

# Scoping Archaeological Impact Assessment

**Proposed development of the Plan 8 Grahamstown Wind Energy Project: including Farms Gilead 361, Peynes Kraal 362 and Tower Hill 363, Grahamstown, Makana Municipality, Eastern Cape Province**

Prepared for

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## **Executive Summary**

*Because the above-named proposed development triggers the National Heritage Resources Act (Act 25 of 1999), Mr Hylton Newcomb of Coastal & Environmental Services - on behalf of Plan 8 (Pty) Limited - appointed the author to conduct a Scoping Archaeological Impact Assessment (SAIA). The SAIA focused on the areas affected by the provisional layout and placement of wind turbines. Wind turbine sites coincide with high lying areas on the farms Gilead 361, Peynes Kraal 362 and Tower Hill 363. The aim of the SAIA was to determine the archaeological sensitivity of the high lying parts of the affected properties. Results of the scoping study would also provide information regarding potential sites for the placement of wind turbines and associated services and facilities as well as the way forward regarding archaeological assessment and mitigation.*

*The high lying areas are relatively flat and consist of gently undulating hills that slope steeply toward small ravines and gorges. Overall, the area is very rocky and not suitable for cultivation. The higher lying areas are vegetated with grasses, bushes and shrubs while ravines and gorges include trees and thicket. Due to dense vegetation cover, archaeological visibility is generally poor. Nevertheless, sufficient ground surfaces were inspected to determine the overall archaeological sensitivity of the affected properties.*

*The main restriction to the archaeological investigation was poor visibility of ground surfaces and inaccessibility due to dense vegetation cover. Apart from two unmarked graves and an old horse/oxen drawn plough, no material culture or structural remains of historical significance were observed in the studied area. Two isolated artefacts of Stone Age origin were recorded and a cave with rock paintings occurs in one of the gorges. Because shales occur in the study area, the potential for the occurrence of fossils calls for palaeontological input. Additionally, the affected areas border on the N2 and therefore, visual impact must be considered.*

*Based on results from the current study it is recommended that;*

- Because of the overall lack in archaeological remains, it is suggested that – from an archaeological perspective - the proposed development may move beyond the scoping phase of assessment,*
- Surveyed areas (walk tracks) – with the exception of waypoints 1 and 34-35 – are suitable for the proposed activities,*
- Any areas outside the surveyed tracts might be archaeologically sensitive and therefore, placement of any activities outside the studied areas will require further archaeological investigation and assessment,*
- Once the final layout and placement of wind turbines and associated facilities and services are determined, an Archaeological Impact Assessment focusing on the affected areas should be undertaken,*
- Because shales occur in the study area the presence of fossils cannot be ruled out and therefore, a Palaeontological Impact Assessment (Desktop Study) should be conducted, and*
- The affected properties border on the N2 and therefore it is suggested that a Visual Impact Assessment may be necessary.*

*Note that;*

- *In the event that vegetation clearing and earthmoving activities expose archaeological materials, such activities must stop and the South African Heritage Resources Agency must be notified immediately.*
- *If archaeological materials are exposed during vegetation clearing and/or earth moving activities, then they must be dealt with in accordance with the National Heritage Resources Act (No. 25 of 1999) and at the expense of the developer.*
- *In the event of exposing human remains during construction, the matter will fall into the domain of the South African Heritage Resources Agency (Mrs. Colette Scheermeyer) and will require a professional archaeologist to undertake mitigation if needed.*

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# 1. Introduction

## 1.1 Background

Because the above-named proposed development triggers the National Heritage Resources Act (Act 25 of 1999), Mr Hylton Newcomb of Coastal & Environmental Services and on behalf of Plan 8 (Pty) Limited, appointed the author to conduct a Scoping Archaeological Impact Assessment (SAIA). The SAIA was conducted on 29 and 30 November 2011 and focused on the areas affected by the provisional layout and placement of wind turbines. Wind turbine sites coincide with high lying areas on the farms Gilead 361, Peynes Kraal 362 and Tower Hill 363, Grahamstown in the Makana municipality, Eastern Cape Province (Figures 1, 2 and 3). The aim of the SAIA was to determine the archaeological sensitivity of the high lying parts of the affected properties. Results of the scoping study would also provide information regarding potential sites for the placement of wind turbines and associated services and facilities as well as the way forward regarding the archaeological component of the broader Environmental Impact Assessment.

The proposed project will entail the construction and operation of up to 32 wind turbines each generating 2.5MW of power with a total generation capacity of 67.5MW. The proposed activity includes the installation of wind turbines and associated structures, services and facilities. The final specifications and scope of the activity will be determined by results from various specialist studies and when further wind data has been obtained from the existing wind mast. For further details contact Mr Hylton Newcombe (details on title page). A layout plan of the project is shown in Figure 2 and the main boundary of the study area is shown in Figure 3. Coordinate data for the provisional turbine localities are given in Table 1 (also see Figures 2 & 3).

**Table 1. Coordinate data for provisional turbine localities.**

Name	Description	Datum: WGS 84 Lat/Lon dec.degrees	Datum: WGS 84 SA National	Grid:
T1	turbine locality	S33.26570 E26.82321	27 Y0016472 X3682229	
T10	turbine locality	S33.26978 E26.83614	27 Y0015266 X3682680	
T11	turbine locality	S33.26257 E26.83655	27 Y0015266 X3682680	
T12	turbine locality	S33.26340 E26.84072	27 Y0015230 X3681881	
T13	turbine locality	S33.27550 E26.84192	27 Y0014727 X3683314	
T14	turbine locality	S33.26808 E26.84932	27 Y0014039 X3682490	
T15	turbine locality	S33.26835 E26.85320	27 Y0013677 X3682520	
T16	turbine locality	S33.28137 E26.84518	27 Y0014422 X3683964	
T17	turbine locality	S33.28101 E26.85399	27 Y0013602 X3683924	
T18	turbine locality	S33.27979 E26.85873	27 Y0013161 X3683787	
T19	turbine locality	S33.28916 E26.83585	27 Y0015290 X3684830	
T2	turbine locality	S33.26848 E26.82906	27 Y0015926 X3682537	
T20	turbine locality	S33.28690 E26.84219	27 Y0014700 X3684579	
T21	turbine locality	S33.29021 E26.84655	27 Y0014294 X3684945	
T22	turbine locality	S33.28998 E26.85632	27 Y0013383 X3684918	
T23	turbine locality	S33.29077 E26.86412	27 Y0012656 X3685005	
T24	turbine locality	S33.29319 E26.84325	27 Y0014600 X3685276	
T25	turbine locality	S33.29726 E26.86203	27 Y0012850 X3685725	
T26	turbine locality	S33.29566 E26.87112	27 Y0012004 X3685546	
T27	turbine locality	S33.29866 E26.87630	27 Y0011521 X3685878	
T3	turbine locality	S33.27560 E26.82921	27 Y0015911 X3683327	
T4	turbine locality	S33.28001 E26.81270	27 Y0017448 X3683819	
T5	turbine locality	S33.27952 E26.81828	27 Y0016929 X3683764	
T6	turbine locality	S33.27919 E26.82460	27 Y0016340 X3683726	
T7	turbine locality	S33.27880 E26.83236	27 Y0015617 X3683681	
T8	turbine locality	S33.28608 E26.82284	27 Y0016503 X3684490	
T9	turbine locality	S33.28639 E26.83226	27 Y0015625 X3684523	

Development activities will include earthmoving operations that could have a permanent negative impact on archaeological and tangible heritage related resources.

## **1.2. Purpose and Scope of the Study**

Objectives of the Scoping Archaeological Impact Assessment are:

- To assess an adequate portion of the study area for traces of archaeological and heritage related resources to determine the archaeological sensitivity of the proposed site;
- To identify options for archaeological mitigation and further assessment in order to minimize potential negative impacts;
- To make recommendations for archaeological mitigation where necessary and the way forward for the archaeological component of the EIA process; and
- To identify heritage resources and issues that may require further attention.

Terms of Reference (ToR):

- a) Locate boundaries and extent of the study area.
- b) Conduct a survey of a portion of the study area to identify and record archaeological and heritage related resources.
- c) Assess the impact of the proposed development on above-named resources.
- d) Recommend mitigation measures and additional assessment where necessary.
- e) Prepare and submit a report to the client that meets standards required by the South African Heritage Resources Agency in terms of the National Heritage Resources Act, No. 25 of 1999.

## **1.3 Study Area**

The study area is comprised of the farms Gilead 361, Peynes Kraal 362 and Tower Hill 363, Grahamstown (Figures 1, 2 and 3). Some 2500ha in extent, the site is situated approximately 30km east of Grahamstown and immediately north and south of the N2 (Figures 1 & 3). The study area was accessed by vehicle from the N2.

The high lying areas are relatively flat and consist of gently undulating hills that slope steeply toward small ravines and gorges. Overall, the area is very rocky and not suitable for cultivation. The higher lying areas are vegetated with grasses, bushes and shrubs while ravines and gorges include trees and thicket. Due to dense vegetation cover, archaeological visibility is generally poor. Nevertheless, sufficient ground surfaces were inspected to determine the overall archaeological sensitivity of the affected properties. Modern human activities in the studied area consist mostly of vehicle tracks, and two large clay quarries were noted. Evidence for burrowing by large and smaller mammals was also seen. Examples of the affected environment – vegetation, topography, exposed surfaces and so on - are shown in Plates 1 through 5.

## **1.4 Approach to the Study**

A review of earlier archaeological work conducted in the area is beyond the scope of this report, but see references given below. Grahamstown and its surroundings contain a rich and varied archaeological record from the Stone Age through the historic period. The Howiesons Poort Type site is situated in the Grahamstown area. Stone Age sites include caves and rock shelters, open air artefact scatters and rock paintings while the historic period is represented by numerous buildings with Provincial and National Heritage Site status.

On behalf of Plan 8 (Pty) Limited, Mr Hylton Newcombe of Coastal & Environmental Services provided a locality and layout map as well as coordinate data for provisional turbine sites (Figure 2 and Table 1). Mr Newcombe also provided contact details of the farm owners. Permission to access farms Gilead, Peynes Kraal and Tower Hill was obtained from Mr Gavin Dixon, Mr Wayne Nortier and Mr Morne Erwee respectively. Farm Gilead was first visited with Mr Dixon who indicated the farm boundaries as well as two unmarked graves. Mr Michael Nortier kindly showed me the boundaries of Peynes Kraal as well as a rock shelter with rock paintings. The study was then conducted independently and mostly on foot with small portions covered by vehicle. For the most part, archaeological visibility is poor.

The aim of the scoping study was to determine the archaeological sensitivity of the proposed areas for wind turbine placement and not to record all archaeological and tangible heritage related occurrences. To this end, the field work focused on high lying areas as well as the provisional turbine localities. Some turbine localities were not accessible due to impenetrable vegetation.

Survey tracks were fixed with a hand held Garmin Camo GPS to record the search area (Figure 3, gpx tracking file is available from the author). The position of identified archaeological occurrences and photo localities were fixed by GPS (Figure 3, Plates 1 through 8 and Table 2). Digital audio notes and a comprehensive, high quality digital photographic record were also made (full data set available from author). In this report, localities of archaeological occurrences and photograph localities are established by matching the numbers on photographs with those of waypoints in Figure 3 (also see Table 2). Directions of photographic views are indicated with compass bearing names like E is east; WSW is west south west, and so on. Bearing names on panoramic views indicate the bearing at the position of the label on the photograph.

## 2. Results

On 29 and 30 November 2011- in 2 days of survey - a distance of 38km was walked and 6km traversed by vehicle, covering an area of about 250ha of which an average of some 30% provided good archaeological visibility (Figure 3 and Plates 1 through 8).

Two unmarked graves are situated at **Waypoint 1** (Plate 6 [1], Figure 3 and Table 2). Because the substrate is very rocky, the graves are likely to be very shallow and this would also explain why the burials are covered with substantial stone piles. Both burials are west-east aligned and the ovals measure some 2m in length and about 80cm in width. According to Mr Dixon, they are the graves of two farm workers who lived nearby in wattle and daub structures which have since disintegrated. The burials are thought to be at least 80 years old.

### **Significance and Recommendation:**

Human burials are protected by law, are normally considered to be of significance and are archaeologically sensitive. As such, it is recommended that the burials not be disturbed and that a buffer zone of at least 15m in radius should be put in place in the form of a balustrade or suitable wooden palisade fencing.

An isolated Later Stone Age core/scrapper was identified at **Waypoint 5** (Plate 6[5], Figure 3 and Table 2). The stone artefact is in quartzite and one surface is retouched to produce a scrapper edge.

**Significance and Recommendation:** Because this specimen occurs in isolation and is in secondary context, it is of no scientific value and is considered to be of no archaeological significance. No further mitigation measures are necessary.

An isolated Stone Age flake of indeterminate age was recorded at **Waypoint 8** (Plate 7[8], Figure 3 and Table 2). The specimen is in quartzite and is not retouched.

**Significance and Recommendation:** Because this specimen occurs in isolation and is in secondary context, it is of no scientific value and is considered to be of no archaeological significance. No further mitigation measures are necessary.

An old and rusted horse/oxen drawn plough is located at **Waypoint 13** (Plate 7[13], Figure 3 and Table 2).

**Significance and Recommendation:** Examples of this type of plough are relatively common on South African farms and the implement is of no particular historic value. Nevertheless, it forms part of the history of agricultural implements and machinery used in South Africa. Since the implement is in close proximity to the unmarked graves at waypoint 1, it is suggested that it be included in the buffer zone that will protect the graves.

**Waypoints 34 and 35** represent the location of a cave with rock paintings (Plate 8, Figure 3 and Table 2). The site is situated in a gorge and is not readily visible until one is relatively close to it. Without the guidance of Michael Nortier, the site would not have been found since the focus of the study was on the higher lying ground. Within the drip-line the cave is approximately 8 meters in length and about a maximum of 5 meters deep. The most common paintings are hand prints in red ochre. Most paintings are in red or orange ochre and no polychromes were identified. However, the presence of "hook heads" suggests that human faces were probably painted in lighter colours which have since faded. A few depictions of antelope and thereanthropes were also seen.

**Significance and Recommendation:** The rock art site is considered to be of high significance, but it will not be directly impacted by the proposed activity because it is situated in a gorge and because wind turbine sites occur on high lying areas. It may be best not to draw any attention to the site because it is not readily visible and therefore it is not easily stumbled upon. No mitigation measures are necessary.

Shales were seen in several locations including **Waypoints 29 and 31** (Plate 5[29&31], Figure 3 and Table 2). The presence of sedimentary geological deposits suggests that fossiliferous sediments may occur in the study area.

**Significance and Recommendation:** If the shales proved to be fossil bearing, then these occurrences will be of high significance. It is recommended that a Palaeontological Impact Assessment (Desktop Study) be conducted to establish whether or not the shales in the study area are potentially fossil bearing.

Because the affected properties lie immediately north and south of the N2 (scenic route) it is recommended that a Visual Impact Assessment be undertaken.

**Table 2. Coordinate and descriptive data for photo localities and archaeological occurrences (see Figure 3 and Plates 1 through 8).**

Name	Description img=image snd=sound	Datum: WGS 84 Lat/Lon dec.degrees	Datum: WGS 84 SA National	Grid:	meters above sea level
1	unmarked graves img4178-82 snd4812	S33.27430 E26.82743	27 Y0016078 X3683183		521 m
2	img4183-6 snd4186 panorama NW-NE	S33.27311 E26.82898	27 Y0015933 X3683051		497 m
3	img4187-90 snd4190 panorama W-N & veg	S33.26912 E26.82989	27 Y0015849 X3682608		500 m
4	img4191-4 snd4194 panorama N-E	S33.26520 E26.82300	27 Y0016492 X3682175		489 m
5	isolated LSA artefact img4195-4201 snd4201	S33.26554 E26.82401	27 Y0016397 X3682212		494 m
6	exposures img4202 snd4202	S33.26832 E26.83053	27 Y0015790 X3682520		509 m
7	exposures img4203-4 snd4204	S33.26671 E26.82685	27 Y0016133 X3682342		502 m
8	isolated flake age indet. img4205-8 snd4208	S33.26845 E26.82930	27 Y0015904 X3682534		516 m
9	img4209-10 snd4210 W	S33.26979 E26.83665	27 Y0015219 X3682682		491 m
10	img4211-5 snd4215 panorama NE-SW	S33.27003 E26.83742	27 Y0015147 X3682708		489 m
11	exposures img4216-7 snd4217	S33.27524 E26.82942	27 Y0015892 X3683287		525 m
12	img4218-23 snd4223 panorama S-N old kraals & dip	S33.27527 E26.82851	27 Y0015977 X3683290		525 m
13	old horse/oxen drawn plough img4224-6 snd4226	S33.27514 E26.82801	27 Y0016023 X3683276		526 m
14	exposures SW img4227-8 snd4228	S33.27785 E26.82674	27 Y0016141 X3683576		525 m
15	exposures E 4229-30 snd4230	S33.27900 E26.82301	27 Y0016488 X3683704		510 m
16	img4231-5 snd4235 panorama SSE-NW T8	S33.28427 E26.82418	27 Y0016378 X3684289		510 m
17	img4237-7 snd4327 veg cover & rocky	S33.28446 E26.82524	27 Y0016279 X3684310		516 m
18	img4238-9 snd4239 T8	S33.28636 E26.83233	27 Y0015618 X3684520		503 m
19	img4240 snd4240 veg & rocky - T19	S33.28866 E26.83533	27 Y0015339 X3684775		509 m
20	img4241-3 snd4243 veg cover - T20	S33.28669 E26.84171	27 Y0014745 X3684555		527 m
21	img4244-7 snd4247 panorama NW-NE - T5	S33.28109 E26.81821	27 Y0016935 X3683937		489 m
22	img4248-9 snd4249 veg cover - T4	S33.27994 E26.81308	27 Y0017413 X3683811		489 m
23	rocky exposure img4250 snd4250	S33.28291 E26.84692	27 Y0014260 X3684136		555 m
24	img4251-2 snd4252 E veg cover	S33.28059 E26.85210	27 Y0013778 X3683877		549 m
25	img4253-4 snd4254 ENE - T18	S33.28029 E26.85624	27 Y0013392 X3683843		539 m
26	img4255-9 snd4259 panorama NE-SW - T18	S33.27975 E26.85872	27 Y0013161 X3683784		513 m
27	exposure img4260-2 snd4262	S33.26874 E26.85317	27 Y0013680 X3682563		488 m
28	img4263-8 snd4268 panorama S-N	S33.26802 E26.84990	27 Y0013985 X3682484		499 m
29	shale outcrop exposure img4269-71 snd4271	S33.27281 E26.85280	27 Y0013714 X3683014		473 m
30	veg cover - panorama N-E img4272-6 snd4276	S33.26519 E26.84081	27 Y0014832 X3682171		351 m
31	shale outcrop img4277-9 snd4279	S33.26274 E26.84416	27 Y0014520 X3681899		330 m
32	img4280-4 snd4284 low point in gorge	S33.26335 E26.84043	27 Y0014868 X3681967		312 m
33	img4284-9 snd4289 low part of gorge - vegetation	S33.26247 E26.83647	27 Y0015237 X3681869		308 m
34	approximate locality of rock shelter with paintings img4290-4310 snd4310	S33.26506 E26.83960	27 Y0014945 X3682156		316 m
35	approximate locality of rock shelter with paintings img4290-4310 snd4310	S33.26596 E26.84020	27 Y0014889 X3682257		334 m
36	img4311-4 snd4314 low lying area S of T13	S33.27644 E26.84176	27 Y0014742 X3683419		498 m
37	veg cover img4317 snd4317	S33.28856 E26.85964	27 Y0013074 X3684760		551 m
38	img4318-22 snd4322 panorama E-W - T23 veg cover - stony	S33.29078 E26.86403	27 Y0012665 X3685006		539 m
39	veg cover - high ground - T26 img4323-4 snd4324	S33.29570 E26.87109	27 Y0012007 X3685550		475 m
40	veg cover - T27 img4325-6 snd4326	S33.29797 E26.87511	27 Y0011632 X3685802		452 m
41	veg cover - high ground - T27 panorama S-NW img4327-32 snd4332	S33.29870 E26.87646	27 Y0011506 X3685883		457 m
42	veg cover - W - T25 img4333 snd4333	S33.29674 E26.86664	27 Y0012421 X3685666		460 m
43	veg cover - W - 10m E of T25 img4334-5 snd4335	S33.29723 E26.86221	27 Y0012834 X3685722		462 m
44	50m E of T21 - low lying area img4336-41 snd4341	S33.29048 E26.84679	27 Y0014271 X3684974		489 m
45	img4342-3 snd4342 somewhat lower lying ground - T25	S33.29311 E26.84327	27 Y0014598 X3685266		478 m

### 3. Sources of Risk, Impact Identification and Assessment

The proposed development will involve considerable earthmoving activities for the construction and installation of wind turbines and associated services and facilities. These

activities can have a permanent negative impact on archaeological resources in the study area. The SAIA showed that overall, and with a few exceptions, the studied area is not archaeologically sensitive.

To minimize and/or avoid negative impacts, recommendations for mitigation and further assessment are made below. Provided that recommendations and mitigation measures - as approved by the South African Heritage Resources Agency - are implemented, there are no objections to the authorization of the proposed development. Table 3 summarizes the potential impact of the proposed development on archaeological resources with and without mitigation.

**Table 3. Significance Statement: Potential impact on and loss of archaeological resources with and without mitigation.**

RATING		Temporal Scale		Spatial Scale		Severity of Impact		Risk or Likelihood		Total
	Without Mitigation	permanent	4	regional	3	unknown		probable	3	10
With Mitigation	permanent	4	localized	1	slight	1	unlikely	1	7	
<b>Overall Significance without mitigation</b>									<b>MODERATE</b>	
<b>Overall Significance with mitigation</b>									<b>LOW</b>	

#### 4. Recommended and Required Mitigation Measures

Based on results from the current study it is recommended that;

- Because of the overall lack in archaeological remains, it is suggested that – from an archaeological perspective - the proposed development may move beyond the scoping phase of assessment,
- Surveyed areas (walk tracks) – with the exception of waypoints 1 and 34-35 – are suitable for the proposed activities,
- Any areas outside the surveyed tracts might be archaeologically sensitive and therefore, placement of any activities outside the studied areas will require further archaeological investigation and assessment,
- Once the final layout and placement of wind turbines and associated facilities and services are determined, an Archaeological Impact Assessment focusing on the affected areas should be undertaken,
- Because shales occur in the study area the presence of fossils cannot be ruled out and therefore, a Palaeontological Impact Assessment (Desktop Study) should be conducted, and
- The affected properties border on the N2 and therefore it is suggested that a Visual Impact Assessment may be necessary.

It is required that;

- In the event that vegetation clearing and earthmoving activities expose archaeological materials, such activities must stop and the South African Heritage Resources Agency must be notified immediately.

- If archaeological materials are exposed during vegetation clearing and/or earth moving activities, then they must be dealt with in accordance with the National Heritage Resources Act (No. 25 of 1999) and at the expense of the developer.
- In the event of exposing human remains during construction, the matter will fall into the domain of the South African Heritage Resources Agency (Mrs. Colette Scheermeyer) and will require a professional archaeologist to undertake mitigation if needed.

## References

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## Figures and Plates (on following pages)

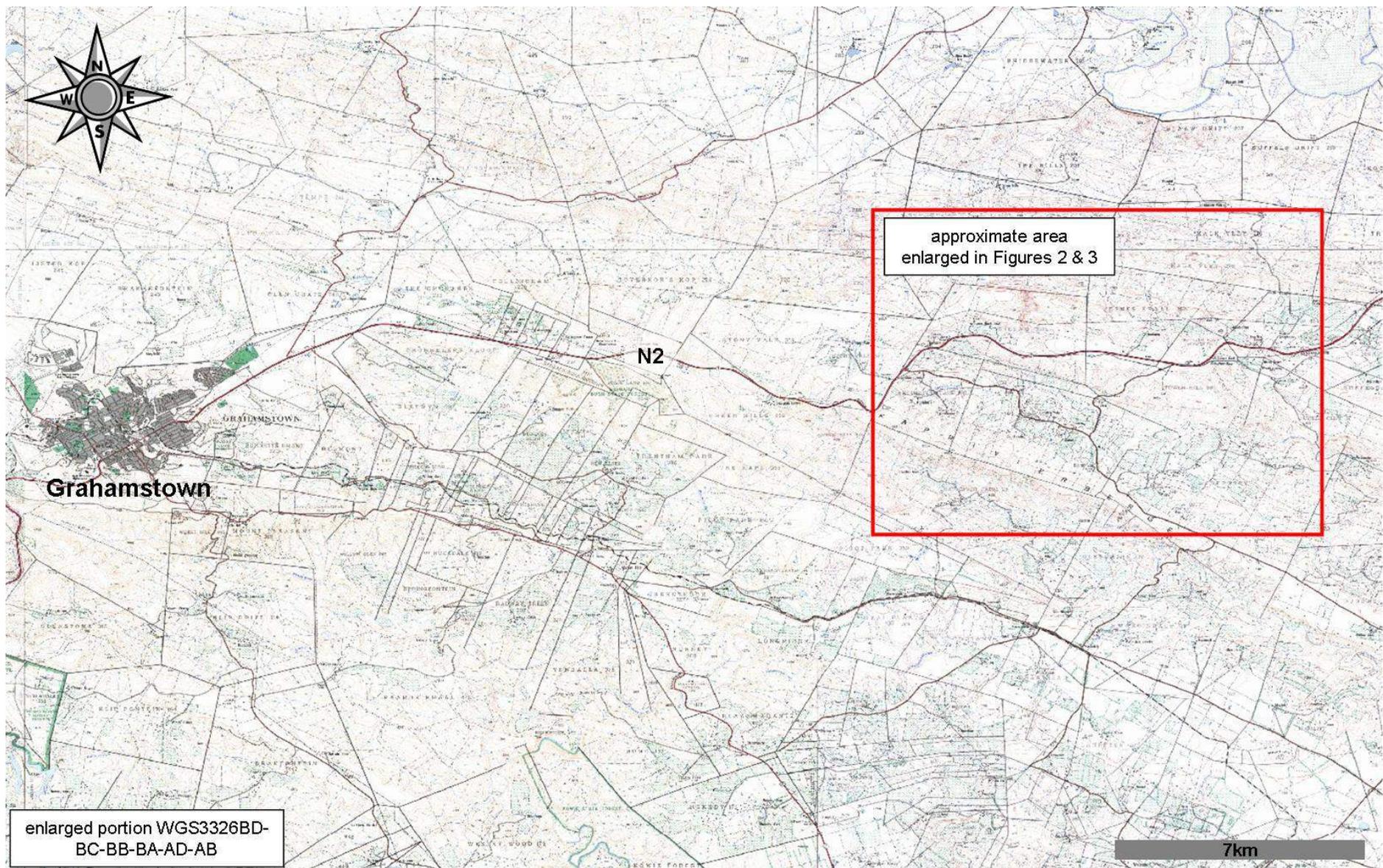


Figure 1. Location of the study area relative to Grahamstown, Makana Municipality, Eastern Cape Province. (Map courtesy of The Chief Directorate, Surveys & Mapping, Mowbray).

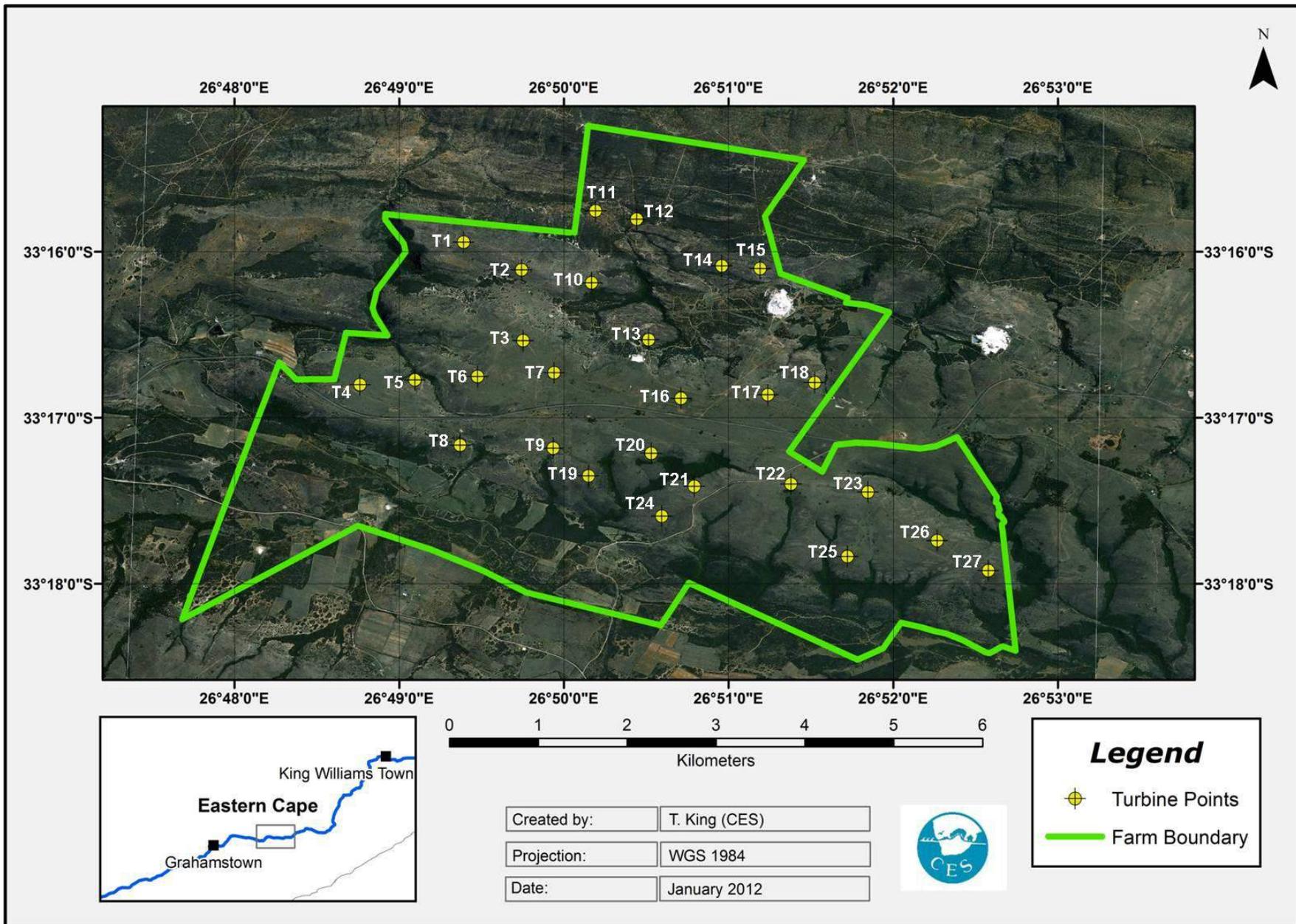


Figure 2. Layout plan for the proposed development of the Plan 8 Grahamstown Wind Energy Project (courtesy of the client).

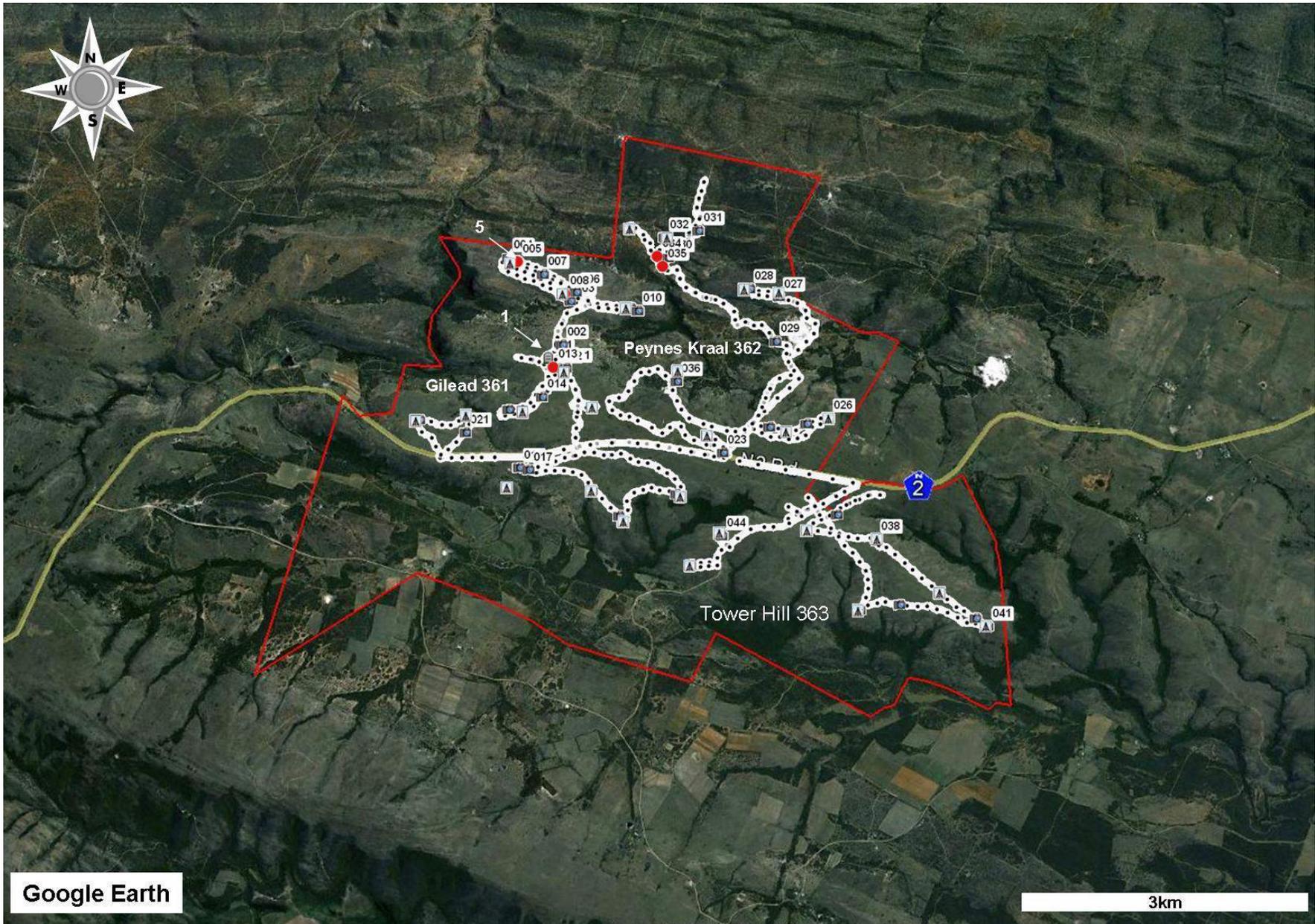


Figure 3. Enlarged area indicated in Figure 1 with walk tracks (white), waypoints (red dots) and photo localities (camera icons).

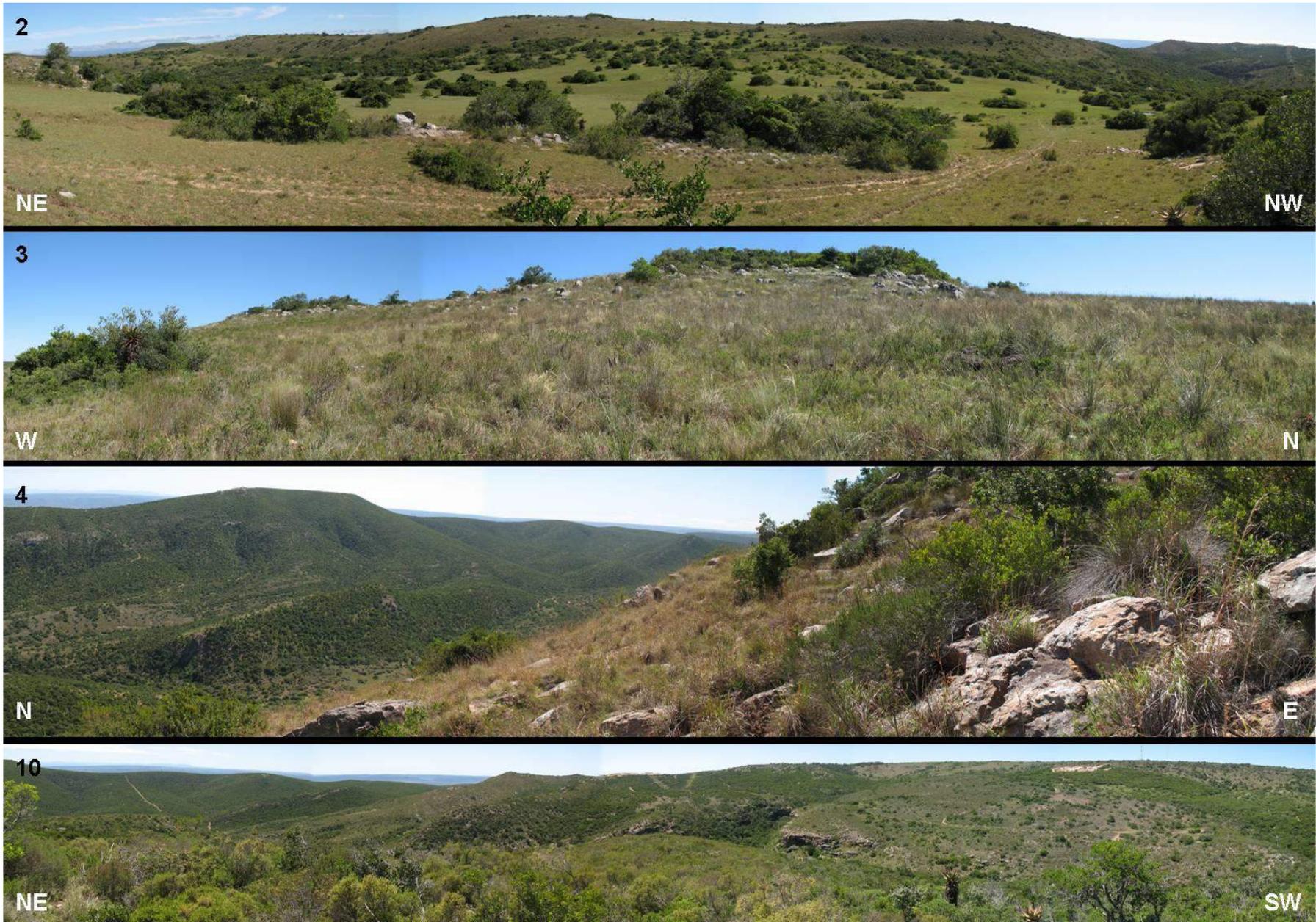


Plate 1. Examples of the surrounding environment, exposures, topography and vegetation cover (see Figure 3 and Table 2).



Plate 2. Examples of the surrounding environment, exposures, topography and vegetation cover (see Figure 3 and Table 2).



Plate 3. Examples of the surrounding environment, exposures, topography and vegetation cover (see Figure 3 and Table 2).



Plate 4 Examples of the surrounding environment, exposures, topography and vegetation cover (see Figure 3 and Table 2).

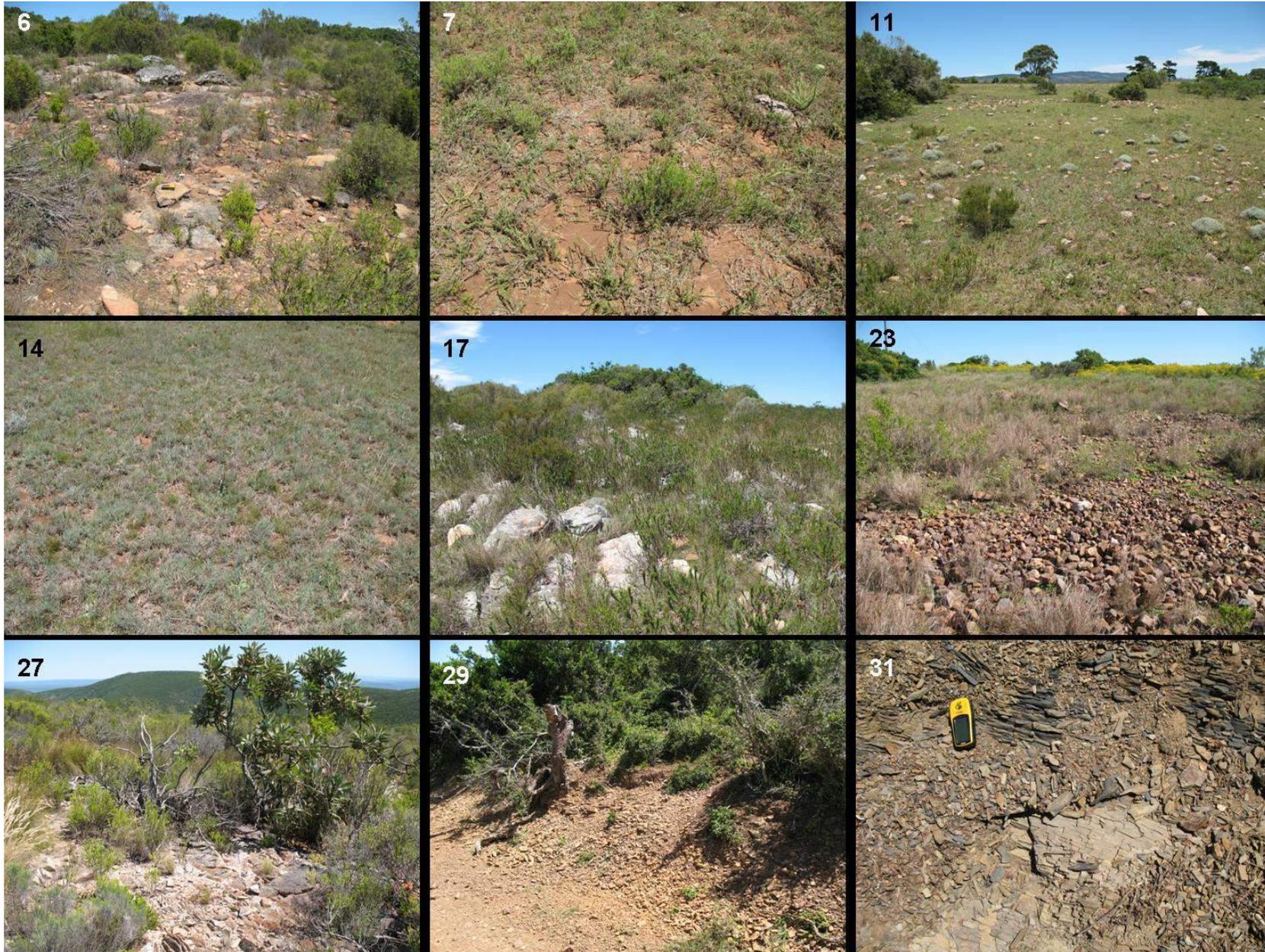


Plate 5 Examples of exposed surfaces and shale outcrops at waypoints 29 & 31 (see Figure 3 and Table 2).



Plate 6 Examples of contexts and archaeological finds. Top images are of two unmarked graves and bottom images are of a Later Stone Age core/scrapper (see Figure 3 and Table 2).



Plate 7 Examples of contexts and archaeological finds. Top images are of an unretouched flake of indeterminate age (see Figure 3 and Table 2).



Plate8 Rock shelter with paintings including hand prints, hunter with “hook head”, antelope and thereanthropic depictions (see Figure 3 and Table 2).