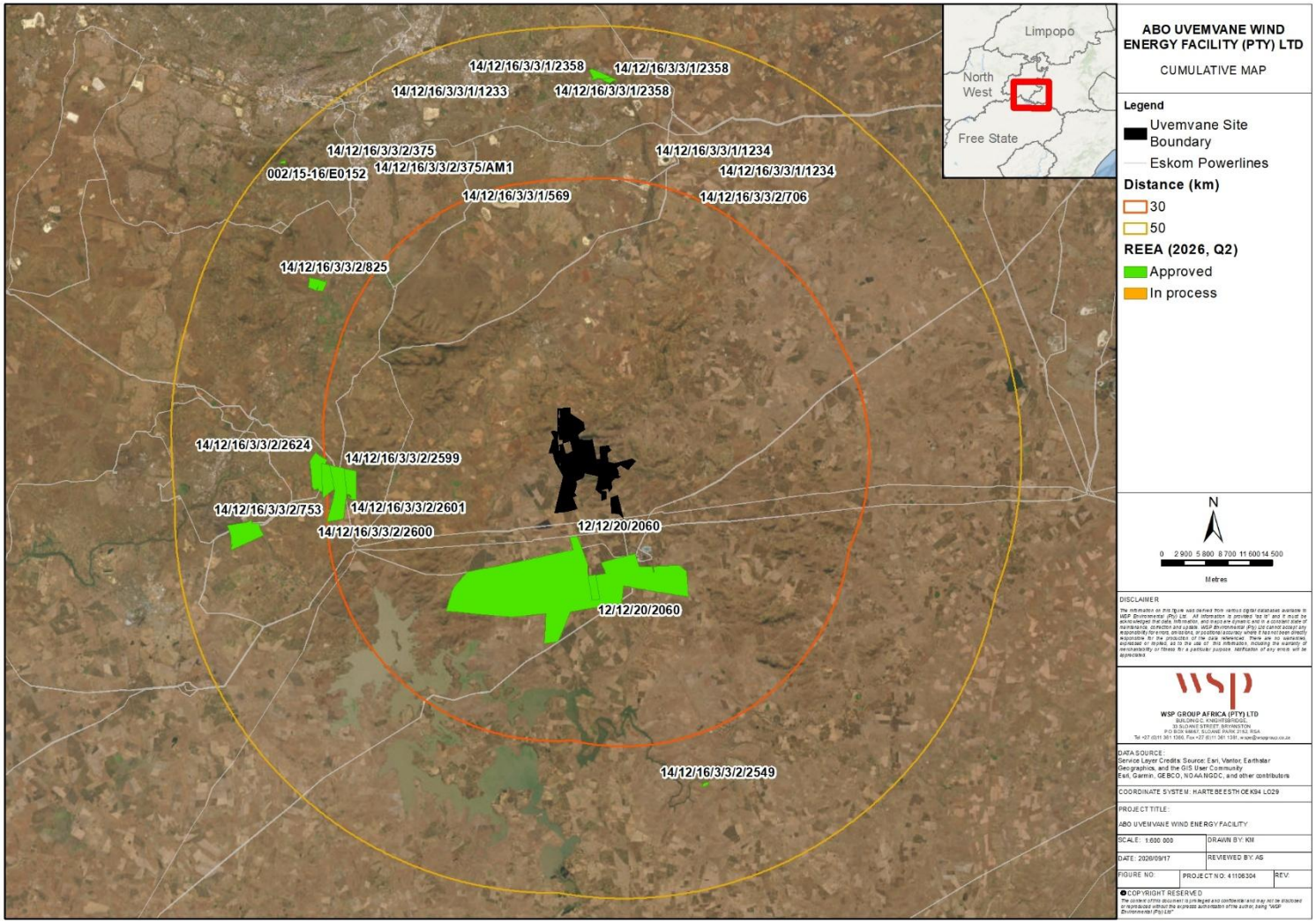

Figure 10-1 - Map showing projects within 50km of the project

10.1 SOIL, LAND USE AND LAND CAPABILITY

The spatial boundary evaluated in assessing the cumulative effects includes an area of a 50 km radius (as required by the agriculture protocol) surrounding the proposed project area. According to the South African REEA Database for the first quarter of 2026, as published on 29 May 2026 (REEA, 2026) there are several approved renewable energy projects and related infrastructure projects within this area.

Due to all the small (relative to the larger agricultural environment) physical footprint of the project infrastructure, the cumulative loss of future agricultural production potential is assessed as '**Low**'. With the information available at the time of this assessment, the specialist is satisfied that the proposed project will not have an unacceptable negative cumulative impact on the agricultural production capability of the area.

With regards to the proposed grid connection related to the project, no significant cumulative impact is anticipated due to its proposed route following existing roads and border fences where it will have no negative effect on the agricultural production potential of the land. Similarly, no major cumulative impacts are expected from the proposed access roads or other project supporting infrastructure (Take note that the electrical grid connection component of the project will be subject to separate environmental impact assessments).

10.2 TERRESTRIAL BIODIVERSITY, PLANT & ANIMAL SPECIES

According to the REEA Q1 2026 database and data received from MTPA, several approved renewable energy development projects are located across the broader region surrounding the PAOI. Within a 50 km radius of the PAOI, these include *inter alia*, Suikerbos PV 1 and Suikerbos PV 2, Suikerbos PV 3, Suikerbos PV 4, Waterall Solar Park, Lethabo Power Station Solar PV Facility. Others, are in the process of obtaining their environmental authorisation. It is also noted that additional infrastructure elements associated with this proposed Project, such as the required grid connection (which will form part of a separate authorisation process), will also take place in the surrounding landscape and will have negative ecological impacts. It is within the context of these various projects that cumulative impacts on terrestrial biodiversity including plant and animal species associated with the proposed Project were assessed below:

10.2.1. CUMULATIVE IMPACT ON FAUNA SCC DUE TO NATURAL HABITAT LOSS, DISTURBANCE AND FRAGMENTATION

Large portions of the landscape in which the PAOI is located are already modified and fragmented as a consequence of historic and current agriculture, amongst other land uses. This places significant pressure on the functioning and integrity of remaining natural and semi-natural habitat patches, and their ability to support terrestrial biodiversity.

Although the individual development footprints of each of the planned/proposed renewable energy developments listed above are expected to be relatively small, the combined effects of habitat loss, fragmentation and disturbance from vegetation clearing and earth works are likely to negatively affect broader-scale ecological habitat integrity and functioning. This in turn, can negatively impact the metapopulation dynamics of local flora and fauna SCC. The combined effects of habitat loss, fragmentation and disturbance of these various renewable energy projects is therefore a cumulative impact of concern.

Prior to any form of mitigation, the cumulative impact on terrestrial biodiversity resulting from habitat loss, disturbance and fragmentation is rated 'high'. The proposed Project contribution to cumulative impacts can be minimised by strictly and successfully implementing the mitigation measures detailed in this report, and if required, addressing any significant residual impacts via additional conservation actions. The cumulative impact can be thus reduced to 'Low' significance.

10.2.2. CUMULATIVE LOSS OF FLORA SCC DUE TO NATURAL HABITAT LOSS, DISTURBANCE AND FRAGMENTATION.

The cumulative effects of the various renewable energy projects listed above are a concern with respects to flora SCC. Not only is it possible for individual threatened plants to be killed during vegetation clearing for these various projects, but it is also possible that the associated habitat loss, disturbance and fragmentation may compromise the integrity of the broader habitat matrix and negatively affect the key ecological process that sustain viable SCC populations, including pollinator movement, seed dispersal and the maintenance of suitable microhabitats.

Prior to any form of mitigation, the cumulative impact on flora SCC from habitat loss, disturbance and fragmentation is rated 'high'. The proposed Project's contribution to cumulative impacts can be minimised by strictly implementing the required mitigation measures and addressing any significant residual impacts via additional conservation actions. The cumulative impacts on terrestrial flora SCC can therefore be reduced to 'Low' significance.

10.2.3. CUMULATIVE IMPACT ON FAUNA SCC DUE TO MORTALITY, INJURY AND DISTURBANCE

Construction activities associated with various renewable energy projects in the region, coupled with their general operational and maintenance activities, will lead to an increase in general human activities in the landscape, which may result in an escalation of direct negative impacts on fauna SCC through, inter alia, vehicle collisions, increased hunting/snaring, and disturbances through high or excessive levels of noise, vibrations and dust entrainment

10.3 AQUATIC

It is unclear whether other projects not related to renewable energy are or have been constructed in this area, and whether other projects are proposed. In general, development activity in the area is focused on urban, mining and agricultural activities (cultivation). Future renewable energy developments may take place within the general area.

The approved Suikerbos PV 1, PV2, PV3 and PV4 are located about 28km from the project, further downstream on the Suikerbosrant River, while the other two renewable energy projects are within 30 km to 50 km of the proposed project and are within sub-catchments of the Vaal and Rietspruit Rivers. **There are not likely to be any cumulative impacts**, given that the other projects are located far from the site or in a different catchment.

10.4 HERITAGE RESOURCES

The cumulative impact of a development is the impact that development will have when its impact is added to the incremental impacts of other past, present or reasonably foreseeable future activities that will affect the same environment. It is important to note that the cumulative impact assessment for a particular project, like what is being done here, is not the same as an assessment of the impact of all surrounding projects. The cumulative assessment for this project is an assessment only of the

impacts associated with this project but seen in the context of all surrounding impacts. It is concerned with this project's contribution to the overall impact, within the context of the overall impact. But it is not simply the overall impact itself.

The most important concept related to a cumulative impact is that of an acceptable level of change to an environment. A cumulative impact only becomes relevant when the impact of the proposed development will lead directly to the sum of impacts of all developments causing an acceptable level of change to be exceeded in the surrounding area. If the impact of the development being assessed does not cause that level to be exceeded, then the cumulative impact associated with that development is not significant.

In terms of cumulative impacts to heritage resources, impacts to archaeological and palaeontological resources are sufficiently dealt with on a case by case basis. The primary concern from a cumulative impact perspective would be to the cultural landscape. The cultural landscape is defined as the interaction between people and the places that they have occupied and impacted. In some places in South Africa, the cultural landscape can be more than 1 million years old where we find evidence of Early Stone Age archaeology (up to 2 million years old), Middle Stone Age archaeology (up to 200 000 years old), Later Stone Age archaeology (up to 20 000 years old), evidence of indigenous herder populations (up to 2000 years old) as well as evidence of colonial frontier settlement (up to 300 years old) and more recent agricultural layers.

Modern interventions into such landscapes, such as renewable energy development and its associated grid connection infrastructure, constitutes an additional layer onto the cultural landscape which must be acceptable in REDZ areas and in Strategic Transmission Corridors. The primary risk in terms of negative impact to the cultural landscape resulting from renewable energy development lies in the eradication of older layers that make up the cultural landscape. There are various ways that such impact can be mitigated.

The area proposed for development is presently dominated by agricultural activities and as such, the pattern of settlement within this landscape reflects this. At this stage, there is the potential for the cumulative impact of proposed renewable energy facilities and its associated grid infrastructure to negatively impact the cultural landscape due to a change in the landscape character from rural to semi-industrial.

However, as the proposed layout of the project avoids impacts to areas of very high heritage sensitivity and adheres to existing road alignments as far as possible, **the anticipated cumulative impact expected from this project is acceptable.**

10.5 AVIFAUNA

The EIA Regulations 2014, as amended, define cumulative impacts as "in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities."

Cumulative impacts include the combination of all the impacts for a project, which may be higher than the sum of impacts, as well as all known past, present and proposed projects in an area of 35 km surrounding the proposed development.

A total of 1149.8 MW of solar energy has been proposed and/or approved within a 35 km radius of the proposed Uvemvane PAOI (refer to Annexure E). No approved wind facilities were identified within the cumulative assessment radius (REEA 2026, Q1).

The impacts of the cumulative projects will be negative by making a larger area of avifaunal grassland habitat unavailable and of higher risk for SCC flying in or through the area.

There is also a potential for an increased barrier effect being created by the combination of these projects, which would be a negative, regional, long-term impact. As these projects are not located on any major flyways, the probability of this occurring is however unlikely.

The contribution of the Uvemvane WEF to the cumulative impact in a 35 km radius is considered to be relatively low since with up to 170 MW the Uvemvane WEF would contribute to the total approved MW by renewable energy for the area by approximately 13%.

However, avifaunal reports were not obtainable for all cumulative projects at this stage. The potential contribution of the Uvemvane WEF to the cumulative impacts associated with overhead powerlines would be relatively low, as the OHPLs would contribute less than 10% of the total approved OHPL length in the cumulative impact zone.

The only real mitigation possible in order to minimise cumulative impacts, beyond minimising impacts for each project separately during the EIA process, is for the Competent Authority to ensure only projects that are practically mitigatable to an acceptable level are authorised, and that do not lead to unacceptable negative impacts, including cumulative impacts, and to ensure the correct implementation of authorised Environmental Management Programmes through compliance audits and enforcement.

10.6 BUTTERFLY HABITAT

As per DEA's requirements, specialists are required to assess the cumulative impacts. The purpose of the cumulative impact assessment is to establish whether impacts that are associated with the proposed project are relevant within the broader regional context and, specifically, whether the addition of the proposed development at the identified locations would contribute to or intensify existing regional impact patterns.

A project may have a low or acceptable impact when assessed in isolation but may nevertheless make a meaningful collective contribution to impacts when considered in combination with similar and associated activities within the region, particularly where areas of elevated butterfly sensitivity have been identified. These cumulative impacts are primarily associated with the progressive degradation, loss and fragmentation of sensitive butterfly habitat, which may affect population viability, dispersal, movement patterns and ecological connectivity. Over time, such effects may contribute to population declines and, where sufficiently severe and sustained, potentially increase the conservation risk or threat status of affected species.

The assessment of cumulative impacts (from the perspective of this butterfly assessment) will therefore consider past, present, and (reasonably foreseeable) future impacts of the development/ activity reasonably foreseeable future impacts of the proposed activity in combination with impacts from existing, authorised or planned similar activities and other land-use activities that are associated with the planned activity within the broader region.

The role of the cumulative assessment is therefore to test if such impacts are relevant to the proposed project in the proposed location (i.e., whether the addition of the proposed project in the area will increase the impact). This section will therefore address whether the proposed development will result in:

- Unacceptable risk;
- Unacceptable loss;
- Complete or whole-scale changes to the environment or sense of place; or
- Unacceptable increase in impact.

To assess cumulative impacts of the proposed development, existing and planned developments and applications within the wider region were considered (refer Figure 15 of the specialist report).

While the unmitigated significance of cumulative impacts is considered significant on a local and regional scale, post-mitigation ratings represent the contribution of the proposed WEF to cumulative regional impacts after implementation of project-specific avoidance, minimisation, rehabilitation and monitoring measures. It is however important to note that they do not imply that regional cumulative impacts from other developments will be eliminated.

10.7 BATS

The proposed project area is located close to a collection of prospective SEFs when considering the 30 Km radius prescribed by current guidelines (Figure 43 of the specialist report). Unfortunately, no bat data is available for these SEFs as bat assessments are not a requirement for SEF and thorough assessments are rarely performed. Although bats will not be at risk for any fatalities due to collision with renewable energy infrastructure (as with the one wind energy facility present), the possible cumulative habitat destruction if all facilities are built will have an impact on bat foraging habitat. The destruction of habitat will cause a decrease in insects which is the primary food source for the bats found in this region. When assessing the REEA (2026, Q1) data, the total land usage for proposed renewable energy facilities located within a 30km radius of the proposed WEF accounts for approximately 23 384 ha (assuming the entire allocated portions are utilised). This equates to 1,21 % of the total habitat located in the 30 km radius around the proposed WEF. Considering this, it will have a negative effect on the bat populations to some degree, but without knowing the structure and assemblages of bat populations in the areas planned for SEFs it is near impossible to determine the magnitude of the impact. However, not all of these areas allocated to renewable energy facilities will be transformed and mitigation recommendations will ensure that the sensitive habitats are kept. **It is thus believed that the negative impact on bats will only slightly increase due to the cumulative impact of facilities in the area and will not change the stated impact of the proposed project.**

10.8 VISUAL

The study area is considered to have a moderate landscape character sensitivity as a result of the study area's location within the urban edge and mixture of land uses. The condition of the landscape is somewhat natural with a fair amount of built infrastructure and transformation; the landscape character is such that there is some capacity for change.

The proposed project and associated grid connection infrastructure is located near a number of approved Solar PV Facilities within a 50 km radius.

Although several Solar PV have been identified within a 50 km radius, the majority are either solar installations (which have a low vertical profile and limited long-distance visibility) or projects still in early planning phases, meaning the cumulative visual exposure may not materialise to its theoretical maximum.

The potential worst-case cumulative visual impact of the proposed project together with the other authorised, constructed and in-process SEFs and EGI within a 50km radius (refer to Section 6.6 of the specialist report) is expected to be moderate, depending on the observer's sensitivity to wind turbine structures.

10.9 NOISE

The potential effect of cumulative noises during the construction phase was considered, evaluating the impact from numerous simultaneous activities taking place at all locations where WTG will be developed.

Considering the operational noise levels, there are no other WEFs within the potential area of influence and there is no risk of cumulative noise impacts, and the significance of the impact would be the same as the noise impact as defined for the operational phase.

10.10 TRAFFIC

To assess a cumulative impact, it is generally assumed that all currently approved and authorized renewable energy projects within a 30 km radius would be constructed at the same time. This is a precautionary approach as in reality, these projects would be subject to a highly competitive public bidding process or a similarly competitive private market, and not all the projects may be selected to enter into a Power Purchase Agreement. Even if all the facilities are constructed and/or decommissioned at the same time, the roads authority will consider all applications for abnormal loads and work with all project companies to ensure that loads on the public roads are staggered and staged to ensure that the impact will be acceptable.

Nature of the impact:

Delays to road users,
Increased likelihood of road traffic accidents,
Noise and dust pollution associated with potential traffic,
Potential damage to road surfaces caused by construction vehicles,
Additional temporary increase in traffic due to other RE projects being developed at the same time.

It is noted that it is unlikely that the approved RE projects will be constructed at the same time and the post mitigation significance is low.

10.11 SOCIAL

10.11.1. EMPLOYMENT

One positive short-term social impact will be the creation and retention of jobs at the facility. Construction activities will create several temporary employment opportunities. Other social impacts include increased demand for local services, the influx of job seekers, social problems arising from population growth in the area, changes in land-use, and the effect on the sense of place.

10.11.2. TRAFFIC

The transportation of construction materials and workers to the proposed site during the construction phase is anticipated to have a significant impact on the condition of the transportation infrastructure and local traffic volumes. Additional heavy construction vehicles can damage roads, generate noise and dust, and pose risks to other road users and residents during both construction and operation. A traffic impact assessment will be undertaken as part of the EIA.

10.11.3. ECONOMIC BENEFITS

Increased expenditure during the construction of the proposed facility will contribute to the local economy. The workers' income will likely increase spending in the local community, thereby stimulating the formal and informal sectors and secondary industries, with a positive multiplier effect.

10.12 GEOTECH

The Cumulative impact significance level ranges between “Negative Low to Negative High” without mitigation. With mitigation measures Cumulative impact significance of potential impacts decreases to “Negative Low to Negative Very Low

10.13 SHE RISK ASSESSMENT

Unless another BESS is installed within 500m of the BESS location proposed for this project, cumulative impacts of other developments in the greater area do not affect the safety and health of employees, contractors of members of the public within the BESS impact zone. The same can be said for the BESS electrical infrastructure. Additional BESS installations are not planned within 500m (see Appendix C of the study).

10.14 CUMULATIVE ASSESSMENT PER ASPECT

The results of the cumulative impact assessment (complete project Life-Cycle) are represented in **Table 10-2** to **Table 10-10** below.

10.14.1. TERRESTRIAL BIODIVERSITY

Table 10-2 - Potential Impacts on Terrestrial Biodiversity (M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Terrestrial Biodiversity										
Cumulative impact of loss, disturbance and fragmentation of natural habitat	Without Mitigation	5	3	3	5	5	80	High	(-)	High
	With Mitigation	3	3	3	4	2	26	Low	(-)	High
	Avoidance As far as possible, proposed Project infrastructure should be located outside of land designated CBA 1 and CBA 2 and natural habitat classified as Vulnerable and Endangered; • The maintenance road in the east of PAOI that intersects CBA Irreplaceable land must not be upgraded. It should be used in its current condition, with all vehicle-related disturbance strictly controlled and rehabilitated to avoid negative impacts; • Wind Turbines 05, 06 and 07 should be oriented in a manner that ensures the majority of their disturbance footprints are contained within the designated ridge buffer; • If feasible, the two existing farm roads that provide access to the facility from the south, should be formalised and upgraded rather than establishing the proposed new route to the north of these that requires the development of a water-crossing; As far as possible proposed permanent Project infrastructure should be located in areas of modified habitat (i.e., Cultivated Fields and Secondary Grassland); • It is recommended that Substation Site 2 is selected as the preferred site. This site is entirely located within Secondary Grassland (old lands). All temporary construction footprints, (e.g., construction camps, laydown areas), should only be located in areas of modified habitat: • It is recommended that Temporary Laydown Area 2 should be relocated to a nearby cultivated field or confined entirely within the Secondary Grassland patch that comprises the northern portion of its current footprint; • A pre-construction walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform the micro-siting of Project infrastructure to already disturbed sites and other relevant management measures. • Minimisation • All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these footprints;									

Aspect	Impact	M	E	R	D	P	S	Ca	Con
	• The footprints to be cleared of vegetation should be clearly demarcated, prior to construction, to prevent unnecessary clearing outside of these areas; • No heavy vehicles should travel beyond the marked/demarked work zones; • Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas. Rehabilitation A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that have been disturbed by construction activities. The protocol should include: The correct stockpiling of topsoil that was cleared from development footprints during site preparation; The correct contouring of the post-construction landform to limit potential erosion; Compacted soils should be ripped and loosened to facilitate vegetation establishment; Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and Active revegetation should be conducted using grass species that are indigenous, locally-occurring and perennial.								

10.14.2. PLANT SPECIES

Table 10-3 - Potential Impacts on Plant Species (M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Plant Species										
Cumulative loss of flora SCC due to natural habitat loss, disturbance and fragmentation	Without Mitigation	5	3	5	5	4	72	High	(-)	High
	With Mitigation	2	3	5	4	2	28	**Low**	(-)	High
	Avoidance As far as possible proposed permanent Project infrastructure should be located in areas of modified habitat (i.e., Cultivated Fields and Secondary Grassland); • It is recommended that Substation Site 2 is selected as the preferred site. This site is entirely located within Secondary Grassland (old lands). All temporary construction footprints, (e.g., construction camps, laydown areas), should only be located in areas of modified habitat: • It is recommended that Temporary Laydown Area 2 should be relocated to a nearby cultivated field or confined entirely within the Secondary Grassland patch that comprises the northern portion of its current footprint; A pre-construction walkdown of the approved development footprints should be conducted during both the wet/summer season and dry/winter season to identify sensitive biodiversity and inform the micro-siting of Project infrastructure to already disturbed sites and other relevant management measures. Minimisation • All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these footprints; • The footprints to be cleared of vegetation should be clearly demarcated, prior to construction, to prevent unnecessary clearing outside of these areas; • No heavy vehicles should travel beyond the marked/demarked work zones; • Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas. Rehabilitation									

Aspect	Impact	M	E	R	D	P	S	Ca	Con
	• A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that have been disturbed by construction activities. The protocol should include: – The correct stockpiling of topsoil that was cleared from development footprints during site preparation; – The correct contouring of the post-construction landform to limit potential erosion; – Compacted soils should be ripped and loosened to facilitate vegetation establishment; – Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and – Active revegetation should be conducted using grass species that are indigenous, locally-occurring and perennial.								

10.14.3. ANIMAL SPECIES

Table 10-4 - Potential Impacts on Animal Species (M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Animal Species										
Cumulative impact on fauna SCC due to natural habitat loss, disturbance and fragmentation	Without Mitigation	5	3	3	5	4	64	High	(-)	Moderate
	With Mitigation	3	3	3	4	2	26	Low	(-)	Moderate
	Avoidance As far as possible proposed permanent Project infrastructure should be located in areas of modified habitat (i.e., Cultivated Fields and Secondary Grassland); • It is recommended that Substation Site 2 is selected as the preferred site. This site is entirely located within Secondary Grassland (old lands). All temporary construction footprints, (e.g., construction camps, laydown areas), should only be located in areas of modified habitat; • It is recommended that Temporary Laydown Area 2 should be relocated to a nearby cultivated field or confined entirely within the Secondary Grassland patch that comprises the northern portion of its current footprint;									

Aspect	Impact	M	E	R	D	P	S		Ca	Con
	A pre-construction walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform the micro-siting of Project infrastructure to already disturbed sites and other relevant management measures.									
Cumulative impact of fauna SCC due to Injury, mortality and disturbance	Without Mitigation	5	3	3	4	4	**60**	**Moderate**	**(-)**	Moderate
	With Mitigation	2	5	3	4	2	**28**	**Low**	**(-)**	Moderate
	Prior to any form of mitigation, the cumulative impact on fauna SCC from injury, mortality or sensory disturbance is rated 'medium'. With the implementation of the management and mitigation measures presented in the specialist report, the Project contribution to cumulative impacts on terrestrial fauna SCC can be reduced to 'Low' significance									

10.14.4. AQUATIC

Table 10-5 - Potential Impacts on Aquatic (M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Aquatic										
Degradation of the ecological condition of aquatic ecosystems; modification of flow and water quality.	Without Mitigation	2	1	3	2	2	**16**	**Low**	**(-)**	Low
	With Mitigation	1	1	3	2	1	**7**	**Very Low**	**(-)**	Low
	The approved Suikerbos PV 1, PV2, PV3 and PV4 are located about 28km from the proposed project, further downstream on the Suikerbosrant River, while the other two renewable energy projects are within 30 km to 50 km of the proposed project and are within sub-catchments of the Vaal and Rietspruit Rivers. There are not likely to be any cumulative impacts, given that the other projects are located far from the site or in a different catchment.									

10.14.5. AVIFAUNA

Table 10-6 - Potential Impacts on Avifauna (M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Avifauna										
	Without Mitigation	4	1	3	4	3	**36**	**Moderate**	**(-)**	Low
	With Mitigation	4	3	3	4	3	**42**	**Moderate**	**(-)**	Low
	• The only real mitigation possible in order to minimise cumulative impacts, beyond minimising impacts for each project separately during the EIA process, is for the Competent Authority to ensure only projects that are practically mitigatable to an acceptable level are authorised, and that do not lead to unacceptable negative impacts, including cumulative impacts, and to ensure the correct implementation of authorised Environmental Management Programmes through compliance audits and enforcement.									

10.14.6. BUTTERFLY HABITAT ASSESSMENT

Table 10-7 - Potential Impacts on invertebrates (M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Invertebrates										
Cumulative losses of species and habitat	Without Mitigation	4	3	-	5	5	**60**	**High**	**(-)**	High
	With Mitigation	4	5	-	5	2	**28**	**Low**	**(-)**	High
	• Minimising footprint, protection of highly sensitive features and habitat, prevent infrastructure, rural and infrastructure sprawl, development of research and improvement programmes, collaborative management between role players.									
	• Without Mitigation	• 8	• 4	• -	• 5	• 4	• 68	• High	• (-)	• High

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Threshold considerations; the elevation of the conservation status of protected and/or other threatened species	• With Mitigation	• 2	• 3	• -	• 5	• 2	• 20	• Low	• (-)	• High
	• Minimising footprint, protection of highly sensitive features and habitat, prevent infrastructure, rural and infrastructure sprawl, development of research and improvement programmes, collaborative management between role players on a landscape scale.									

10.14.7. VISUAL

Table 10-8 - Potential Impacts on Visual- (M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Visual										
The potential cumulative visual impact of wind farms, solar farms and EGI on the visual quality of the landscape.	Without Mitigation	4	2	1	4	3	**33**	**Moderate**	**(-)**	High
	With Mitigation	4	2	1	4	3	**33**	**Moderate**	**(-)**	High
	Impacts cannot be mitigated.									

10.14.8. NOISE

Table 10-9 - Potential Impacts on Noise-(M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Noise										
There are no other wind farms proposed within 5km from proposed project, and there is no risk of cumulative effects from other renewable projects in the area.	Without Mitigation	2	3	1	4	3	**30**	**Low**	**(-)**	High
	With Mitigation	2	3	1	4	3	**30**	**Low**	**(-)**	High
	Significance for the cumulative scenario (after mitigation of Uvemvane WEF) would be low, additional mitigation would not be required.									

10.14.9. TRAFFIC

Table 10-10 - Type Caption Here Potential Impacts on Traffic (M = Magnitude, E = Extent, R = Reversibility, D = Duration, P = Probability, S = Significance, Ca = Character, Con = Confidence)

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Traffic										
Additional Traffic impact	Without Mitigation	4	3	3	2	4	**48**	**Moderate**	(-)	High
	With Mitigation	3	3	2	2	3	**30**	**Low**	(-)	High
	• Further increase in development trips and consequently delays on external roads during the construction phase should several RE projects construction periods overlap. • Mitigation measures: • Same as for the construction phase. However, it is noted that it is unlikely that the approved RE projects will be constructed at the same time.									

10.14.10. GEOTECHNICAL

Aspect	Impact	M	E	R	D	P	S		Ca	Con
Geotechnical										
Seismic activity	Without Mitigation	4	1	3	4	3	**36**	**Moderate**	(-)	High
	With Mitigation	2	1	3	3	3	**27**	**Low**	(-)	High
	Design according to expected peak ground acceleration. Frequent monitoring of functionality and servicing of seismic dampening measures.									
Soil erosion	Without Mitigation	3	2	3	3	4	**44**	**Moderate**	**(-)**	High
	With Mitigation	2	1	1	2	2	**12**	**Very Low**	**(-)**	High
	Use existing road network and access tracks. Use temporary berms and drainage channels to divert surface water. Minimize earthworks and demolishing footprints. Rehabilitation of affected areas (such as revegetation). Control stormwater flow.									
Potential hydrocarbon (including oil, fuels, chemicals) spillages	Without Mitigation	4	4	3	4	4	**60**	**Moderate**	**(-)**	High
	With Mitigation	2	1	3	1	2	**14**	**Very Low**	**(-)**	High
	Service vehicle and construction machinery repairs to be undertaken in designated areas with proper soil protection. Frequent checks and conditional monitoring.									
Disturbance of fauna and flora	Without Mitigation	3	1	3	3	3	**30**	**Low**	**(-)**	High
	With Mitigation	2	1	1	2	2	**12**	**Very Low**	**(-)**	High
	Limit excavations developmental/ decommissioning areas.									
Subsidence	Without Mitigation	4	1	5	5	5	**75**	**High**	**(-)**	High
	With Mitigation	2	1	3	4	3	**30**	**Low**	**(-)**	High

Aspect	Impact	M	E	R	D	P	S	Ca	Con
	• Geophysical studies. (approximately 4 to 6 weeks): – During the planning and pre-construction phase, conduct geophysical studies to map the extent of the mine. This may be followed by drilling to confirm the structural layout of the shaft. Undertake numerical modelling and monitoring to assess the associated risks and potential effects on the surface. • Numerical modelling and monitoring to assess the risk and effects on the surface. • No structures within a 100m radius of the mine shaft.								

11 DEIR ASSESSED LAYOUT

During the course of the EIA phase, the DEIR Assessed layout was refined based on the specialist inputs and recommendations. These changes have led to an updated development footprint and layout (**Figure 11-1** and **Figure 11-2**). Furthermore, the layout progression has resulted in an updated project description which is outlined in **Table 11-1** below.

Due consideration has been given to the identified sensitivities and mitigation measures proposed during the draft EIA phase, which resulted in an in the number of turbines being further reduced from 27 during the Scoping phase (**Figure 8-4**) to 20 turbines during the Draft EIA Phase (**Figure 8-6**). A combined sensitivity map was also developed and illustrated all specialist recommended buffers for the DEIR assessed layout (**Figure 11-2**).

The specialist conclusions on the DEIR Assessed Layout were as follows:

Agricultural Agro-Ecosystem specialist's perspective:

No *alternatives to the current project layout are proposed other than the avoidance of two of the EIH alternatives (EIH1 & EIH2) if possible. No recommendations are made in terms of micro-siting, and the specialist is satisfied that all due process has been followed to place WTG locations and other project infrastructure as effectively as possible to actively avoid areas of 'High' and 'Very High' environmental (including agriculture) sensitivity.*

Geotechnical specialist's perspective:

The completed desktop assessment of the geotechnical conditions at the proposed project area has shown the site to be generally suitable for the proposed development. A verified high sensitivity was identified due to the presence of two mine shafts of unknown dimensions. Potential impacts were assessed as ranging from low to high significance before mitigation and very low to low significance after mitigation. The specialist recommends that a site-specific geotechnical investigation be undertaken during the pre-construction phase to confirm founding conditions and verify that no unforeseen geotechnical constraints are present.

Terrestrial biodiversity (including plant and animal species) specialist perspective:

The *infrastructure layout has undergone a series of revisions in line with the mitigation hierarchy to avoid and minimise potential negative impacts on sensitive biodiversity features. These have inter alia, prioritised where possible the placement of wind turbines in areas of modified habitat and the alignment of proposed access roads with existing district gravel roads and farms tracks. Nonetheless, potential negative impacts on terrestrial biodiversity remain, and these have been identified and assessed for the proposed Project for both pre- and post-mitigation scenarios. Several management measures have been recommended in this report to further minimise and rehabilitate negative impacts, and if successfully implemented* these will effectively reduce impact significance.

Aquatic biodiversity specialist's perspective:

The *potential aquatic biodiversity impacts of the proposed ABO Uvemvane WEF1 and associated infrastructure are likely to be of low significance in terms of any potential impact on aquatic habitat, biota, water quality, or flow for all phases of the development, as the proposed layout has avoided the delineated aquatic features* of concern and allowed for a wide buffer area.

Butterfly (Invertebrates) specialist's perspective:

The proposed layout has undergone several iterations to avoid areas identified as having High Sensitivity for butterfly habitat. Some conflict areas identified during earlier project phases were addressed through layout refinement. For example, the position of WT-14 was adjusted from a High Sensitivity area to a lower sensitivity area located outside Critical Biodiversity Area (CBA) habitat as identified in the Mpumalanga Biodiversity Sector Plan (2014). While limited potential conflict areas remain, including portions of proposed roads, powerlines and selected turbine positions, the layout has largely incorporated the recommended avoidance measures and avoids most highly sensitive butterfly habitat. Subject to the implementation of the recommended mitigation measures, the proposed development can be supported in its current form.

Heritage and palaeontological specialist's perspective:

The layout provided for the EIA Reporting Phase avoids the heritage sensitivities that were identified in the field for this project. No further heritage studies are required during the EIA phase of the NEMA process as the recommendations made in this report pertain to the EMPr and the construction phase of the proposed development.

Furthermore, all the proposed new infrastructure is located within areas of low and zero palaeontological sensitivity. As such, it is not anticipated that any significant fossil heritage is likely to be impacted by the proposed development based on the layout considered in this report.

Avifaunal specialist's perspective:

The proposed layout has satisfactorily taken all recommendations into account, including precautionary buffers, and avoids all avifaunal no-go areas, areas of high sensitivity, and adheres to all recommended constraints, in terms of acceptable development activities. Modelled fatality estimates are well below acceptable levels relative to potential biological removal values. The number of turbines proposed was reduced from 66 (pre-scoping) to 20, all of which are located outside areas identified as no-turbine areas and areas where development should be minimised. The proposed layout is therefore supported.

Bat specialist's perspective:

No turbines are located in such a manner that their blade length, assuming it is 100 m, will infringe on buffered areas. As the guidelines regarding the buffer sizes and shapes are stringent and well defined, it is important that all applied buffers be respected and followed when considering final facility layout. The specialist has provided a detailed mitigation measures to be followed in order to reduce the impact of the project to bats. If the mitigation measures are followed this impact can be greatly reduced by only operating the WEF.

Traffic specialist's perspective:

Feasible accessibility of the site was investigated in line with required sight distances, access spacing and gradient requirements. The proposed layout can be accommodated by the surrounding road network and the identified access points provide feasible access to the site, subject to the implementation of recommended road safety measures where required. The highest traffic generation is anticipated during the construction phase. However, with the implementation of mitigation measures, traffic-related impacts are expected to remain low.

Visual specialist's perspective:

Under the current layout, 4 turbines fall within mountain/tall hill terrain, 6 within the N3's 1km buffer, and 2 (turbines 03 and 24) within shadow flicker zones affecting the Geluk and Modderfontein homesteads. Only turbine 24 overlaps two sensitivity buffers. The specialist also acknowledged that the layout has already been revised to reduce exposure. No fatal flaws, from a visual impact perspective, have been identified that would preclude the granting of environmental authorisation for the proposed development, provided that the recommended mitigation measures are implemented and maintained, and that the outstanding shadow flicker engagement process relating to the Modderfontein receptor is concluded in accordance with the recommendations of this report.

EAP: In response to the recommendations of the Visual Impact Assessment, potentially affected landowners and registered I&APs were afforded an opportunity to review and comment on the findings of the Visual Impact Assessment through the EIA public participation process. Registered I&APs, adjacent landowners, authorities and stakeholders were notified through direct correspondence, including notification letters, emails and SMSs, and were afforded an opportunity to review and comment on the DEIR and specialist findings during the public review period from 25 August 2026 to 28 September 2026. Records of stakeholder notifications, correspondence, comments received and responses provided are included in the Stakeholder Engagement Report (Sections 2.3 and 3.3), together with supporting notification records in Appendices B.1 to B.5. Should shadow flicker impacts require further management following detailed design or operational monitoring, the mitigation and management measures identified in the Visual Impact Assessment and EMPr will apply. The adequacy of the assessment and proposed mitigation measures remains a matter for determination by the competent authority.

Acoustic (Noise) specialist's perspective:

With the implementation of appropriate mitigation measures, the proposed layout (turbine placement) is considered acceptable from a noise perspective and there is no restriction in the WTG that the developer could use (subject that the calculated noise levels are less than 45 dBA at NSR locations used for residential purposes). Noise monitoring is required should the developer select to use a WTG with a PWL higher than 105 dBA (re 1 pW). It is therefore recommended that the proposed Uvemvane WEF 1 (and associated infrastructure) be authorised.

Socio-Economic specialist's perspective:

There *will be numerous positive impacts that align with legislative and policy frameworks; and any potential negative impacts of the construction and operation phases can be mitigated. The layout is not anticipated* to affect the socio-economic impacts identified.

SHE Risk specialist's perspective:

- *In terms of a worst conceivable case container fires, the significant impact zone is likely to be limited to within 10m of the container and mild impacts to 20m. Based on the current proposed layouts, radiation impacts at the closest houses, public roads etc. are not expected.*
- *In terms of a worst conceivable case explosion, the significant impact zone is likely to be limited to with 10m of the container and minor impacts such as debris within 50m. Based on the current proposed layouts, explosion impacts at the closest houses, public roads are not expected.*
- *All of the no-go areas were avoided for the proposed development and all three of the proposed locations for BESS are therefore considered acceptable. Changes to the layouts post*

Environmental Authorisation (should such be granted) are deemed acceptable if the changes remain within the approved buildable areas / development footprints, and within the assessed areas (which have avoided all no-go sensitive areas).

The following buffers have been recommended by the specialist team in **Table 11-1** below. Overall, the DEIR Assessed Layout (**Figure 11-1**) has been refined to avoid identified no-go areas and incorporate specialist-recommended buffers wherever practicable. All aquatic, heritage, avifaunal and bat-related buffers have been adhered to. Limited deviations remain within the visual sensitivity constraints (mountain terrain, N3 buffer and one remaining shadow flicker receptor), however these were assessed by the relevant specialist, and the overall layout was still supported, subject to implementation of the recommended mitigation measures.

Table 11-1 - Buffers recommended by specialist team

Specialist Assessment	Sensitivity Aspects	Recommended Buffer	DEIR Layout compliance with recommended buffers
Terrestrial Biodiversity	Wind Turbines 05, 06 and 07	Should be oriented in a manner that ensures the majority of their disturbance footprints are contained within the designated ridge buffer	Compliant. The terrestrial biodiversity specialist confirmed that the infrastructure layout has been revised to avoid and minimise impacts on sensitive biodiversity features and supported the DEIR layout subject to implementation of mitigation measures. WT05, WT06 and WT07 remain acceptable provided micro-siting ensures disturbance footprints are largely contained within the ridge buffer.
Plant Species	No flora Species of Conservation Concern (SCC) were recorded within the PAOI during the field programme. However, should any flora SCC be confirmed during the pre-construction phase, the proposed infrastructure must be re-sited outside the prescribed buffer area around the relevant Red List species, in accordance with SANBI (2026).	200m	Compliant. No flora SCC were recorded during the field survey. The DEIR layout is acceptable, subject to a pre-construction walkdown and re-siting of infrastructure should any flora SCC be identified during pre-construction surveys.
Aquatic Biodiversity	Watercourses	50m	Compliant. The aquatic specialist confirmed that the proposed layout avoids delineated aquatic features of concern and allows for a wide buffer area around watercourses
	Wetland Habitats	100m	
Archaeological and Heritage Resources	Iron Age Settlements	100m	Compliant. The heritage specialist confirmed that the EIA layout avoids identified heritage sensitivities.
	Burial grounds and graves located within the area proposed for development	100m	Compliant. The DEIR layout avoids identified graves and

Specialist Assessment	Sensitivity Aspects	Recommended Buffer	DEIR Layout compliance with recommended buffers
			burial-related heritage sensitivities.
	Sites with contextual historic value are graded IIIB, i.e. Malanskraal structures located at Site 065	500m	Compliant. The heritage specialist confirmed that the EIA layout avoids identified heritage sensitivities, including higher-value heritage resources.
	Sites with contextual historic value are graded IIIC	50m	Compliant. The DEIR layout avoids identified heritage sensitivities and is supported by the heritage specialist.
Avifauna Species	Within 200 m of NFEPA Rivers and Wetlands (artificial and natural)	200m	Compliant. The avifaunal specialist confirmed that the proposed layout avoids all avifaunal no-go areas, areas of high sensitivity and incorporates the recommended precautionary buffers.
	Vulture Colonies and Roosts	50km	Compliant. The specialist confirmed the layout adheres to all recommended avifaunal constraints and precautionary buffers and supported the proposed layout.
Bats Species	Water bodies, rivers, wetlands, ridges and wooded areas	200m	Compliant. The bat specialist confirmed that no turbines are positioned such that the turbine rotor sweep infringes on the applied buffered areas.
	Roosts found have been classified as small and large roosts	A 1 km and 2.5 km buffer respectively	Compliant. The specialist confirmed that all applied bat buffers have been respected by the DEIR layout.
	Mine Shafts	500m	Compliant. No turbines are located within the recommended mine shaft buffers and the layout was supported by the bat specialist.
	Other associated WEF developments, such as buildings, sub-stations, roads and powerlines, developers: Roads	200m	Compliant. Associated infrastructure remains outside applicable bat constraints and the layout was supported by the specialist.
	Powerlines	500m	Compliant. The bat specialist confirmed that all applicable buffers have been adhered to by the DEIR layout.
	Buildings and sub-station infrastructure	500m minimum	Compliant. The specialist confirmed that the layout does not infringe the recommended bat-related infrastructure buffers

Specialist Assessment	Sensitivity Aspects	Recommended Buffer	DEIR Layout compliance with recommended buffers
Visual	Turbines placed within the topographical feature areas identified as mountains	Potential relocation/repositioning of these turbines, if at all possible	Partially compliant. The visual specialist confirmed that four turbines remain within mountain/tall hill terrain. These turbines were retained following optimisation and balancing of other environmental and technical constraints. The specialist acknowledged that the layout had already been revised to reduce exposure. Therefore, no fatal flaws were identified from a visual perspective.
	Shadow flicker zone of visible shadows: identified five (5) homesteads, namely Geluk, Steynskraal, dwelling south of Modderfontein, dwelling south of Sandpos and Request	No turbines should be placed within the identified shadow flicker zone of visible shadows unless otherwise agreed upon by the affected landowner, even if the landowner is located within the development site. This applied to five (5) turbines, namely turbines 03, 04, 24, 28 and 30	Partially compliant. Following refinement of the layout, only Turbine 24 remains within a shadow flicker sensitivity area affecting the Modderfontein homestead. Turbines 03, 04, 28 and 30 were removed from the DEIR layout during optimisation. The visual specialist noted that only Turbine 24 overlaps two sensitivity buffers.
	Turbines 01, 12, 16, 20, 22 and 24	Turbines placed within the 1km buffer associated with the N3 are carefully considered for development with a “tread-light” approach and minimum infrastructure development.	Partially compliant. The visual specialist confirmed that six turbines (01, 12, 16, 20, 22 and 24) remain within the N3 1 km visual buffer. These turbines were retained following consideration of overall project constraints, and a tread-light development approach is recommended.
	Turbine numbers 01, 03, 04, 05, 07, 09, 10, 11, 12, 16, 24 and 30.	This recommendation is based on the findings of the scoping report and applied only to turbines that are located within two or more sensitive visual buffers / areas. Of note is that should landowner consent be received for turbines 03, 04 and 30 then, the above recommendation will not apply to these specific turbines.	Partially compliant. Of the turbines previously identified during scoping, only Turbine 24 remains within multiple visual sensitivity buffers. The specialist acknowledged that the layout was revised substantially from the earlier layouts and reduced exposure to sensitive receptors.
Noise	When construction activities must take place near noise-sensitive developments/receptors/communities (NSR).	500m during the day; and 1,000m at night	Compliant. The acoustic specialist concluded that the proposed turbine layout is acceptable from a noise perspective, provided the recommended mitigation measures are implemented and operational noise limits are complied with.

Specialist Assessment	Sensitivity Aspects	Recommended Buffer	DEIR Layout compliance with recommended buffers
Invertebrates (Butterflies)	Confirmed Heidelberg Golden Opal (*Chrysoritis aureus*) localities and Very High sensitivity habitat.	200m	Partially compliant. Potential conflict areas have been identified where the proposed layout overlaps with High Sensitivity areas and where turbine footprints are placed in proximity to confirmed localities of threatened species (although appropriately outside a suitable buffer zone). While these are generally not regarded to be major impacts, it should nonetheless be considered with caution

Table 11-2 - Layout progression through the project period – ABO Uvemvane WEF 1

Layout Iteration	MW Applied for	WTG in layout
Preliminary Layout (SSVR Phase) - **Figure 8-1** and **Figure 8-2**	-	66
Optimised Project Layout (Pre-Scoping Phase) – **Figure 8-3**	170MWac	31
Revised Optimised Project Layout (Scoping Phase) – **Figure 8-4**	170MWac	27
DEIR Assessed Layout - **Figure 11-1**	170MWac	20
Resubmission of the DEIR – Final Layout Submitted for Decision - **Figure 11-1**	170MWac	20

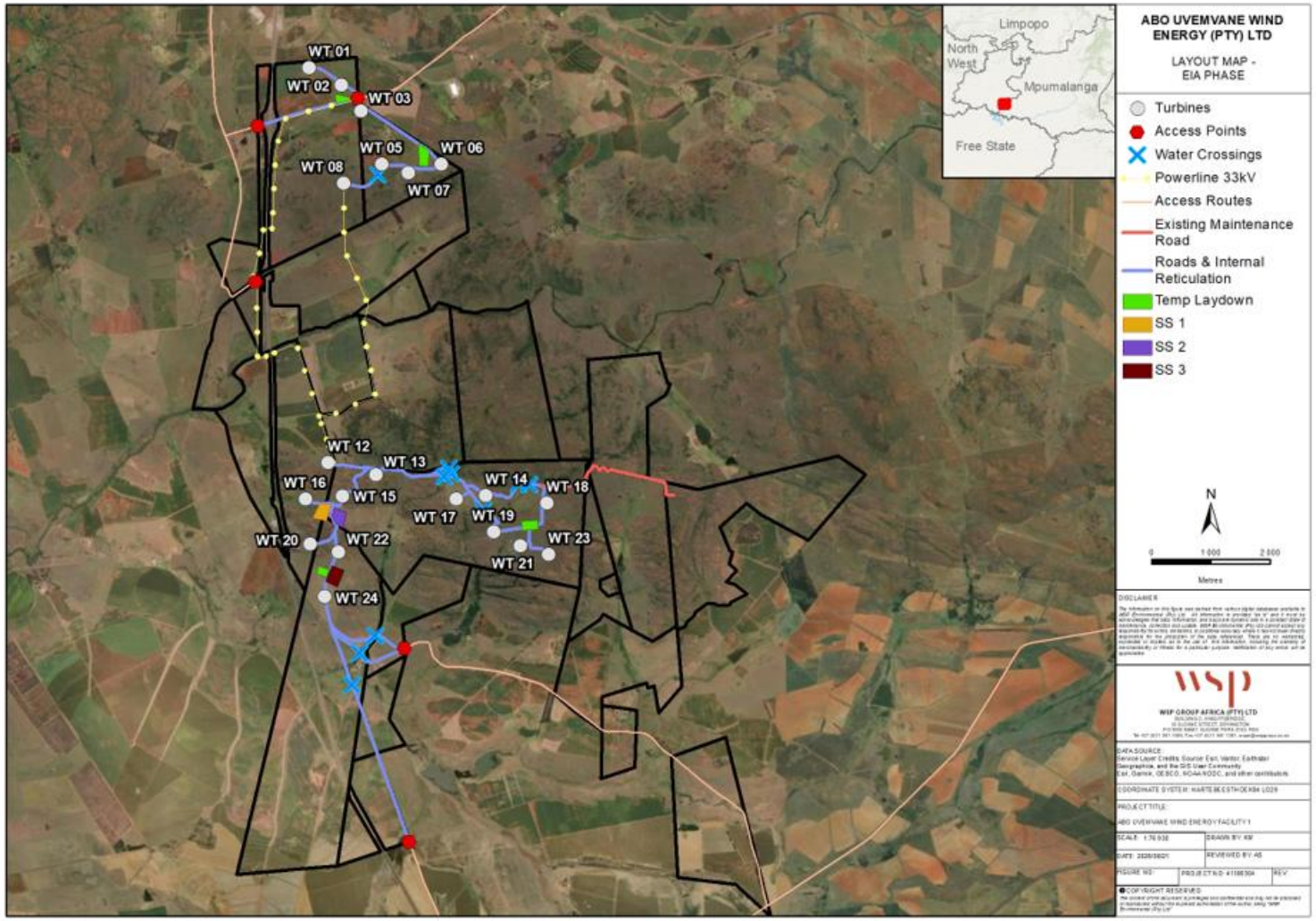

Figure 11-1 - ABO Uvemvane WEF 1 Final Layout (DIER Assessed Layout).

Figure 11-2 - <u>Combined Sensitivity for the ABO Uvemvane WEF 1 Final Layout</u> (DEIR Assessed Layout).

12 ENVIRONMENTAL IMPACT ASSESSMENT

The essence of any impact assessment process is aimed at ensuring informed decision-making, environmental accountability, and to assist in achieving environmentally sound and sustainable development. In terms of NEMA, the commitment to sustainable development is evident in the provision that "development must be socially, environmentally and economically sustainable…. and requires the consideration of all relevant factors…". NEMA also imposes a duty of care, which places an obligation on any person who has caused, is causing, or is likely to cause damage to the environment to take reasonable steps to prevent such damage. In terms of NEMA's preventative principle, potentially negative impacts on the environment and on people's environmental rights (in terms of the Constitution of the Republic of South Africa, Act No. 108 of 1996) should be anticipated and prevented, and where they cannot be prevented altogether, they must be minimised and remedied in terms of "reasonable measures".

In assessing the environmental feasibility of the proposed development of the proposed Project, the requirements of all relevant legislation have been considered. The identification and development of appropriate mitigation measures that should be implemented to minimise potentially significant impacts associated with the project, has been informed by best practice principles, past experience, specialist studies and the relevant legislation (where applicable).

The original DEIR was subject to public review, which was be undertaken according to the requirements of NEMA with every effort made to include representatives of all stakeholders within the process. This resubmission DEIR has been updated taking into consideration all comments received during the public review period of the original DEIR. This resubmission DEIR will be updated and finalised subsequent to additional public review before being submitted to the CA for decision-making.

12.1 IMPACT SUMMARY

A summary of the identified impacts and corresponding significance ratings for the proposed project is provided in **Table 12-1 (Construction Phase), Table 12-2 (Operation Phase) and Table 12-3 (Decommissioning Phase).**

Table 12-1 - Summary of the identified impacts for the Construction Phase.

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
Agriculture	Agricultural land use change.	C	(-)	Low	Very Low
	Land and soil degradation.	C	(-)	Moderate	Low
	Disruption or prevention of farming operations.	C	(-)	Low	Low
	Positive impacts project lifetime	C	(+)	Moderate	N/a
Terrestrial Biodiversity	Direct loss and disturbance of natural habitat.	C	(-)	High	Low
	Fragmentation reducing natural habitat connectivity and integrity	C	(-)	Moderate	Low
	Establishment and spread of alien invasive species	C	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Increased soil erosion and sedimentation	C	(-)	Moderate	Low
Plant Species	Direct loss and disturbance of natural habitat	C	(-)	High	Low
	Fragmentation reducing natural habitat connectivity and integrity	C	(-)	Moderate	Low
	Loss of flora of conservation concern	C	(-)	Moderate	Low
	Establishment and spread of alien invasive species	C	(-)	Moderate	Low
Animal Species	Direct loss and disturbance of natural habitat	C	(-)	High	Low
	Fragmentation reducing natural habitat connectivity and integrity	C	(-)	Moderate	Low
	Loss of fauna species of conservation concern - Mountain Reedbuck	C	(-)	Moderate	Low
	Loss of fauna species of conservation concern - Grey Rhebok	C	(-)	Moderate	Low
	Loss of fauna species of conservation concern - Serval	C	(-)	Low	Very Low
	Loss of fauna species of conservation concern - Cape Clawless Otter	C	(-)	Low	Very Low
	Loss of fauna species of conservation concern - Southern African Hedgehog	C	(-)	Low	Very Low
	Loss of fauna species of conservation concern - Vlei Rat	C	(-)	Low	Very Low
Aquatic ecosystems	Aquatic habitat disturbance /loss and short-term water quality and flow impacts.	C	(-)	Low	Very Low
Archaeology	Impacts of the proposed development to archaeological resources	C	(-)	Moderate	Very Low
Palaeontology	Impacts of the proposed development to palaeontological resources	C	(-)	Low	Very Low
Avifaunal	Displacement through disturbance	C	(-)	High	Low
	Displacement through habitat loss	C	(-)	High	Moderate
Invertebrates (Butterflies)	Direct losses of sensitive species	C	(-)	High	Moderate
	Loss of habitat/areas that are considered suitable/highly suitable for sensitive butterfly species	C	(-)	High	Low
	Persistent and exacerbated deterioration of sensitive, natural,	C	(-)	High	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	range restricted, or untransformed habitat				
	Disruption of ecological processes, services, ecological functionality	C	(-)	Moderate	Low
	Increased disruption of local movement and migration patterns, ecological interaction, and ecological processes that may affect diversity patterns through loss of connectivity (increased fragmentation, barrier effects), and conservation corridor networks in the landscape	C	(-)	Moderate	Low
Bats	Habitat loss or roost disturbance	C	(-)	Moderate	Very low
Visual	Visual impacts on residents of homesteads, visitors to tourist accommodation and Protected Areas within 5km of the proposed WEF	C	(-)	High	Moderate
	Visual impact of construction activities on observers travelling along roads within 5km of the proposed WEF.	C	(-)	High	Moderate
Noise	Daytime activities noise relating to the construction of access roads	C	(-)	Low	Low
	Daytime construction traffic passing NSR	C	(-)	Low	Low
	Increase in ambient sound levels due to day-time WTG construction activities	C	(-)	Very Low	Very Low
	Increase in ambient sound levels due to night-time WTG construction activities	C	(-)	Very Low	Very Low
Traffic	Increase in development trips for the duration of the construction/decommissioning phase.	C	(-)	Moderate	Low
	Construction associated noise and dust pollution.	C	(-)	Moderate	Low
	Possible damage to road surfaces caused by construction vehicles.	C	(-)	Moderate	Low
Geotechnical	Slope stability	C	(-)	Low	Very Low
	Seismic activity	C	(-)	Moderate	Low
	Soil erosion from clearing of sites for drilling and test pitting	C	(-)	Moderate	Very Low
	Potential hydrocarbon (including oil, fuels, chemicals) spillages	C	(-)	Moderate	Very Low
	Disturbance of fauna and flora from clearing of sites	C	(-)	Low	Very Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Subsidence	C	(-)	High	Low
Social	Job Creation	C	(+)	Moderate	High
	Population Influx	C	(-)	Moderate	Low
	Procurement From Local Businesses	C	(+)	Low	Moderate
	Community Health, Safety and Security	C	(-)	Low	Very Low
High Level Safety, Health and Environmental Risk Assessment - Solid State Lithium-Ion BESS	Human Health - chronic exposure to toxic chemical or biological agents	C	(-)	Moderate	Low
	Human Health - exposure to noise	C	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	C	(-)	Low	Very Low
	Human Health - exposure to psychological stress	C	(-)	Low	Low
	Human Health - exposure to ergonomic stress	C	(-)	Low	Low
	Human and Equipment Safety - exposure to fire radiation (a)	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to fire radiation (b)	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to explosion over pressures	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents (a)	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents (b)	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	C	(-)	High	Low
	Human and Equipment Safety - exposure to electromagnetic waves	C	(-)	Moderate	Low
	Environment - emissions to air	C	(-)	Low	Very Low
	Environment - emissions to water	C	(-)	Low	Low
	Environment - emissions to earth	C	(-)	Low	Low
	Environment - waste of resources e.g., water, power etc	C	(-)	Low	Very Low
	Public - Aesthetics	C	(-)	Low	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Investors - Financial	C	(-)	Moderate	Low
	Employees and investors - Security	C	(-)	Moderate	Low
	Emergencies	C	(-)	Moderate	Low
	Investors - Legal	C	(-)	Moderate	Low
High Level Safety, Health and Environmental Risk Assessment Vanadium Redox Flox BESS	Human Health - chronic exposure to toxic chemical or biological agents	C	(-)	Moderate	Low
	Human Health - exposure to noise	C	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	C	(-)	Low	Very Low
	Human Health - exposure to psychological stress	C	(-)	Low	Low
	Human Health - exposure to ergonomic stress	C	(-)	Low	Low
	Human and Equipment Safety - exposure to fire radiation	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to explosion over pressures	C	(-)	N/A	N/A
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents (a)	C	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	C	(-)	High	Low
	Human and Equipment Safety - exposure to electromagnetic waves	C	(-)	Moderate	Low
	Environment - emissions to air	C	(-)	Low	Very Low
	Environment - emissions to water	C	(-)	Low	Low
	Environment - emissions to earth	C	(-)	Low	Low
	Environment - waste of resources e.g., water, power etc	C	(-)	Low	Very Low
	Public - Aesthetics	C	(-)	Low	Low
	Investors - Financial	C	(-)	Moderate	Low
	Employees and investors - Security	C	(-)	Moderate	Low
	Emergencies	C	(-)	Moderate	Low
	Investors - Legal	C	(-)	Moderate	Low

Table 12-2 - Summary of the identified impacts for the Operation Phase.

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
Agriculture	Land and soil degradation	O	(-)	Low	Very Low
	Disruption or prevention of farming operations.	O	(-)	Low	Very Low
	Positive impacts project lifetime	O	(+)	Moderate	N/a
Terrestrial Biodiversity	Establishment and spread of alien invasive species	O	(-)	Moderate	Low
	Increase in wildfires from Project workers or faulty infrastructure	O	(-)	Moderate	Very Low
Plant Species	Establishment and spread of alien invasive species	O	(-)	Moderate	Low
Animal Species	Direct impact on fauna SCC from operating wind turbines	O	(-)	Moderate	Low
	Direct impact on fauna SCC from supporting operational activities	O	(-)	Moderate	Low
Aquatic ecosystems	Aquatic habitat disturbance and degradation of the ecological condition of aquatic ecosystems; modification of low and water quality	O	(-)	Low	Very Low
Avifaunal	Displacement through disturbance	O	(-)	High	Low
	Mortality from collisions with wind turbines	O	(-)	High	Moderate
	Mortality from collisions with overhead powerlines	O	(-)	High	Moderate
	Mortality from electrocutions on electrical infrastructure	O	(-)	High	Very Low
Bats	Bat mortality	O	(-)	Very High	Moderate
	Artificial lights	O	(-)	Moderate	Very Low
Visual	Visual impact on residents of homesteads and visitors to tourist accommodation (if present) within 5 km to the proposed WEF.	O	(-)	Very High	Very High
	Visual impact on observers travelling along the roads within 5 km of the proposed wind turbine structures	O	(-)	High	High
	Visual impact on residents of homesteads and visitors to tourist accommodation (if present) within 5-10 km to the proposed WEF.	O	(-)	High	High
	Visual impact on observers travelling along roads within 5-10 km to the proposed WEF	O	(-)	High	High
	Visual impact on residents of homesteads and visitors to tourist accommodation within 10-20 km to the proposed WEF.	O	(-)	Moderate	Moderate

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Visual impact on visitors to Protected Areas within 10-20 km to the proposed WEF.	O	(-)	Moderate	Moderate
	Visual impact on observers travelling along roads within 10 - 20km to the proposed WEF	O	(-)	Moderate	Moderate
	Residents of homesteads and visitors to tourist accommodation (if present) (located beyond the 20km radius of the proposed WEF)	O	(-)	Low	Low
	Visual impact of shadow flicker on sensitive visual receptors located outside of the development site who are located within the zone of visual shadows of a proposed turbine.	O	(-)	High	Low
	Visual impact of lighting at night on residents and visitors to homesteads, tourist accommodation and Protected Areas within 10km from the proposed WEF	O	(-)	Very High	High
	Visual impact of lighting at night on observers travelling along roads within 10km from the proposed WEF	O	(-)	Moderate	Moderate
	Visual impact of the ancillary infrastructure on observers in close proximity to the structures.	O	(-)	High	Moderate
	Visual impact of blade painting on the overall perception of the WEF by sensitive receptors especially within 0-5km and potentially up to 10km radius of the wind turbine structures.	O	(-)	Low	Low
Noise	Increases in residual noise levels due to air-borne noise from the WTG.-Daytime	O	(-)	Very Low	Very Low
	Increase in the residual noise levels due to air-borne noise from the WTG-Night-time (Average expected noise levels)	O	(-)	Moderate	Low
	Increase in the residual noise levels due to air-borne noise from the WTG-Night-time (Potential worst-case noise levels)	O	(-)	Moderate	Low
Traffic	Slight increase in trips due to permanent staff travelling from site; irregular periodical maintenance trips.	O	(-)	Low	Low
Geotechnical	Slope stability	O	(-)	Low	Very Low
	Seismic activity	O	(-)	Moderate	Low
	Soil erosion from clearing of sites for drilling and test pitting	O	(-)	Moderate	Very Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Potential hydrocarbon (including oil, fuels, chemicals) spillages	O	(-)	Moderate	Very Low
	Disturbance of fauna and flora from clearing of sites	O	(-)	Low	Very Low
	Subsidence	O	(-)	High	Low
Social	Job creation	O	(+)	Moderate	Moderate
	Population influx	O	(+)	Moderate	Low
	Procurement From Local Businesses	O	(+)	Low	Moderate
	Community Health, Safety and Security	O	(-)	Low	Low
	Energy Generation	O	(+)	Low	Moderate
High Level Safety, Health and Environmental Risk Assessment - Solid State Lithium-Ion BESS	Human Health - chronic exposure to toxic chemical or biological agents (a)	O	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents (b)	O	(-)	Moderate	Low
	Human Health - exposure to noise	O	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	O	(-)	Low	Very Low
	Human Health - exposure to psychological stress	O	(-)	Low	Very Low
	Human Health - exposure to ergonomic stress	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to fire radiation (a)	O	(-)	High	Low
	Human and Equipment Safety - exposure to fire radiation (b)	O	(-)	High	Low
	Human and Equipment Safety - exposure to explosion over pressures	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents (a)	O	(-)	Low	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents(a)	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to electromagnetic waves	O	(-)	Moderate	Low
	Environment - emissions to air	O	(-)	Low	Very Low
	Environment - emissions to water	O	(-)	Low	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Environment - emissions to earth	O	(-)	Low	Very Low
	Environment - waste of resources e.g., water, power etc	O	(-)	Low	Very Low
	Public - Aesthetics	O	(-)	Low	Low
	Investors - Financial	O	(-)	Moderate	Low
	Employees and investors – Security (a)	O	(-)	Moderate	Low
	Employees and investors – Security (b)	O	(-)	Moderate	Low
	Emergencies	O	(-)	Moderate	Low
	Investors - Legal	O	(-)	Moderate	Low
High Level Safety, Health and Environmental Risk Assessment Vanadium Redox Flox BESS	Human Health - chronic exposure to toxic chemical or biological agents (a)	O	(-)	Moderate	Low
	Human Health - chronic exposure to toxic chemical or biological agents (b)	O	(-)	Moderate	Low
	Human Health - exposure to noise	O	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	O	(-)	Low	Very Low
	Human Health - exposure to psychological stress	O	(-)	Low	Very Low
	Human Health - exposure to ergonomic stress	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to fire radiation (a)	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to fire radiation (b)	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to explosion over pressures	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents (a)	O	(-)	Low	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents (b)	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	O	(-)	Moderate	Low
	Human and Equipment Safety - exposure to electromagnetic waves	O	(-)	Moderate	Low
	Environment - emissions to air	O	(-)	Low	Very Low
	Environment - emissions to water	O	(-)	Low	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Environment - emissions to earth	O	(-)	Low	Very Low
	Environment - waste of resources e.g., water, power etc	O	(-)	Low	Very Low
	Public - Aesthetics	O	(-)	Moderate	Low
	Investors - Financial	O	(-)	Moderate	Low
	Employees and investors – Security (a)	O	(-)	Moderate	Low
	Employees and investors – Security (b)	O	(-)	Moderate	Low
	Emergencies	O	(-)	Moderate	Low
	Investors - Legal	O	(-)	Moderate	Low

Table 12-3 - Summary of the identified impacts for the Decommissioning Phase.

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
Agriculture	Land and soil degradation	D	(-)	Low	Very Low
	Disruption or prevention of farming operations.	D	(-)	Low	Very Low
	Positive impacts project lifetime	O	(+)	Moderate	N/a
Terrestrial Biodiversity	Establishment and spread of alien invasive species	D	(-)	Moderate	Low
	Increased soil erosion and sedimentation	D	(-)	Moderate	Low
Plant Species	Establishment and spread of alien invasive species	D	(-)	Moderate	Low
Animal Species	Injury and mortality of fauna, including SCC	D	(-)	Moderate	Low
Aquatic ecosystems	Degradation of the ecological condition of aquatic ecosystems; modification of flow and water quality	D	(-)	Low	Very Low
Avifaunal	Displacement through disturbance	D	(-)	High	Low
	Displacement through habitat loss	D	(-)	Moderate	Moderate
Visual	Visual impact of decommissioning activities on sensitive visual receptors within 5km to the proposed WEF.	D	(-)	Moderate	Moderate
Noise	Increase ambient sound levels due to air-borne noise from infrastructure decommissioning activities may	D	(-)	Very Low	Very Low
Traffic	Increase in development trips for the duration of the construction/decommissioning phase.	D	(-)	Moderate	Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Construction associated noise and dust pollution.	D	(-)	Moderate	Low
	Possible damage to road surfaces caused by construction vehicles.	D	(-)	Moderate	Low
Geotechnical	Slope stability	D	(-)	Low	Very Low
	Seismic activity	D	(-)	Moderate	Low
	Soil erosion from clearing of sites for drilling and test pitting	D	(-)	Moderate	Very Low
	Potential hydrocarbon (including oil, fuels, chemicals) spillages	D	(-)	Moderate	Very Low
	Disturbance of fauna and flora from clearing of sites	D	(-)	Low	Very Low
	Subsidence	D	(-)	High	Low
Social	Loss of Employment	D	(-)	Moderate	Low
	Reduced Community Investment	D	(-)	Moderate	Low
	Associated Infrastructure	D	(-)	Moderate	Low
High Level Safety, Health and Environmental Risk Assessment - Solid State Lithium-Ion BESS	Human Health - chronic exposure to toxic chemical or biological agents	D	(-)	Moderate	Low
	Human Health - exposure to noise	D	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	D	(-)	Low	Very Low
	Human Health - exposure to psychological stress	D	(-)	Low	Low
	Human Health - exposure to ergonomic stress	D	(-)	Low	Low
	Human and Equipment Safety - exposure to fire radiation	D	(-)	Moderate	Low
	Human and Equipment Safety - exposure to explosion over pressures	D	(-)	Moderate	Low
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	D	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to electromagnetic waves	D	(-)	Moderate	Low
	Environment - emissions to air	D	(-)	Low	Very Low
	Environment - emissions to water	D	(-)	Low	Low
	Environment - emissions to earth	D	(-)	Moderate	Low
	Environment - waste of resources e.g., water, power etc	D	(-)	Low	Very Low

Aspect	Impact Description	Phase	Character	Without Mitigation	With Mitigation
	Public - Aesthetics	D	(-)	Low	Low
	Investors - Financial	D	(-)	Moderate	Low
	Employees and investors - Security	D	(-)	Moderate	Low
	Emergencies	D	(-)	Moderate	Low
	Investors - Legal	D	(-)	Moderate	Low
High Level Safety, Health and Environmental Risk Assessment Vanadium Redox Flox BESS	Human Health - chronic exposure to toxic chemical or biological agents	D	(-)	Moderate	Low
	Human Health - exposure to noise	D	(-)	Moderate	Low
	Human Health - exposure to temperature extremes and/or humidity	D	(-)	Low	Very Low
	Human Health - exposure to psychological stress	D	(-)	Low	Low
	Human Health - exposure to ergonomic stress	D	(-)	Low	Low
	Human and Equipment Safety - exposure to fire radiation	D	(-)	Moderate	Low
	Human and Equipment Safety - exposure to explosion over pressures	D	(-)	N/A	N/A
	Human and Equipment Safety - exposure to acute toxic chemical and biological agents	D	(-)	Moderate	Low
	Human and Equipment Safety - exposure to violent release of kinetic or potential energy	D	(-)	High	Low
	Human and Equipment Safety - exposure to electromagnetic waves	D	(-)	Moderate	Low
	Environment - emissions to air	D	(-)	Low	Very Low
	Environment - emissions to water	D	(-)	Low	Low
	Environment - emissions to earth	D	(-)	Moderate	Low
	Environment - waste of resources e.g., water, power etc	D	(-)	Low	Very Low
	Public - Aesthetics	D	(-)	Low	Low
	Investors - Financial	D	(-)	Moderate	Low
	Employees and investors - Security	D	(-)	Moderate	Low
	Emergencies	D	(-)	Moderate	Low
	Investors - Legal	D	(-)	Moderate	Low

12.2 SPECIALIST CONCLUSIONS

12.2.1. SOIL, LAND USE AND LAND CAPABILITY

The main conclusion of the Agricultural Agro-Ecosystem Specialist Assessment is that the proposed development will not have an unacceptable negative impact on the agricultural production capability of the site or cumulatively in the wider area. This is substantiated by the fact that most agricultural activities can continue relatively unaffected on all parts of the affected land other than the relatively small development footprint (about 1.12 % of the affected properties), the actual loss of agricultural production potential is therefore insignificant. Therefore, the proposed development will not significantly change the agricultural character of the area and therefore will not lead to unacceptable cumulative impacts on agricultural activities. In addition, there will be no significant loss of high potential agricultural land that need to be preserved for agricultural purposes and/or food security in the country, therefore the project is deemed acceptable.

All the proposed 20 WTG hardstands, together with three alternative EIH development options, have been verified as having medium to low agricultural sensitivity due to a variety of soil, slope and/or terrain limiting factors. The small area of agricultural land loss, however, together with the fact that the total area of agricultural land loss through the proposed development is well within the Allowable Development Limits (ADL) as prescribed by DFFE in the agricultural protocols, being the prime motivation factors for this conclusion. From this point of view, all proposed project infrastructure is subsequently viewed as acceptable for the proposed development. However, two of the proposed EIH alternatives (EIH1 and EIH2) fall in planted pastures, which should be avoided if possible. Although these do not cause an exceedance in the ADL it would be advisable to avoid these areas due to their current valuable contribution towards sustainable livestock farming in the agro-ecosystem that the project area falls in. These mentioned options, however, are not deemed as no-go areas but EIH3 is the preferred option from an agro ecosystem point of view.

From the findings of this assessment, most agricultural activities can continue relatively unaffected on all parts of the affected land other than the relatively small development footprints of the project. The actual loss of agricultural production potential is therefore deemed insignificant. Therefore, the proposed development will not significantly change the agricultural character of the area and will not lead to unacceptable cumulative impacts on agricultural activities. In addition, there will be no significant loss of high potential agricultural land that needs to be preserved for agricultural purposes and/or food security in the country, therefore the project is deemed acceptable

As a direct positive outcome, the proposed project offers improved financial security for landowners, as well as wider, societal benefits such as job security for farm workers. This income by far supersedes the income that is obtainable trough crop or livestock production on areas directly affected by the development. The rental income diversifies the landowner's revenue streams, which can be especially valuable in times where agricultural production may be variable or less stable due to climate change, droughts, floods, or other natural crop/livestock destroying disasters.

The WEF project also has an indirect security benefit to the farm environment against stock theft and other crime due to heightened security in and around the affected project area. Furthermore, the project poses a low risk in terms of causing soil degradation and the loss of agricultural land by occupation is not permanent as the land will become available again for agricultural production after decommissioning of the project. From this it can be concluded that, from an agricultural impact perspective, the proposed development is the preferred alternative between the development and the

no-go option. In the view of the specialist, therefore, the advantages to the agro ecosystem with the development of the proposed project outweigh the disadvantages thereof.

The positioning of WTGs in a WEF project is a complex exercise and multiple, interacting factors that determine the locations that will ensure the viability of the WEF need to be considered. Different environmental sensitivities as well as technical considerations, topography, individual turbine wake loss setbacks, grid setbacks, land right risks, and landowner inputs must all be considered in combination to ensure the developable area, which in this case is quite limited, is optimally positioned in the larger ecological landscape. WTG's, therefore, cannot simply be moved off croplands into adjacent areas as viable alternatives. However, it been illustrated in the impact assessment that the agricultural impact of the currently proposed WTG hardstands within the cropland boundaries in the project area is so small that it is deemed senseless to compromise the viability of the total WEF project to affect a relatively insignificant change to the agricultural production environment. The project layout initially included 31 WTG positions of which only 20 are being applied for environmental authorization. Three EIH alternatives are also included. No alternatives to the current project layout are proposed other than the avoidance of two of the EIH alternatives (EIH1 & EIH2) if possible. No recommendations are made in terms of micro-siting, and the specialist is satisfied that all due process has been followed to place WTG locations and other project infrastructure as effectively as possible to actively avoid areas of 'High' and 'Very High' environmental (including agriculture) sensitivity.

Therefore, based on the findings of this assessment, it is the specialist's opinion that the proposed development is favourably considered for approval from an agricultural production potential and agro-ecosystem point of view.

12.2.2. TERRESTRIAL BIODIVERSITY ASSESSMENT

The PAOI is characterised by extensive tracts of diverse natural habitat, dominated by rocky hills and ridges and interspersed with grassy plains and river valleys. These factors create myriad micro-habitats that support terrestrial biodiversity.

Four regional vegetation types characterise the PAOI, of which two are threatened according to NEMBA Threatened Ecosystems (2021), namely Soweto Highveld Grassland (Vulnerable) and Tsakane Clay Grassland (Endangered). Large areas of the PAOI are also classified as CBAs and ESAs according to the delineations of the MBSP (2024) and the Gauteng C-Plan (2024). The continued integrity and protection of threatened vegetation types and CBAs is crucial to meet conservation targets. The presence of these sensitive features is therefore a particular concern with respects to terrestrial biodiversity management. The PAOI is also characterised by other environmental and conservation planning features that may be negatively impacted by the proposed Project, including Priority Focus Areas for protected area expansion, rocky ridges, Freshwater Ecosystem Priority Areas, and climate change adaption corridors.

On-site natural habitats provide important habitat for flora and fauna, and contribute to broader habitat connectivity, which is an important component of maintaining various landscape-scale ecological processes and terrestrial biodiversity. Fauna SCC, including the Mountain Reedbuck (EN) were recorded on-site during the field programme, and habitat suitability assessments suggest that several other fauna SCC and indeed flora SCC may be present on-site. The DFFE screening tool rated the Terrestrial Biodiversity Theme for the PAOI as 'Very High' sensitivity, and the findings of this study confirm this sensitivity rating for patches of natural habitat.

The infrastructure layout has undergone a series of revisions in line with the mitigation hierarchy to avoid and minimise potential negative impacts on sensitive biodiversity features. These have inter alia, prioritised where possible the placement of wind turbines in areas of modified habitat and the alignment of proposed access roads with existing district gravel roads and farms tracks. Nonetheless, potential negative impacts on terrestrial biodiversity remain, and these have been identified and assessed for the proposed Project for both pre- and post-mitigation scenarios. Several management measures have been recommended in this report to further minimise and rehabilitate negative impacts, and if successfully implemented these will effectively reduce impact significance. It is also recommended that all relevant mitigation and management measures for the proposed Project should be incorporated into an integrated Biodiversity Management/Action Plan.

In accordance with the outcomes of the impact assessment, and taking cognisance of the baseline conditions presented herein, as well as the impact management measures, the proposed Project, is not deemed to present significant negative ecological issues or impacts on terrestrial biodiversity. and there are no identified constraints that would prevent the proposed Project from being authorised.

12.2.3. PLANT SPECIES ASSESSMENT

The PAOI is characterised by extensive tracts of diverse natural habitat, dominated by rocky hills and ridges and interspersed with grassy plains and river valleys. These factors create myriad micro-habitats that could potentially support flora SCC.

Although no flora SCC were recorded in the PAOI during the field programme, habitat suitability assessments suggest that several flora SCC, including many of those highlighted by the DFFE screening tool, may be present on-site. The DFFE screening tool rated the Plant Species Theme for the Project site as ‘Medium’ sensitivity and the findings of this specialist study confirm this sensitivity rating.

It is possible that vegetation clearing and earth works associated with the proposed Project may negatively impact any flora SCC occurring in development footprint through the destruction of individual plants, but broader habitat loss and disturbances and the associated disruption of key ecological processes (e.g. pollination) may compromise local population viability, resulting in SCC losses.

During the initial site sensitivity verification and scoping phase of the proposed Project, the infrastructure layout underwent a series of revisions in line with the mitigation hierarchy to avoid and minimise potential negative impacts on sensitive biodiversity features. These have inter alia, prioritised the placement of wind turbines in areas of modified habitat and the alignment of proposed access roads with existing district gravel roads and farms tracks. Nonetheless, potential negative impacts on flora SCC remain possible, and these have been identified and assessed for the proposed Project for both pre- and post-mitigation scenarios.

The successful implementation of the recommended mitigation measures presented in this report can effectively manage the identified impacts on flora SCC. It is also recommended that all relevant mitigation and management measures for the proposed Project should be incorporated into an integrated Biodiversity Management/Action Plan.

In accordance with the outcomes of the impact assessment, and taking cognisance of the baseline conditions presented herein, as well as the impact management measures, the

proposed Project, is not deemed to present significant negative ecological issues or impacts on flora SCC. The proposed Project should thus be authorised.

12.2.4. ANIMAL SPECIES ASESSMENT

The PAOI is characterised by extensive tracts of diverse natural habitat, dominated by rocky hills and ridges and interspersed with grassy plains and river valleys. Many of the individual land portions within the PAOI are also managed as game farming operations. These factors promote a large and diverse fauna assemblage, with 43 mammal species and nine herpetofauna species recorded on-site during the 2024/2025 field programme. Natural habitat within the POAI therefore represents a high-value ecological resource for local fauna communities, which include SCC.

Amongst the recorded mammals, six are free-roaming SCC, namely Mountain Reedbuck (Endangered), Serval (Near Threatened), Cape Clawless Otter (Near Threatened), Grey Rhebok (Near Threatened), Southern African Hedgehog (Near Threatened) and the Vlei Rat (Near Threatened). Habitat suitability assessments further indicate that several additional SCC may also occur within the PAOI. Based on these findings, the 'High' sensitivity rating for the animal species theme assigned by the DFFE National Web-Based Screening Tool, is confirmed.

During the initial site sensitivity verification and scoping phase of the proposed Project, the infrastructure layout underwent a series of revisions in line with the mitigation hierarchy to avoid and minimise potential negative impacts on sensitive biodiversity features. These have inter alia, prioritised the placement of wind turbines in areas of modified habitat and the alignment of proposed access roads with existing district gravel roads and farms tracks. Nonetheless, it is expected that direct loss, disturbance and fragmentation of natural habitat will result from construction phase vegetation clearing and earth works. Moreover, it is also anticipated that some fauna SCC may be killed, injured or disturbed during the various Project phases through inter alia, vehicle collisions, noise, dust entrainment and illegal hunting/snaring.

These impacts can be effectively avoided and mitigated through the successful implementation of the mitigation measures recommended in this report. It is also recommended that all relevant mitigation and management measures for the proposed Project should be incorporated into an integrated Biodiversity Management/Action Plan.

In accordance with the outcomes of the impact assessment, and taking cognisance of the baseline conditions presented herein, as well as the impact management measures, the proposed Project, is not deemed to present significant negative ecological issues or impacts.

12.2.5. AQUATIC ECOLOGY IMPACT ASSESSMENT

The aquatic features occurring within the site are the Suikerbosrant tributary of the Vaal River and its associated tributaries and wetland areas. These watercourses range from being largely natural on the higher-lying areas of the site to being moderately to largely modified ecological condition in their middle and lower reaches. The watercourses have moderate ecological importance but are of high sensitivity. They provide corridors for the movement of water and biota through the site and are particularly sensitive to flow, water quality and habitat modification due to the associated wetland habitat along many of the watercourses.

A buffer of 50m is recommended for the watercourses, while the associated wetland habitats should be protected by a 100m buffer. Services could be placed through these aquatic habitats and buffer areas but must be kept to a minimum and adequately mitigated.

The findings of this assessment thus largely agree with the DFFE screening tool for aquatic biodiversity sensitivity mapping in that most of the site is of low aquatic sensitivity.

Given the distance of any aquatic ecosystem features from the proposed development footprint, the potential aquatic ecosystem impacts associated with the proposed project are likely to be low. There is thus no reason from an aquatic ecosystem perspective why the proposed development should not be approved. That is, provided the recommended mitigation measures are implemented.

12.2.6. HERITAGE IMPACT ASSESSMENT

Based on the above findings, a sensitivity map of the development area has been drafted indicating areas that are appropriate for the WEF development within the identified development areas. Overall, however, it must be noted that the overall heritage sensitivity of the development areas for WEF 1 range from moderate to very high. The areas identified as having very high sensitivity should be considered as no-go for new infrastructure, areas of high heritage sensitivity should be considered as "tread-lightly" and the areas identified as having moderate sensitivity must be considered more closely for development activities.

As noted above, due to their landmark value within this cultivated landscape, it is recommended that the higher elevations of these mountains are not suitable for the construction of turbines, and more significantly, the construction of the large-scale roads required to construct these turbines. These areas must be considered as very high sensitivity in the sensitivity maps below. Due to the combined sensitivity from cultural landscape impacts and impacts to buried archaeology, development within this VERY HIGH sensitivity landscape will need to be limited to have minimal impact and align with visual impacts, and carefully considered in terms of micrositing to prevent impacts to burial archaeology. It is preferred if no new infrastructure development takes place within this very high sensitivity area.

Turbine Positions

All of the proposed turbine locations are acceptable from a heritage perspective as they are located outside of the recommended buffers and high sensitivity areas identified.

Substation Options

Based on the layout provided in July 2026 for the EIA Phase, the proposed positions of Substation 1, 2 and 3 are all acceptable as they are located outside of the recommended buffers and high sensitivity areas identified.

Temporary Laydown areas

Based on the layout provided in July 2026 for the EIA Phase, the proposed position of both temporary laydown areas is acceptarele as they are located outside of the recommended buffers and high sensitivity areas identified.

Internal Roads

It is greatly appreciated that many of the internal proposed roads follow existing farm roads within the development area. This is commended.

Archaeological monitoring is recommended for all road construction that passes through the very high sensitivity area mapped in this report.

33kV OHL

This proposed alignment is positioned within the buffers recommended along the N3. However, as this infrastructure is only a 33kV line (and not a wind turbine), and as this infrastructure is a linear development aligned along an existing linear element in the landscape, the impact of the proposed 33kV line on the N3 is considered acceptable from a heritage perspective. The N3 alignment is preferred to the Alternative Route, discussed below.

The Alternative Route intersects with the recommended buffers for Sites 40, 41, 42 and 43, and passes the high sensitivity area to connect to WT8. While this Alternative Route follows existing farm roads, which is commendable, this is not the case within the high sensitivity area. This is considered as less preferable from a heritage perspective.

As noted above, all of the proposed new infrastructure is located within areas of low and zero palaeontological sensitivity. As such, it is not anticipated that any significant fossil heritage is likely to be impacted by the proposed development based on the layout considered in this report.

12.2.7. AVIFAUNAL IMPACT ASSESSMENT

The specialist site inspection, nest surveys and six seasonal surveys of pre-application monitoring confirmed that the proposed development site is of high sensitivity in terms of the Screening Tool classification for the animal theme (taxon Aves) and the avian (wind) theme. An Avifaunal Specialist Assessment as per the avifauna (wind) protocol (GN320) and an Avian Species Specialist Assessment must be conducted as per the animal species protocol (GN 1150, refer to section 2.10.2 above) for the ABO Uvemvane WEF 1.

This assessment represents the required avifaunal impact assessment report in terms of both applicable protocols for the proposed development. Pre-application monitoring did not result in any apparent red flags for the project that would prohibit potential wind energy development at the proposed ABO Uvemvane WEF 1 site.

Avifaunal constraints were identified from the results of nest surveys and pre-application monitoring and provided to the developer to inform the project design. The proposed layout has satisfactorily taken all recommendations into account, including precautionary buffers, and avoids all avifaunal no-go areas, areas of high sensitivity, and adheres to all recommended constraints, in terms of acceptable development activities. Modelled fatality estimates are well below acceptable levels relative to potential biological removal values. The number of turbines proposed was reduced from 66 to 20, all of which are located outside areas identified as no-turbine areas and areas where development should be minimised. The proposed layout is therefore supported.

All impacts on avifauna can be mitigated to an acceptable level of very low, low and moderate environmental impact significance through the implementation of the mitigation hierarchy of avoidance, minimisation and mitigation of residual impacts.

12.2.8. BUTTERFLY HABITAT ASSESSMENT

Natural grassland and savanna that have not been subjected to transformative or disruptive impacts ultimately represent the most important natural attribute when considering butterfly habitat sensitivity in the wider landscape.

Watercourses and associated riparian and wetland zones exhibit attributes of 'High Sensitivity', mainly because of the importance as conservation corridors for insects, or the likelihood that the Near Threatened *Metisella meninx* could persist at some of these wetland/riparian areas.

Rocky ridges and areas of complex topography often exhibit high butterfly diversity and serve as important corridors or 'stepping stones' that are often embedded in transformed areas. The sensitivity of these areas (where no threatened species were observed) is therefore categorised as 'High Sensitivity'.

Remaining (untransformed) terrestrial habitat of the site is assessed to be of 'Medium Sensitivity' for butterflies. Cultivated, modified, or transformed areas do not exhibit any sensitivity; a 'Low Sensitivity' is ascribed to these parts.

Elevated habitat sensitivities (high or very high) are often associated with habitat that exhibit specific attributes, e.g., the presence of certain host plant/animal species, high rockiness, topographically complex, wetland and mesic types, etc.

The presence of threatened or sensitive butterflies from these 'special' habitat types cannot be excluded entirely and High or Very High Sensitivities were ascribed to these parts.

The proposed development plan does provide consideration of these areas and most of these areas are effectively avoided.

Some conflict areas have been identified during earlier phases of the project, and the proposed layout is considerate of the recommendations. For example, the position of turbine WT-14 has been indicated to be situated in high sensitivity areas; the position was adjusted to be in lower sensitivity areas that are also outside CBA habitat according to the Mpumalanga BPS (2014).

Some potential conflict areas were identified where proposed project infrastructure overlaps with High Sensitivity areas. While these are generally not regarded to be major impacts (note quantified impacts), it should nonetheless be considered with caution.

Potential conflict areas were noted with the following infrastructure:

- Wind Turbine 8, Wind Turbine 20;
- Selected portions of proposed 33 kV Powerline
- Selected portions of proposed Alternative 33 kV Powerline; and
- Selected portions of proposed Maintenance and Reticulation Roads.
- Apart from some impacts from potential impact areas, there appears to be no significant threat to threatened or sensitive butterfly species.

12.2.9. BATS IMPACT ASSESSMENT

The SABPG states that, for the Grassland ecoregion, if the median bat passes per hour is less than 0,23 at ground level and less than 0,04 in the rotor sweep zone the area is considered as being of Low Sensitivity to bats. If the median bat passes per hour is between 0,23 and 1,76 at ground level and between 0,04 and 0,39 at height the area is seen as being of Medium Sensitivity to bats. Based on our monitoring results the median number of bat passes per hour at ground level is 2.48 and 0,07 within the rotor sweep zone indicating that the area is of High sensitivity to bats on ground level and of Medium sensitivity in the rotor sweep zone. It must, however, be stated that during the spring and summer periods the sensitivity is High at ground level and at height.

If the mitigation measures are followed this impact can be greatly reduced by only operating the WEF during periods when bats are less active. It is highly recommended that Automated Curtailment devices are installed as this is the only realistic method to ensure that bat mortalities are kept to a minimum.

12.2.10. VISUAL IMPACT ASSESSMENT

The following findings have been considered by the Visual Impact assessment specialist in evaluating whether the proposed development should be authorised:

Landscape and receptor sensitivity: The region has moderate landscape character sensitivity consisting of open, rural, agricultural land with scattered settlements and several protected areas (none within the development site; closest is Alice Glockner Nature Reserve, 2.7km away). Population density is higher in the north (Gauteng) than south (Mpumalanga). The DFFE Screening Tool rated both Landscape and Flicker themes as very high sensitivity; the specialist assessment revised Landscape sensitivity down to high but confirmed Flicker sensitivity as very high.

Turbine layout: Under the current layout, 4 turbines fall within mountain/tall hill terrain, 6 within the N3's 1km buffer, and 2 (turbines 03 and 24) within shadow flicker zones affecting the Geluk and Modderfontein homesteads. Only turbine 24 overlaps two sensitivity buffers.

Cumulative impact: Rated low. The facility is "transformative" as the first WEF in the area, but the landscape can accommodate the proposed WEF without leading to an unacceptable loss of visual resource or overwhelming the viewer's experience from a cumulative perspective.

Shadow flicker: Consent[21] has been obtained for Geluk (turbine 03), resolving this matter. Modderfontein (Charmick Wedding and Functions Venue, turbine 24) requires documented landowner engagement; if objections arise, the Section 12 (of the specialist report) mitigation hierarchy applies.

EAP: It can be confirmed that Stakeholders and landowners were afforded an opportunity to comment on the Visual Impact Assessment during the EIA process, with proof of engagement provided in **Appendix E** and mitigation measures included in the Visual Impact Assessment (**Appendix G.7**) and EMPr (**Appendix J**).

Overall significance: High, both pre- and post-mitigation, driven mainly by unmitigable turbine visibility within 0–10km and very-high night lighting impacts (reducing only to high post-mitigation). Conventional mitigation (e.g., screening) is largely ineffective against the primary impact; mitigation is only meaningfully effective for lighting and construction-phase impacts.

Despite high significance ratings, the assessment concludes **no fatal flaw exists**, because:

- Visual impact is subjective/receptor-based, not a loss of an irreplaceable resource.
- The impact is reversible upon decommissioning.
- Affected receptors are limited and spatially defined; layout has already been revised to reduce exposure.
- Shadow flicker is largely resolved or has a clear resolution pathway.

[21] Landowner consent for Geluk is appended to the amended application form, submitted with this DEIR.

- Cumulative impact is only moderate.
- Effective mitigation exists for secondary impacts (lighting, blade painting, construction/decommissioning).

No visual fatal flaws preclude authorisation, provided mitigation measures are implemented and maintained, and the Modderfontein shadow flicker engagement is concluded per the specialist report's recommendations. Proof of engagement with stakeholders and landowners during the scoping and EIA phase is included in Appendix E.

A number of best practice mitigation measures have been proposed for the proposed ABO Uvemvane WEF 1 in order to limit the impacts of the proposed development (**Section 12 of the specialist report Section 12 of the specialist report Appendix G.7**). Conventional mitigation (e.g. such as screening of the structures) of the potential visual impacts is highly unlikely to succeed due to the nature of the development and the receiving environment. The proposed mitigation measures will primarily be effective in terms of mitigating lighting and construction phase visual impacts only.

Regardless of whether or not mitigation measures will reduce the significance of the anticipated visual impacts, they are considered to be good practice and should all be implemented and maintained throughout the construction, operation and decommissioning phases of the proposed facility.

In light of the above assessment and the outcomes determined thereof, the visual specialist is of the opinion that the visual impacts associated with the proposed project are within acceptable limits when considering the nature of the proposed infrastructure from a visual perspective.

12.2.11. NOISE IMPACT ASSESSMENT

It was determined that the potential noise impacts, without mitigation, would be:

- of a low significance for the daytime construction (or upgrading) of the access roads;
- of a low significance for the daytime construction traffic passing NSR;
- of a low significance for the daytime construction activities (hard standing areas, excavation and concreting of foundations and the erecting of the WTG and other infrastructure) at this WEF;
- of a low significance for the night-time construction activities (such as the pouring of concrete, erecting the WTG);
- of a low significance for the daytime operational activities; and
- of a medium significance for operational activities (noises from WTG) when considering the worst-case PWL, with mitigation measures recommended that would reduce the potential significance to low.

There is no potential for a cumulative noise impact.

With the implementation of appropriate mitigation measures, the proposed layout (turbine placement) is considered acceptable from a noise perspective and there is no restriction in the WTG that the applicant could use (subject that the calculated noise levels are less than 45 dBA at NSR locations used for residential purposes). Noise monitoring is required should the applicant select to use a WTG with a PWL higher than 105 dBA (re 1 pW). It is therefore recommended that the proposed project (and associated infrastructure) be authorised.

It should be noted that the applicant should re-evaluate the noise impact should:

- the layout be revised (as part of amendment process post EA) where any WTG, located within 2,500 m from a confirmed NSR, are moved closer to the NSR;
- the layout be revised (as part of amendment process post EA) where any new WTG are introduced within 2,500m from an NSR;
- the layout be revised (as part of amendment process post EA) where the number of WTG within 2,500m from an NSR are increased; and
- the applicant selects to use a WTG with PWL higher than 110.5 dBA (re 1 pW).

It is proposed that the applicant recommend to landowners that no new residential dwellings be developed within areas enveloped by the 42 dBA noise level contour.

12.2.12. TRAFFIC IMPACT ASSESSMENT

The potential traffic and transport related impacts for the construction, operation and decommissioning phases of the proposed project were identified and assessed.

The main impact on the external road network will be during the construction and decommissioning phases. This phase is temporary in comparison to the operational phase. The number of abnormal load vehicles was estimated and found to be accommodated by the road network including the recommended mitigation measures.

The traffic generated during the construction phase, although significant, will be temporary and impacts are considered to be of medium negative impact. However, after mitigation a rating of low negative significance was given.

During operation, it is expected that maintenance and security staff will periodically visit the facility. The generated trips can be accommodated by the external road network, and the impacts were rated low negative.

The traffic generated during the decommissioning phase will be similar to or even less than the construction phase traffic and the impact on the surrounding road network was considered to be of low negative significance with mitigation.

The other projects within a 30 km radius from the project site as indicated in this report were taken into consideration for the cumulative impact. Mitigation measures would be important and can reduce the impact. The cumulative impact can then be rated as low negative with the mitigation measures.

The overall mitigation measures mentioned in the construction and decommissioning phases are:

The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.

Dust suppression of gravel roads located within the site boundary, including the main access road to the site and the site access roads, during the construction phase, if required.

Regular maintenance of gravel roads located within the site boundary, including the access roads to the site, by the Contractor during the construction phase and by the Owner/Facility Manager during the operational phase.

The use of existing licensed quarries near the site would decrease the traffic impact on the surrounding road network, if available and feasible.

Staff and general trips should occur outside of peak traffic periods as far as possible.

Vehicular movements within the site boundary are the responsibility of the respective Contractor and the Contractor must ensure that all construction road traffic signs and road markings (where applicable) are in place.

If required, low hanging overhead lines (lower than 5.1m) e.g., Eskom and Telkom lines, along the proposed routes, will have to be moved (to be arranged by the haulage company and communicated beforehand with the service provider of the OHL) to accommodate the abnormal load vehicles. The Contractor and the Developer are to ensure that the haulage company is aware of this requirement.

The haulage company is to provide evidence to the Contractor and the Developer that any affected overhead lines have been moved or raised.

The preferred route should be surveyed by the developer to identify problem areas (e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, which may require modification). After the road modifications have been implemented, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, prior to the transportation of any components, to ensure that delivery will occur without disruptions. This process is to be undertaken by the haulage company transporting the components and the contractor, who will modify the road and intersections to accommodate abnormal vehicles. The “dry-run” should be undertaken within the same month that components are expected to arrive. The haulage company is to provide evidence that the route has been surveyed and deemed acceptable for the transportation of the abnormal load.

The Contractor needs to ensure that any gravel sections of the haulage routes (i.e., the site access road and the main access road to the site) remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.

Design and maintenance of internal roads. The internal gravel roads will require grading with a grader to obtain a camber of between 3% and 4% (to facilitate drainage) and regular maintenance blading will also be required. The geometric design of these gravel roads needs to be confirmed at detailed design stage. This process is to be undertaken by a civil engineering consultant or a geometric design professional.

For upgraded or newly constructed site and access roads, it needs to be ensured that all bellmouths and radii of bends can accommodate the largest construction vehicle. The dimensions will be communicated as part of the detail design stage as per Geometric Design Standard guideline.

The construction and decommissioning phases of a WEF are the only significant traffic generators. The duration of these phases is of a temporary nature, i.e., the impact of the WEF on the external traffic on the surrounding road network is temporary and operational WEFs not add significant traffic to the road network.

The proposed development of the project and associated infrastructure is supported from a traffic engineering perspective, provided that the recommendations and mitigation included in this report are adhered to.

12.2.13. GEOTECHNICAL ASSESSMENT

The completed desktop assessment of the geotechnical conditions at the proposed project area has shown the site to be generally suitable for the proposed development. A verified high sensitivity was assessed due to the presence of two mine Shaft, whose dimensions are unknown.

A “Negative Low to Negative High” impact significance range pre-mitigation was assessed. Post-mitigation, the assessed impact significance decreases to “Negative Very Low to Negative Low”.

The cumulative impacts were found to have a significance level range of “Negative Low to Negative High” without mitigation. With mitigation measures, the significance of potential impacts ranges will be “Negative Very Low to Negative Low”.

It is recommended that a site specific, geotechnical investigation is carried out (during the pre-construction/ planning phase) at the site to validate the expected founding conditions and to ensure that no conditions at variance to those indicated are present.

12.2.14. SOCIAL ASSESSMENT

Based on the findings of the assessment, the proposed project is expected to make a positive contribution to South Africa’s renewable energy objectives while supporting economic growth within the affected municipalities. The Project has the potential to generate a range of social benefits, including employment opportunities during the construction and operational phases, increased procurement opportunities for local businesses, income generation for participating landowners, and the provision of renewable energy. These benefits are particularly significant in an area where unemployment and limited economic opportunities remain key socio-economic challenges.

The assessment also identified several potential negative social impacts that may arise during the different phases of the Project. These include the influx of job seekers, increased pressure on local infrastructure and services, community health and safety concerns, the loss of agricultural land, and visual and noise-related impacts on surrounding communities. However, with the implementation of the recommended mitigation and management measures, most of these impacts are expected to be reduced to low or moderate levels of significance.

Based on the findings of this Social Impact Assessment, the proposed Project is considered socially acceptable, provided that the recommended mitigation and management measures are implemented throughout the Project lifecycle. Continued engagement with affected communities, prioritisation of local employment and procurement opportunities, and effective grievance management will be essential to maximise social benefits and minimise adverse impacts.

12.2.15. SHE RISK ASSESSMENT

The assessment has found that with suitable preventative and mitigative measures in place (e.g. separation distances etc.), none of the identified potential risks are excessively high, i.e., from a Safety, Health and Environment (SHE) perspective no fatal flaws were found with either type of technology for the BESS installation at either of the three proposed EIH locations within the ABO Uvemvane WEF 1.

At a large facility, without installation of the state-of-the art battery technology that includes protective features, there can be significant risks to employees and first responders. The latest battery designs include many preventative and mitigative measures to reduce these risks to tolerable levels. State-of-the-art technology should be used, i.e., not old technology, such as pure liquid phase batteries, that may have been prone to fire and explosion risks.

The design should be subject to a full Hazard and Operability Study (HAZOP) prior to commencement of procurement. A HAZOP is a detailed technical systematic study that looks at the intricacies of the design, the control system, the emergency system etc. and how these may fail under abnormal operating conditions. Additional safeguards may be suggested by the team doing the study.

For most projects, from an acute health and safety point of view, the No-Go option will usually be a preferred option since there are no immediate health and safety risks associated with not doing a project, i.e. no one can get hurt if something does not exist. However, some projects aim to reduce adverse effects elsewhere and can be viewed at offsetting either current or future risks. In this case, renewable energy projects should help to mitigate possible adverse impacts of climate change, create jobs and contribute to sustainable energy, i.e. the project risks are offset against future social risk reduction.

From a safety and health point of view, the above Risk Assessment shows that risks posed by Vanadium Redox Flow Battery (VRFB) systems may be slightly lower than those of (Lithium-ion Battery) LIB facilities, particularly with respect to fire and explosion risks. From an environmental spill and pollution point of view the VRFB systems present higher short-term risks than the LIB systems. However, the above conclusions may be due to the fact that the VRFB technology is not as mature as LIB technology and therefore there is not as much operating experience and accident information available for the VRFB. Overall, from and SHE RA points of view, there is no specific preference for a type of technology.

12.3 ALTERNATIVES ASSESSMENT

Project alternatives in terms of activity, technology, location and layout were considered as part of this EIAr process. The revised layout avoids sensitivities as much as possible.

Table 12-2 outlines the preferred alternatives considered feasible and preferred from an environmental perspective (that is, as per the input from the Specialists).

Table 12-4 – Preferred Alternatives

Alternative	Preferred	Comment
Site	ABO Uvemvane WEF 1	There is no site alternative for the Project. The location of the Project infrastructure was subjected to a site selection process as described in **Section 5.2** in line with the objectives of JET.
Technology	Wind Technology (Preferred Alternative)	Wind technology has been identified as the preferred activity in terms of generating electricity from a renewable resource. Please refer to **Section 5.1.1.**
	BESS technology: Given the ongoing improvement in battery storage technology and the significant advantages of combining battery storage with wind farms, it makes sense to include a battery facility with WEF.BESS Technology: With regard to the proposed BESS, the technology thereof is dynamic and so the specific type/technology to be developed would be selected based on market demands and technology availability at the time of construction. Therefore, both Lithium-ion and redox-flow are assessed as technology alternatives, with Lithium-ion being the current preferred technology.	Both Lithium-ion and redox flow were assessed as technology alternatives. Solid state battery technology is still in developmental stages but proposes to present a safer alternative to lithium-ion batteries as is an alternative that could be considered. According to the SHE Risk Assessment: • Risks posed by VRFB systems may be slightly lower than those of LIB facilities, particularly with respect to fire and explosion risks. • From an environmental spill and pollution point of view the VRFB systems present higher short-term risks than the LIB systems. However, the above conclusions may be due to the fact that the VRFB technology is not as mature as LIB technology and therefore there is not as much operating experience and accident information available for the VRFB. • Overall, from and SHE RA points of view, there is no specific preference for a type of technology.

Alternative	Preferred	Comment
		• All other specialists are of the opinion the both Lithium-ion and redox-flow are assessed as technology alternatives, with Lithium-ion being the current preferred technology.
Layout and Design	WEF 1: Preliminary Layout – SSVR Phase: up to 66 Turbines. (Eliminated) (**Figure 8-1 and Figure 8-2)** Optimised Layout - Pre-Scoping Phase: up to 31 Turbines (**Figure 8-3**)**.** Revised Optimised Layout –Scoping Phase: up to 27 Turbines (**Figure 8-4**) DEIR assessed Layout – EIA Phase: up to 20 Turbines (**Figure 8-6**)	During the SSVR phase, 66 turbines were proposed for the Project (preliminary layout). However, due to the outcome of the SSVR, the Project layout was optimised, and the number of turbines was reduced to 31 (pre-scoping Phase). During the Draft Scoping Phase, the project layout was further optimised to 27 turbines. The turbine layout was revised in order to avoid sensitive features and buffer areas. The Project layout, including the associated infrastructure was revised during the draft EIA Phase based on the specialist assessment and recommendation. The turbine layout was further revised in order to avoid sensitive features and buffer areas, which has resulted in a reduced development footprint and resulted in a reduction in the number of turbines from 27 to 20. All specialists are in agreement that the DEIR assessed layout including all 20 turbine positions are acceptable from an environmental impact perspective. The DEIR layout is recommended as the final layout for DFFE approval.
Electrical Grid Infrastructure	33kV overhead/underground line to connect northern and southern parts of the facility: • A 100 m assessment corridor has been assessed; the actual servitude width would only be 22m. • The line is approximately 8km long and a conservative average span length of approximately 100 m has been assumed for assessment purposes, although actual spans may be longer (depending on final engineering design and terrain). • Two route alternatives assessed.	Although two route alternatives were assessed, as detailed below, the western route is identified as the preferred route for the proposed 33kV overhead/underground powerline and is therefore recommended for approval by DFFE. • SHE Risk: no fatal flaws were found with either type of technology for the BESS installation at either of the three proposed electrical infrastructure hub locations within the ABO Uvemvane Wind Energy Facility 1. • Terrestrial Biodiversity: The N3 highway alignment is preferred as it follows existing disturbed linear infrastructure and transformed habitat. In contrast, the alternative route traverses less fragmented habitat. Given the substantial disturbance zone associated with the N3, co-locating new linear infrastructure along this corridor will reduce additional impacts on terrestrial biodiversity. • Heritage: The N3 alignment is preferred to the Alternative Route. • Visual Assessment: No dedicated viewshed analyses have been generated for the 33kV, as

Alternative	Preferred	Comment
		the range of visual exposure will fall within (and be overshadowed by) that of the turbines. It is expected to be of high significance and may be mitigated to moderate and found to be acceptable from a visual impact perspective. • Aquatic biodiversity Assessment: Two alternative 33 kV line routes were assessed. The western route includes four watercourse crossings and generally follows existing formal roads, while the eastern route includes five crossings and predominantly follows farm roads. The specialist concluded that both alternatives would result in similar low significance aquatic ecosystem impacts, provided that appropriate mitigation measures are implemented at watercourse and wetland crossings. Either route, and either overhead or underground line configuration, was considered acceptable from an aquatic ecosystem perspective. It may, however, be necessary to use overhead lines where disturbance of wetland habitat cannot be avoided.

12.3.1. NO-GO ALTERNATIVE

In the “no project” alternative, the proposed project will not be developed. In this scenario, there could be a missed opportunity to address the need for increase in renewable energy generation in an effort to mitigate against concerns of climate change and exploitation of non-renewable resources. The no-go alternative would not assist in responding to the growing electricity demand in South Africa and would not contribute to the reliability of electricity supply at a national scale. Conversely, negative environmental impacts of the project (as outlined in **Section 9**) associated with the development of the proposed project would be avoided, and the current status quo will continue. This includes continued use of the land for agriculture.

Should development not proceed, the current land management would continue, therefore, current impacts such as overgrazing by cattle, fire patterns, and control the spread of alien invasive could not be mitigated resulting in further degradation to the study area.

Specialists have considered the no-go alternative as outlined in **Section 5.4**.

12.4 RECOMMENDATIONS

The following key aspects are recommended to be included as conditions of authorisation:

- The buildable area and associated layout must avoid all the no-go areas identified by the specialists;
- The EMPr and EIA mitigation measures must be adhered to;
- Recommendations for the layout as provided by the relevant specialists must be implemented as far as possible;
- The final EMPr must form part of all contractual documents with contractors during construction and operational phases of the project. Furthermore, a dedicated Environmental

Control Officer (ECO) must be appointed to ensure compliance to all EA conditions and EMPr commitments throughout the construction phase;
- Appropriate permits in terms of the relevant provincial ordinance must be obtained before commencement; and
- Where required, water use authorisation (WUA) under NWA is to be obtained from the Department of Water and Sanitation (DWS) prior to construction.

12.4.1.1 Soil, Land use and Land Capability

No recommendations are made in terms of micro-siting, and the specialist is satisfied that all due process has been followed to place WTG locations and other project infrastructure as effectively as possible to actively avoid areas of 'High' and 'Very High' environmental (including agriculture) sensitivity.

12.4.1.2 Terrestrial Biodiversity

It is recommended that during the pre-construction planning phase all terrestrial biodiversity mitigation and monitoring measures, including those outlined in the Terrestrial Biodiversity, Plant Species, and Animal Species Specialist Assessment Reports, as well as all management measures recommended in other ecological specialist studies, should be consolidated into a single, integrated Biodiversity Management/Action Plan (BMP/BAP) for the proposed Project.

A single, consolidated BMP/BAP will provide an integrated and practical framework that encompasses, aligns and guides all aspects of biodiversity management throughout the various life-cycle phases of the Project.

12.4.1.3 Aquatic Assessment

The recommended buffer of at least 50m from the larger watercourse and wetland corridors along the western and eastern proposed development area boundaries and the proposed project activities should be maintained.

Clearing of indigenous vegetation should be avoided and should not take place within the aquatic features and the recommended buffers. Any disturbed areas should be revegetated with suitable vegetation to minimise the risk of erosion and sedimentation of aquatic habitats following rainfall events. The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance. There are 10 watercourse crossings associated with the internal roads for the final proposed layout. Six of these crossings are associated with existing informal farm roads, and four will be new watercourse crossings. One crossing is over a minor watercourse in the northern section and the other three crossings are on an unnamed stream with a wider associated wetland habitat. Efforts should be made to avoid making these additional road crossings if possible.

During the construction phase, proper site management must be undertaken to address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities, such as hydrocarbon spills. Any stormwater that does arise within the construction site must be handled appropriately to trap sediments and reduce flow velocities. Any water supply, sanitation services, as well as solid waste management services that should be required for the proposed project should preferably be provided by an off-site service provider.

Any disturbance during the operation phase should be limited to the approved footprint and disturbance of the soil and natural vegetation cover should be avoided.

Stormwater run-off infrastructure must be designed to mitigate both the flow and water quality impacts of any stormwater leaving the developed areas. The runoff should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate channels and swales.

Invasive alien plant growth and signs of erosion within the project area should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants. Should any erosion features develop, they should be stabilised as soon as possible.

With regard to the 33kV overhead/underground line to connect the northern and southern parts of the facility, disturbance of the watercourse/wetland corridor crossings must be minimised and disturbance of the wetland habitats avoided as far as possible. It may be necessary to use overhead lines where disturbance of wetland habitat cannot be avoided.

During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible. Disturbed areas may need to be rehabilitated and revegetated.

Proper site management must be undertaken during decommissioning to address on-site stormwater management and prevention of pollution measures from any potential pollution sources during decommission activities, such as hydrocarbon spills. Any stormwater that does arise within the works must be handled appropriately to trap sediments and reduce flow velocities.

Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion), post decommissioning, may be required.

12.4.1.4 Heritage Assessment

There is no objection to the proposed development from an archaeological perspective on condition that:

- The buffers recommended in **Table 11-1** are adhered to
- The identified very high sensitivity archaeology areas are not impacted by the development of any new infrastructure.
- Archaeological monitoring takes place for all construction activities located within the very high sensitivity areas identified.
- The Chance Fossil Finds Protocol (Appendix 1 of the specialist report) must be implemented throughout the construction phase, particularly in areas underlain by the Vryheid Formation.
- Existing gravel and access roads should be used as far as possible to minimise unnecessary ground disturbance in sensitive areas.
- If any archaeological resources or unmarked human remains are uncovered or exposed during construction operations these must immediately be reported to SAHRA.

12.4.1.5 Avifaunal Assessment

All impacts on avifauna can be mitigated to an acceptable level of very low, low and moderate environmental impact significance through the implementation of the mitigation hierarchy of avoidance, minimisation and mitigation of residual impacts.

12.4.1.6 Butterfly Habitat Assessment

Biodiversity Offset recommendations will be considered should the Competent Authority deem this necessary upon review of this report. The recommendation is that, although considered beneficial, a Biodiversity Offset pertaining to threatened butterfly species, is not presently required for this project.

Rehabilitation Approach

The near-permanent nature of the proposed development (> 20 years) and considering continued expansion of similar activities and infrastructure within the immediate surrounds, implies that it is extremely unlikely that the development will be decommissioned within the immediate future. Addressing unforeseen impacts that result from the development in adjacent natural habitat should be attended immediately and dealt with on a case-by-case basis. The implementation of a generic mitigation approach, which should be based on results and recommendations from a dedicated environmental monitoring programme is expected to be successful in preventing any undue impacts in the surrounding natural environment.

Exclusion and avoidance of High Sensitivity Areas

Iterative changes to the layout of project components since the scoping phase of the project resulted in avoidance of most of the High Sensitivity areas that were initially identified. Minor conflict areas were subsequently identified where project infrastructure and High Sensitivity areas will overlap (refer Section 11.4 of the study). Attention to the mitigation approach is recommended in these parts, with specific reference to a final walkthrough.

12.4.1.7 Bats Assessment

All confirmed roosts and their associated buffers must be considered as No-Go, and thus No-Go areas for turbines and no part of the turbines may cross the buffers implemented around these locations.

All water sources, including open water and streams are considered as Medium Sensitivity and a 200 m buffer has been placed around these areas which should be seen as No-Go zones for turbines.

12.4.1.8 Noise Assessment

It is recommended that the project developer:

1. Re-evaluate the noise impact should the layout be revised (as part of amendment process post EA) where:
    a. any WTG, located within 2,500 m from a confirmed NSR, are moved closer to the NSR;
    b. any new WTG are introduced within 2,500m from an NSR;
2. the number of WTG within 2,500m from an NSR are increased;
3. Re-evaluate the noise impact should the developer make use of a WTG with a maximum PWL exceeding 110.5 dBA re 1 pW;
4. Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. Engine bay covers over heavy equipment could be pre-fitted with sound absorbing material. Heavy equipment that fully encloses the engine bay should be considered, ensuring that the seam gap between the hood and vehicle body is minimised;
5. Include a component covering environmental noise in the Health, Safety & Environmental Induction to sensitize all employees and contractors about the potential impact from noise, especially those employees and contractors that have to travel past receptors at night, or might

be required to do work close (within 1,000m) to NSRs at night. This should include issues such as minimising the use of vehicle horns;

6. Investigates any reasonable and valid noise complaint if registered by a receptor staying within 2,500 m from the location where construction activities are taking place, or where an operational WTG are located. A complaint register, keeping a full record of the complaint, must be kept by the developer; and
7. Where practicable, mobile equipment should be fitted with broadband (white-noise generators/alarms [22] [23]), rather than tonal reverse alarms.

12.4.1.9 Visual

A number of best practice mitigation measures have been proposed for the proposed ABO Uvemvane WEF 1 in order to limit the impacts of the proposed development. Conventional mitigation (e.g. such as screening of the structures) of the potential visual impacts is highly unlikely to succeed due to the nature of the development and the receiving environment. The proposed mitigation measures will primarily be effective in terms of mitigating lighting and construction phase visual impacts only.

Regardless of whether or not mitigation measures will reduce the significance of the anticipated visual impacts, they are considered to be good practice and should all be implemented and maintained throughout the construction, operation and decommissioning phases of the proposed facility.

12.4.1.10 Traffic

The overall mitigation measures mentioned in the construction and decommissioning phases are:

The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.

Dust suppression of gravel roads located within the site boundary, including the main access road to the site and the site access roads, during the construction phase, if required.

Regular maintenance of gravel roads located within the site boundary, including the access roads to the site, by the Contractor during the construction phase and by the Owner/Facility Manager during the operational phase.

The use of existing licensed quarries near the site would decrease the traffic impact on the surrounding road network, if available and feasible.

Staff and general trips should occur outside of peak traffic periods as far as possible.

Vehicular movements within the site boundary are the responsibility of the respective Contractor and the Contractor must ensure that all construction road traffic signs and road markings (where applicable) are in place.

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[22] White Noise Reverse Alarms: http://www.brigade-electronics.com/products.

[23] https://www.constructionnews.co.uk/home/white-noise-sounds-the-reversing-alarm/885410.article - White noise sounds the reversing alarm

If required, low hanging overhead lines (lower than 5.1m) e.g., Eskom and Telkom lines, along the proposed routes, will have to be moved (to be arranged by the haulage company and communicated beforehand with the service provider of the OHL) to accommodate the abnormal load vehicles. The Contractor and the Developer are to ensure that the haulage company is aware of this requirement.

The haulage company is to provide evidence to the Contractor and the Developer that any affected overhead lines have been moved or raised.

The preferred route should be surveyed by the haulage company to identify problem areas (e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, which may require modification). After the road modifications have been implemented, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, prior to the transportation of any components, to ensure that delivery will occur without disruptions. This process is to be undertaken by the haulage company transporting the components and the contractor, who will modify the road and intersections to accommodate abnormal vehicles. The “dry-run” should be undertaken within the same month that components are expected to arrive. The haulage company is to provide evidence that the route has been surveyed and deemed acceptable for the transportation of the abnormal load.

The Contractor needs to ensure that any gravel sections of the haulage routes (i.e., the site access road and the main access road to the site) remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.

Design and maintenance of internal roads. The internal gravel roads will require grading with a grader to obtain a camber of between 3% and 4% (to facilitate drainage), and regular maintenance blading will also be required. The geometric design of these gravel roads needs to be confirmed at detailed design stage. This process is to be undertaken by a civil engineering consultant or a geometric design professional.

For upgraded or newly constructed site and access roads, it needs to be ensured that all bellmouths and radii of bends can accommodate the largest construction vehicle. The dimensions will be communicated as part of the detail design stage as per Geometric Design Standard guideline.

12.4.1.11 Socio-Economic

The Project has the potential to generate a range of social benefits, including employment opportunities during the construction and operational phases, increased procurement opportunities for local businesses, income generation for participating landowners, and the provision of renewable energy. These benefits are particularly significant in an area where unemployment and limited economic opportunities remain key socio-economic challenges.

The assessment also identified several potential negative social impacts that may arise during the different phases of the Project. These include the influx of job seekers, increased pressure on local infrastructure and services, community health and safety concerns, the loss of agricultural land, and visual and noise-related impacts on surrounding communities. However, with the implementation of the recommended mitigation and management measures, most of these impacts are expected to be reduced to low or moderate levels of significance.

12.4.1.12 SHE Risk Assessment

There are numerous different battery technologies, but using one consistent battery technology system for the BESS installation associated with all the development in the ABO Uvemvane WEF 1 would allow for ease of training, maintenance, emergency response and could significantly reduce risks.

Where reasonably practicable, state-of-the-art battery technology should be used with all the necessary protective features e.g., draining of cells during shutdown and standby-mode, full BMS with deviation monitoring and trips, leak detection systems

There are no fatal flaws associated with the proposed ABO Uvemvane WEF Battery Energy Storage Facility for either technology type, although the exact location within the proposed development footprint can be optimized to reduce risks.

The tables in Section 4 of this assessment contain technical and systems suggestions for managing and reducing risks. Ensure the items listed in these tables under preventative and mitigative measures are included in the design.

The overall design should be subject to a full HAZOP prior to finalization of the design.

For the VRFB systems an end of life (and for possible periodic purging requirements) solution for the large quantities of hazardous electrolyte should be investigated, e.g., it can be returned to the supplier for re-conditioning.

Prior to bringing any battery modules/containers into the country, the contractor should ensure that:

- An Emergency Response Plan is in place that would be applicable for the full route from the ship to the site. This plan would include details of the most appropriate emergency response to fires both while the units are in transit and once they are installed and operating.
- An End-of-Life plan is in place for the handling, repurposing or disposal of dysfunctional, severely damaged batteries, modules and containers.

The site layout and spacing between lithium-ion containers should be such that it mitigates the risk of a fire or explosion event spreading from one container to another. The battery supplier should be able to provide guidance as well as technical proof that the proposed container to container separation distances are adequate.

Suitable separation must also be ensured between the BESS containers and other onsite facilities such as transformers, any high voltage overhead powerlines etc. In this regard there are National Fire Protection Agency (NFPA - USA) and Eskom guidelines. Separation from offices (O&M) areas should be at least 30m to avoid direct damage from possible explosions and fires and possibly be 50m to avoid minor impacts explosion debris.

Under certain weather conditions, the noxious smoke from a fire in a lithium battery container could travel some distance from the unit. The smoke will most likely be acrid and could cause irritation, coughing, distress etc. Close to the source of the smoke, the concentration of toxic gases may be high enough to cause irreversible harmful effects. Location of the facilities needs to ensure a suitable separation distance from public facilities / roads / residences etc. Placing the BESS within 500m of occupied dwelling or 150m of a busy public road, is considered unsuitable. All three of the proposed locations for the BESS are suitable in terms of all necessary separation distances.

In terms of aquatic risks, VRFB hazards are mostly related to possible loss of containment of electrolyte and with LIB systems to fires producing toxic smoke and fire fighting which may result in contaminated of firewater runoff. One would not want these liquids to enter water courses nor the smoke to pass close to houses / industries / public traffic. All three of the proposed electrical infrastructure hub locations are over 50m from any steam, borehole/water reservoir and are therefore suitable.

Finally, it is suggested that pre-construction, once the technology has been chosen and more details of the actual design are available, the necessary updated Risk Assessments should be in place.

There is no reason why the proposed WEF should not be approved from a BESS risk perspective at either proposed location, provided that the mitigation and safety measures contained herein are complied with, e.g. separation distances etc.

12.4.1.13 Biodiversity Offset – Technical Memorandum

Micro-siting generally provides the final design-stage opportunity to apply additional avoidance and minimisation by refining the Project layout around CBAs, watercourses, intact natural habitat and habitat for species of conservation concern. In addition to adhering to various special recommendations, these considerations have been applied in the refined layout (i.e. from Scoping to Draft EIA phase) in several ways. The items listed below demonstrates the biodiversity benefit achieved through the adjustments to the proposed layout which have already been made and presented in the DEIR. The micro siting discussed here has also informed the post mitigation ratings (and this been assessed by the various specialists and also in this report) as described in Table 3-1 of the memo, specifically for the CBA associated ratings.

Wind Turbine Generators (WTG)

- Removal of seven WTGs 25–31 with a footprint of up to 7ha:

  This is an improvement, particularly in reducing impacts on CBA/ESA (MBSP) areas, watercourse buffers and secondary grassland. This change alone significantly lowers the overall disturbance footprint and habitat fragmentation risk.

- WTG 5 micro-siting (outside 50 m from cultivated land):

  This is a minor positive refinement; however, it is not a key driver of biodiversity impact significance.

- WTG 14 shift to avoid CBA1 (MBSP) swept area:

  This is critical and well-aligned with avoidance principles. WTG14 swept area is now outside of any sensitivities, hardstand and swept area still within secondary grassland as delineated infield (low impact).

- Conclusion – turbines: The turbine revisions eliminated habitat loss and interaction with CBA 1 as delineated in the MBSP.

Electrical Infrastructure Hubs

- Removal of Electrical Infrastructure Hub Option 4:
- Positive reduction in permanent footprint of 6ha, and associated habitat disturbance within secondary grasslands.

- Conclusion – electrical infrastructure hubs: The revisions produce a benefit through reduced permanent footprint.

Temporary Laydown Areas

- Removal of two temporary laydown areas, one linked to WTGs 25–31 and one to the southwest of WTG24:
- Positive reduction in footprint of approximately 5ha within secondary grasslands.
- Conclusion – laydown areas: The revisions produce a benefit through reduced permanent footprint.

Roads (internal, access and maintenance) and internal reticulation cables

- Removal of approximately 6km of proposed roads linked to WTGs 25–31 (incl. two associated watercourse crossings):
- Significant positive amendment – reduces both habitat loss and aquatic interface risk.
- Re-routing of roads between WTGs 5–8 and WTGs 21–23 with a disturbance footprint of approximately 1.5ha within a CBA (MBSP) area.
- Positive, particularly where avoiding CBA optimal (MBSP) areas.
- Use of existing roads / additional access route:
- Acceptable as widening of this small section of road in CBA being preferable over the establishment of a new road in an intact area.
- Maintenance road within/adjacent to CBA1 (no widening):
- This is a constraint - it was confirmed that no road construction or widening will take place. If the road must be widened or functionally intensified, it will likely result in direct or indirect CBA1 impact, which will not result in low residual impact.
- Conclusion – roads: The revised road network has actively attempted to avoid CBA 1 areas and confirmed with relevant specialist.

12.4.2. FINALISATION OF THE EMPR AND LAYOUT

It is important to note that the EMPr (**Appendix J)** and project layout included in this EIR are final. All specialists are in agreement that the EIR assessed layout including all 20 turbine (**Figure 11-1**) positions are acceptable from an environmental impact perspective. The DEIR assessed layout is recommended as the final layout for DFFE approval.

The following conditions are requested to be included in the EA:

- The layout submitted in the DEIR is considered final. Existing infrastructure must be used as far as possible e.g., roads.
- The EMPr submitted as part of the EIAr is submitted to the DFFE for approval. Once approved the EMPr must be implemented and adhered to.
- The EMPr must be implemented and strictly enforced during all phases of the project. It shall be seen as a dynamic document and shall be included in all contract documentation for all phases of the development when approved.

12.5 AUTHORISATION PERIOD

Appendix 1(3)(1)(q) of the NEMA EIA Regulations 2014, as amended requires “where the proposed activity does not include operational aspects, the period for which the environmental authorisation is

required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised" must be included in the EIA Report.

The EA is required to be valid for a period of 10 years from the date of issuance of the EA. This is considered a reasonable period to allow the Applicant time to conduct relevant internal processes which can only begin after issuance of the EA.

13 CONCLUSION AND WAY FORWARD

The EIA process undertaken for the ABO Uvemvane WEF 1 was conducted in accordance with the requirements of the National Environmental Management Act (NEMA) and associated EIA Regulations. The assessment was informed by a comprehensive suite of specialist investigations which considered the biophysical, social, heritage, visual, traffic, noise, geotechnical, economic, aviation and health and safety environments associated with the proposed development. The findings of these studies were integrated throughout the assessment process and collectively informed the identification, evaluation and mitigation of potential impacts, as well as the refinement of the proposed development footprint.

The overall objective of the EIA is to provide sufficient information to enable informed decision-making by the authorities. This was undertaken through consideration of the proposed project components, identification of the aspects and sources of potential impacts and subsequent provision of mitigation measures.

In assessing the environmental feasibility of the proposed ABO Uvemvane WEF 1, the requirements of all relevant legislation have been considered. The identification and development of appropriate management and mitigation measures that should be implemented in order to minimise potentially significant impacts associated with the project, has been informed by best practice principles, past experience and the relevant legislation (where applicable).

The EIA process has found that the proposed project will involve activities which will lead to a number of direct and indirect negative impacts on the biophysical and socio-economic environment. These impacts were found to vary in terms of their consequence and probability. Positive impacts are limited to the creation of employment opportunities and other socio-economic benefits as a result of the multiplier effect. This includes the potential to improve energy security in South Africa, increase the generation of renewable energy and reduce the reliance on coal powered energy to meet the country's electricity demand. Positive impacts also include the potential recovery, removal and placement of fossils in a recognised institution (if uncovered).

Furthermore, the DEIR followed an iterative and multidisciplinary approach in which specialist input played a central role in project planning and design. Recommendations from the terrestrial biodiversity, aquatic biodiversity, avifauna, bat, heritage, visual, traffic, noise, social and other specialist studies were incorporated into the development of the assessed layout and supporting infrastructure. Sensitive environmental features, including Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), watercourses, wetlands, heritage resources and other site-specific sensitivities, informed successive layout revisions, turbine relocations and infrastructure adjustments to avoid or minimise impacts wherever reasonably possible.

The final assessed layout represents the outcome of a progressive refinement process undertaken from the early project development stages through Scoping and the EIA phase. Through the application of the mitigation hierarchy, avoidance was prioritised as the primary mitigation mechanism, followed by minimisation, rehabilitation and management measures where required. This process resulted in a substantial reduction in environmental risk and ensured that the final development footprint was located within the most environmentally suitable areas identified through the specialist assessments.

A key outcome of the assessment relates to biodiversity conservation, and the consideration of biodiversity offset requirements. In accordance with the South African National Biodiversity Offset Guideline (2021), the need for a biodiversity offset was specifically evaluated through a dedicated Biodiversity Offset Memorandum and supporting specialist investigations. The assessment concluded that the mitigation hierarchy had been appropriately applied through layout refinement and avoidance of sensitive biodiversity features. Following the implementation of recommended mitigation measures, no residual impacts of High or Very High significance remain on biodiversity features that would trigger the need for a formal biodiversity offset. The specialists further confirmed that the final layout avoids material impacts on identified CBAs and other priority biodiversity features. Accordingly, a biodiversity offset is not considered necessary or warranted for the Project.

The impact assessment undertaken for the proposed development indicates that the majority of identified impacts can be reduced to Low or Medium residual significance through the implementation of the mitigation and management measures contained in the EMPr. Importantly, none of the specialist studies identified fatal flaws that would preclude the development from proceeding within the assessed development footprint, provided that the recommended mitigation, monitoring and compliance measures are implemented throughout the project lifecycle.

It is the opinion of the EAP (i.e. WSP), that based on the findings of the DEIR, the outcomes of the specialist assessments, the results of the public participation process, and the application of the mitigation hierarchy, it is concluded that the ABO Uvemvane WEF 1 is environmentally acceptable within the assessed footprint. The findings of the PPP indicate that stakeholder comments have informed the assessment and refinement of the Project, while the Mpumalanga Tourism and Parks Agency (MTPA) has expressed support for the Project subject to the implementation of the recommended mitigation, monitoring and management measures. The Project has been designed and refined to avoid and minimise environmental impacts to the greatest extent practicable, while contributing towards national and provincial renewable energy objectives. Subject to the implementation of the EMPr and specialist recommendations, the proposed development is considered suitable for environmental authorisation.

This DEIR has demonstrated that the proposed development can be implemented within the assessed footprint without resulting in unacceptable environmental impacts. Through the integration of all specialist studies, iterative layout refinement and the prioritisation of avoidance and minimisation measures, the final layout has been designed to avoid sensitive environmental features wherever practicable and reduce residual impacts to acceptable levels. The assessment, supported by the Biodiversity Offset Memo, concludes that the Project does not trigger a requirement for biodiversity offsetting, as no significant residual biodiversity impacts remain after mitigation. The Project therefore represents a responsible renewable energy development that aligns with environmental management principles and may be authorised subject to the implementation of the recommended mitigation, monitoring and management measures.

Additionally, the SIP registration application was submitted in March 2026 and formally acknowledged by Infrastructure South Africa (ISA) on 11 March 2026. On 14 August 2026, ISA provided an update on the application, confirming that a date for consideration by the Validation Committee had not yet been secured and that further communication would follow once the sitting date had been confirmed. Further to this, on 21 September 2026, ISA provided the latest update informing the Applicant that the progress on the SIP registration has been delayed due to the Validation Committee is undergoing reconfiguration and governance processes. The proof of submission and correspondence is included

in the amended application form. The outcome of the SIP registration application will be provided to DFFE as soon as it becomes available.

WAY FORWARD

This DEIR is available for public review from **28 October 2026 to 30 November 2026.**

All issues and comments submitted to WSP during the scoping phase and original DEIR public periods have been incorporated into the SER (**Appendix E)**. The FEIR will be submitted to the DFFE, as the competent authority

If you have any further enquiries, please feel free to contact:

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