Phase 1 Heritage Impact Assessment of a proposed new Landfill Site in Luckhof, Free State Province.

Report prepared by

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Summary

A phase 1 Heritage Impact Assessment was carried out for a proposed new landfill site to be developed in Luckhof, Free State Province. Three possible sites were identified. Site Alternative 1 is underlain by palaeontologically insignificant dolerite, buffered by aeolian sand and calcareous soil veneer not considered to be palaeontologically sensitive. As far as the palaeontological heritage is concerned development of the site can proceed provided that all landfill activities are restricted to within the boundaries of the development footprint. However, a large concentration of lithic remains, of what appears to the result of a stone tool knapping site, is widely distributed over the area. Therefore, as far as the archaeological heritage is concerned it is advised that Site Alternative 1 is assigned a site rating of Local Significance (LS) with the recommendation that development of a landfill site can proceed provided that its eastern boundary is shifted 70 m due west from its current position in order to avoid the stone tool knapping site; that the stone tool knapping site identified during the survey is avoided and that a representational area of the site covering at least 2500 m^2 is protected by a durable and clearly visible fence; that the fence is to be erected at the cost of the developer, before the start of the of the development and under supervision of a qualified heritage specialist, accompanied by appropriate information displays; and that as part of a Phase 2 Archaeological Impact Assessment all diagnostic, residual surface stone tool artifacts, located immediately outside the knapping site's western and southern perimeter are mapped, recorded and relocated to the latter area. Given the depth of the superficial overburden, which is not considered to be palaeontologically sensitive, it is recommended that the planned development can proceed at either Site Alternatives 2 & 3 provided that all landfill activities are restricted to within the boundaries of the development footprints. As far as the archaeological heritage is concerned it is advised that Site Alternative 2 & 3 are assigned a site rating of Generally Protected C (GP.C) with the recommendation that development of a landfill site can proceed at either of these sites provided that all landfill activities are restricted to within the boundaries of the development footprints.

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Introduction

A phase 1 Heritage Impact Assessment was carried out for a proposed new landfill site to be developed in Luckhof, Free State Province (**Fig. 1 & 2**). The assessment is required as a prerequisite for new development in terms of the National Environmental Management Act and is also called for in terms of the National Heritage Resources Act (NHRA) 25 of 1999. The region's unique and non-renewable archaeological heritage sites are 'Generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority. As many such heritage sites are threatened daily by development, both the environmental and heritage legislation require impact assessment reports that identify all heritage resources in the area to be developed, and that make recommendations for protection or mitigation of the impact of such sites.

The NHRA identifies what is defined as a heritage resource, the criteria for establishing its significance and lists specific activities for which a heritage specialist study may be required. In this regard, categories relevant to the proposed development are listed in Section 34 (1), Section 35 (4), Section 36 (3) and Section 38 (1) of the NHR Act and are as follows:

34. (1) No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.

35 (4) No person may, without a permit issued by the responsible heritage resources authority—

- destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
- *b)* destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

36 (3) No person may, without a permit issued by SAHRA or a provincial heritage resources authority—

- (a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

- (b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
- (c) bring onto or use at a burial ground or grave referred to in paragraph *(a)* or *(b)* any excavation equipment, or any equipment which assists in the detection or recovery of metals.

38 (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as—

- The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- The construction of a bridge or similar structure exceeding 50m in length;
- Any development or other activity which will change the character of the site

a) exceeding 5000 m² in extent; or

b) involving three or more existing erven or subdivisions thereof; or

c) involving three or more subdivisions thereof which have been consolidated within the past five years;

- The rezoning of a site exceeding 10 000 m²; or
- Any other category of development provided for in regulations by the South African Heritage Resources Agency (SAHRA).

Terms of Reference

The task involved the following:

- Identify and map possible heritage sites and occurrences using available resources.
- Determine and assess the potential impacts of the proposed development on potential heritage resources;
- Recommend mitigation measures to minimize potential impacts associated with the proposed development.

Methodology

The heritage significance of the affected area was evaluated on the basis of existing field data, database information and published literature. This was followed by a field assessment by means of a pedestrian survey. A Garmin Etrex Vista GPS hand model

(set to the WGS 84 map datum) and a digital camera were used for recording purposes. Maps and aerial photographs (incl. Google Earth) were consulted and integrated with data acquired during the on-site inspection.

Field Rating

Site significance classification standards prescribed by SAHRA (2005) were used to indicate overall significance and mitigation procedures where relevant (**Table 1**).

Locality Data

Three possible sites were identified for the proposed development. Site Alternative1 covers approximately 17 ha of uneven terrain located next to the Luckhof substation about 1.2 km east of the town's CBD **(Fig. 3 & 4**). Site Alternatives 2 & 3 each covers about 2 ha of vegetated terrain located next to a large dry spruit on the western outskirts of Luckhof (**Fig. 3, 5 & 6**).

Map Reference:

1:50 000 topographical map 2924DB Luckhof North and 2924DD Luckhof South

1:250 000 geological map 2924 Koffiefontein

Site Centriod Coordinates:

Site 1: 29°44'58.50"S 24°47'57.42"E

Site 2: 29°45'3.08"S 24°46'36.98"E

Site 3: 29°45'9.42"S 24°46'39.78"E

Geology

Luckhof is for the most part underlain by resistant Jurassic dolerite intrusions (*Jd*), that has intruded argillaceous rocks of the Permian Tierberg Formation (*Pt*) capped by geologically recent aeolian sand (Qs) and alluvium (flying bird symbol) (**Fig. 7**). The doleritic dykes and sills (*Jd***)** determine the relief in the region while the Tierberg formation represents the uppermost unit of the Ecca Group (Karoo Supergroup) and primarily comprises well-laminated, dark shales with abundant carbonate concretions, inter-bedded by siltstones and fine-grained sandstones (Zawada 1992).

Background

Palaeontology

Fossils from the Tierberg Formation are poorly represented and occur mainly as sparsely distributed and generally not diverse assemblages of trace fossils (Anderson 1976; De Beer *et al*. 2002; Viljoen 2005; Johnson *et al.* 2006). These ichno-

assemblages include arthropod trackways and associated resting impressions, fish swimming trails, horizontal epichnial furrows often attributed to gastropods, as well as a variety of different kinds of small burrows. Impressions of *Gondwanidium validum* and pieces of *Dadoxylon* have been discovered between Douglas and Belmont, south of Kimberley (McLaren 1976). Sponge spicules, fish scales and disarticulated microvertebrate remains from calcareous concretions have also been recorded (Zawada 1992, Bosch 1993).

Dolerite, in the form of dykes and sills, is common throughout the region. Regarded as feeders of Drakensberg lavas, dolerites are not palaeontologically significant and can be excluded from further consideration in the present evaluation.

Overbank deposits and alluvial terraces along the Riet River near Koffiefontein have previously yielded numerous Quaternary vertebrate fossil remains, including the remains of extinct bovids such as *Pelorovis antiquus*, *Megalotragus priscus* and *Antidorcas bondi* (Rossouw 2000). Large mammal fossil localities near Koffiefontein have been recorded along the Riet River on the farms Middelfontein Uitdraai, Good Hope Poortjie and Wagenmakersdrift (Rossouw 2000).

Archaeology

The archaeological footprint in and around Luckhof is primarily represented by Early, Middle and Later Stone Age open sites and surface occurrences and rock engravings (Goodwin and Van Riet Lowe 1929, 1931; Van Riet Lowe 1941).

Stone Age archaeological sites in the region are generally associated with river courses and areas where dolerite outcrop occur especially in the vicinity of Goemansberg and Joostenberg (L Rossouw pers. obs.). Dolerite outcrop can be regarded as archaeologically significant since Stone Age artifacts in the region are mostly made of hornfels, a fine-grained isotropic rock found in the hot-contact zone between the dolerites and shales in the area. As a result, stone tool knapping sites are commonly found near dolerite-shale contact zones. In addition, rock engravings on dolerite are fairly common in the region, with recordings made on several farm between Koffiefontein and Luckhof.

Field assessment

Site Alternative 1

The site is underlain by resistant dolerite bedrock, buffered by aeolian sand and a calcareous soil veneer (**Fig. 8)**. There is no evidence for the accumulation and

preservation of intact fossil material within the Quaternary sediments (topsoils) and the likelihood of finding fossil vertebrate fauna within the geologically recent superficial deposits at the site are considered very low.

A foot survey revealed no evidence of prehistoric settlement structures, rock engravings, graves or historically significant buildings older than 60 years within the boundary of the study area. However, the lithic remains of an early Middle Stone Age stone tool knapping site are widely distributed as a surface scatter lag deposit on the landscape (**Fig. 9 - 11**).

Coordinates - stone tool knapping site (see **Fig. 9**):

1) 29°44'49.67"S 24°48'7.30"E
2) 29°44'51.05"S 24°48'5.80"E
3) 29°44'53.34"S 24°48'4.79"E
4) 29°44'54.47"S 24°48'7.08"E
5) 29°44'52.77"S 24°48'9.03"E
6) 29°44'52.74"S 24°48'11.29"E

Site Alternative 2 & 3

The sites are located on low relief terrain with low outcrop visibility (Tierberg Formation) due to a well-developed Quaternary overburden. Both sites are underlain by well-developed superficial alluvial sediments where no signs for the accumulation and preservation of intact Quaternary fossil material were observed (**Fig. 12**).

A foot survey revealed no evidence of *in situ* Stone Age archaeological material, capped or distributed as surface scatters on the landscape, prehistoric settlement structures, rock engravings, graves or historically significant buildings older than 60 years within the boundary of the study area.

Impact Statement & Recommendation

Site Alternative 1

The site is underlain by palaeontologically insignificant dolerite (*Jd*), buffered by aeolian sand and calcareous soil veneer not considered to be palaeontologically sensitive. As far as the palaeontological heritage is concerned development of the site can proceed provided that all landfill activities are restricted to within the boundaries of the development footprint.

However, a large concentration of lithic remains, of what appears to the result of a stone tool knapping site, is widely distributed over the area. Therefore, as far as the

archaeological heritage is concerned it is advised that Site Alternative 1 is assigned a site rating of Local Significance (LS) (**Table 1**) with the recommendation that development of a landfill site can proceed provided that:

- its eastern boundary is shifted 70 m due west from its current position in order to avoid the stone tool knapping site (**Fig. 9**);
- the stone tool knapping site identified during the survey is avoided and that a representational area of the site, covering at least 2500 m^2, is protected by a durable and clearly visible fence;
- the fence is to be erected at the cost of the developer, before the start of the of the development and under supervision of a qualified heritage specialist, accompanied by appropriate information displays;
- as part of a Phase 2 Archaeological Impact Assessment all diagnostic, residual surface stone tool artifacts, located immediately outside the knapping site's western and southern perimeter are mapped, recorded and relocated to the latter area.

Site Alternative 2 & 3

Given the depth of the superficial overburden, which is not considered to be palaeontologically sensitive, it is recommended that the planned development can proceed at either of these sites provided that all landfill activities are restricted to within the boundaries of the development footprints.

As far as the archaeological heritage is concerned it is advised that Site Alternative 2 & 3 are assigned a site rating of Generally Protected C (GP.C) with the recommendation that development of a landfill site can proceed at either of these sites provided that all landfill activities are restricted to within the boundaries of the development footprints.

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DECLARATION OF INDEPENDENCE

I, Lloyd Rossouw, declare that I act as an independent specialist consultant. I do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work as stipulated in the terms of reference. I have no interest in secondary or downstream developments as a result of the authorization of this project and have no conflicting interests in the undertaking of the activity.

10 / 07/ 2018

Tables & Figures

Table 1. Field rating categories as prescribed by SAHRA.

Field Rating	**Grade**	**Significance**	**Mitigation**
National Significance (NS)	Grade 1	-	Conservation; national site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; provincial site nomination
Local Significance (LS)	Grade 3A	High significance	Conservation; mitigation not advised
Local Significance (LS)	Grade 3B	High significance	Mitigation (part of site should be retained)
Generally Protected A (GP.A)	-	High/medium significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium significance	Recording before destruction
Generally Protected C (GP.C)	-	Low significance	Destruction

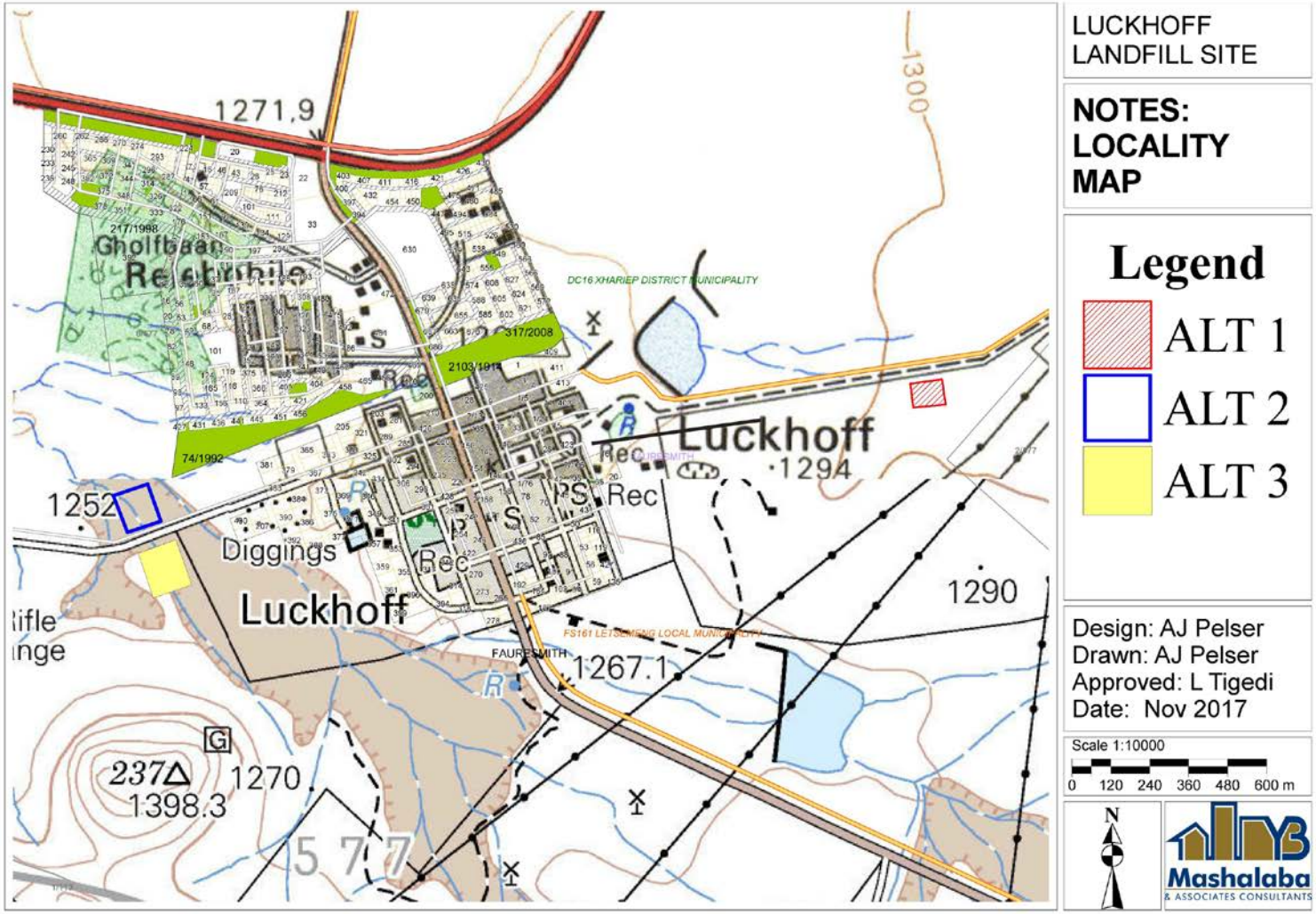

Figure 1. Map of the proposed landfill sites (portion of 1:50 000 scale topographic 2924DB Luckhof North and 2924DD Luckhof South.)

Figure 2. Aerial view of the study areas.

Figure 3. Aerial view of Site Alternative 1 (top) and Site Alternatives 2 & 3 (below).

Figure 4. General view of Site Alternative 1, looking south.

Figure 5. General view of Site Alternative 2, looking north (top) and Site Alternative 3, looking southwest (below).

Figure 6. General view of the spruit, looking south (top) and north (below).

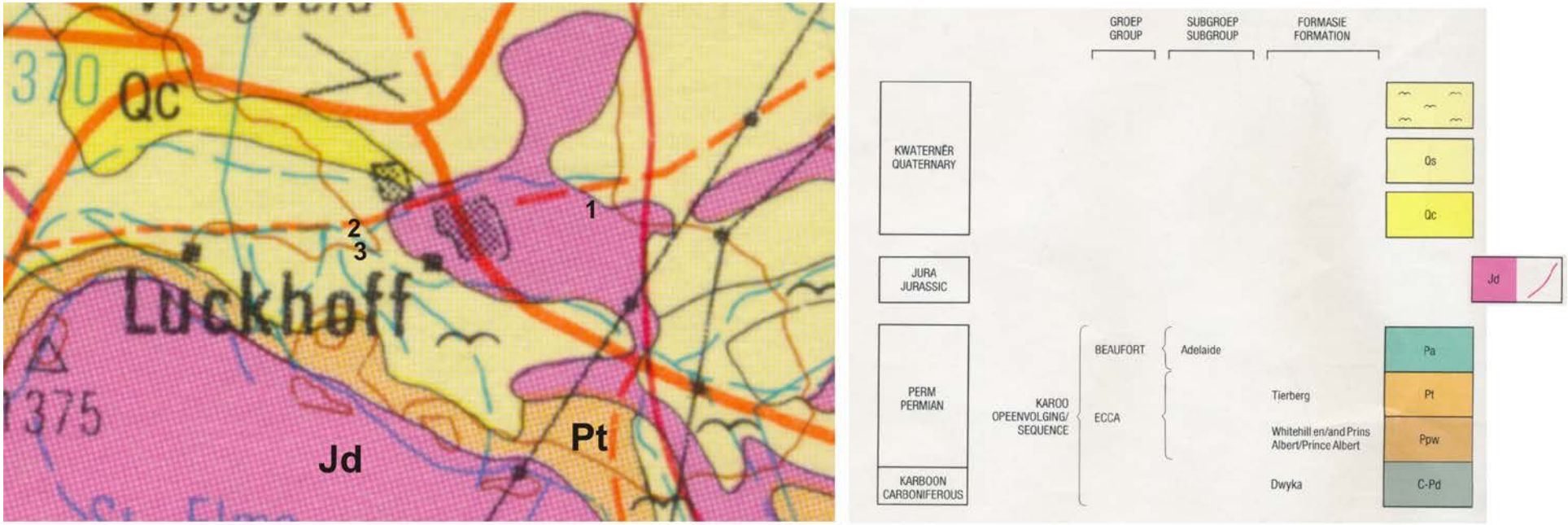

Figure 7. Portion of 1:250 000 scale geological map 2924 Koffiefontein showing underlying geology and site positions (numbered 1 - 3).

Figure 8 Dolerite outcrop at Site Alternative 1.
Scale 1 = 10 cm.

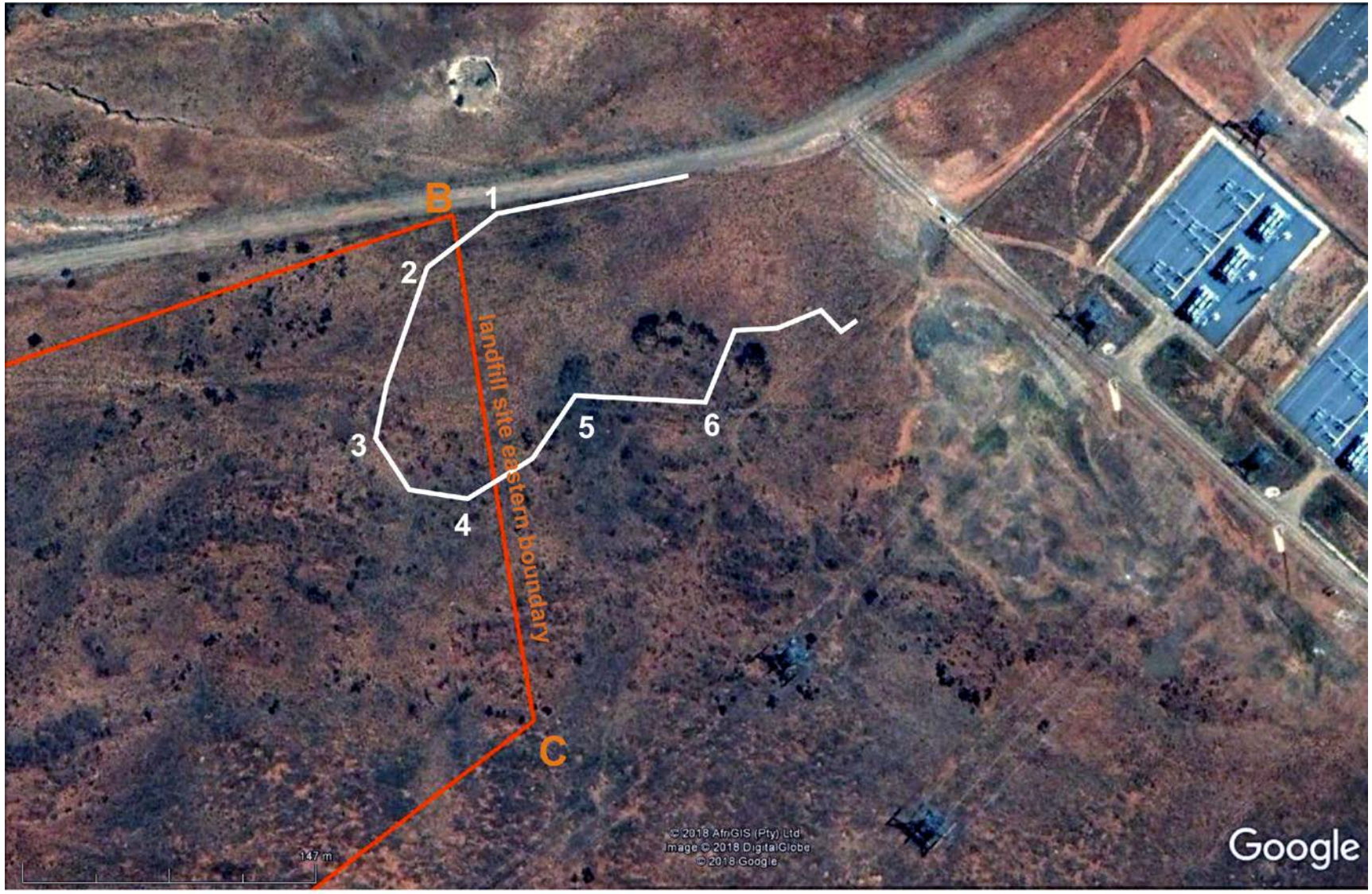

Figure 9. Approximate western and southern boundary of highest stone tool concentration recorded during survey (white line).

Figure 10. High density stone tool scatters at Site Alternative 1, looking north,

Figure 11. Stone tool concentrations at Site Alternative 1.

Figure 12. Geologically recent overbank sediments at Site Alternatives 2 & 3.