

**ARCHAEOLOGICAL IMPACT ASSESSMENT: PROPOSED
CONSTRUCTION OF THE HOTAZEL SOLAR FACILITY (100 MW) ON
REMAINDER FARM YORK A 279 AND 132 kV GRID CONNECTION ON
REMAINDER OF FARM HOTAZEL 280 AND PORTION 11 OF FARM
YORK A 279, JOHN TAOLO GAETSEWE DISTRICT MUNICIPALITY,
NORTHERN CAPE**

(Assessment conducted under Section 38 (8) of the
National Heritage Resources Act No 25 of 1999)

SAHRA CaseID:

Prepared for:
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EXECUTIVE SUMMARY

Lita Webley was appointed by Cape EAPrac Environmental Assessment Practitioners on behalf of ABO Wind Hotazel PV (Pty) Ltd to undertake an archaeological impact assessment (Phase 1 AIA) for the construction of the Hotazel Solar facility (100MW PV), and associated powerline, on the Remaining Extent of the farm York A 279, Portion 11 of the Farm York A 279 and the Remainder of the Farm Hotazel 280, situated 3km south of the town of Hotazel, in the John Taolo Gaetsewe District Municipality, Northern Cape.

The two alternative layout options for the Hotazel Solar and associated powerline were surveyed by Lita Webley and Madelon Tusenius on 22-25 October. The property was accessed from the R31 and transects were walked across the study area. Sections of the proposed powerline, through Portion 11 of York A 279 which belong to Kudumane Mineral Resources, were surveyed from a vehicle. There were no significant limitations to the study. It is assumed that the 1km section of powerline through Farm Hotazel 280, which has already been surveyed by Orton (2017) has been adequately assessed.

The desktop Scoping assessment by Nilssen (2017) suggested that archaeological resources were very scarce in the surrounding landscape and of very low cultural significance.

Solar Facility

Two alternative layout options were assessed, Alternative 1 (eastern option) and Alternative 2 (western option). Alternative 2 is the preferred option.

The field assessment identified:

- Only a handful of banded ironstone artefacts, which appear to be in secondary context as they were likely introduced to the property together with the deposits of the Banded Ironstone Formation (BIF) which underlie the R31 and the railway line.
- The farmhouse of York was originally a shop which has been substantially transformed. The worker's cottage dates to within the last 10 years. Both are located outside of the proposed development area. They will not be impacted.
- No graves were identified in the study area and the owner confirmed that there were no graves on the farm. Although unmarked graves may occur, the likelihood of them occurring is considered to be very low.

Either layout (Alternative 1 or Alternative 2) is acceptable.

Powerlines and Substation

Two options for the location of the on-site sub-station were assessed, Alternative A and Alternative B, with the latter the preferred option. No archaeological resources were identified on either substation location. Similarly, no archaeological resources were identified along the powerline route between the proposed solar facility on York A 279 and the Hotazel substation.

Recommendations

Indications are that in terms of archaeological heritage, impacts to either layout Alternative 1 or Alternative 2 expected to be negligible. The study area is considered to be of very low heritage significance. It is recommended that the project be authorised with the following conditions included in the EMPr:

- If during ground clearance or construction, any archaeological material or human graves are uncovered, work in that area should be stopped immediately and the ECO should report this to SAHRA (Tel: 021 462 4502). The heritage resource may require inspection by the heritage authorities and it may require further mitigation in the form of excavation and curation in an approved institution.

SPECIALIST DECLARATION

I, Lita Webley, as the independent specialist for this application declare that I –

- act as an independent specialist (archaeologist) in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct;
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 (specifically in terms of regulation 13 of GN No.R. 982) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- am aware that a false declaration is an offense in terms of regulation 48 of GN No. R. 982.



Signature of the specialist

Name of company: Dr Lita Webley
Professional Archaeologist and Specialist Heritage Practitioner

Date: 29 October 2018

GLOSSARY

Archaeology: Remains resulting from human activity which is in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.

Early Stone Age: The archaeology of the Stone Age between 2 500 000 and 200 000 years ago.

Fossil: Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Holocene: The most recent geological time period which commenced 10 000 years ago.

Late Stone Age: The archaeology of the last 20 000 years associated with fully modern people.

Middle Stone Age: The archaeology of the Stone Age between 200 000 and 20 000 years ago associated with early modern humans.

National Estate: The collective heritage assets of the Nation

Palaeontology: Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

Pleistocene: A geological time period (of 2.5 million – 10 000 years ago).

SAHRA: South African Heritage Resources Agency – the compliance authority which protects national heritage in the Northern Cape.

Structure (historic): Any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith. Protected structures are those which are over 60 years old.

ABBREVIATIONS

AIA	Archaeological Impact Assessment
BIF	Banded Ironstone Formation
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
ESA	Early Stone Age
EMP	Environmental Management Program
GPS	Global Positioning System
HIA	Heritage Impact Assessment
LSA	Late Stone Age
MSA	Middle Stone Age
NHRA	National Heritage Resources Act, No 25 of 1999
OHL	Overhead line
PV	Photovoltaic
SAHRA	South African Heritage Resources Agency
SAHRIS	South Africa Heritage Resources Information System

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1. INTRODUCTION

Lita Webley was appointed by Cape Environmental Assessment Practitioners (Pty) Ltd on behalf of ABO Wind Hotazel PV (Pty) Ltd to undertake the Archaeological Impact Assessment (AIA) for the construction of a proposed commercial photovoltaic (PV) solar energy facility (SEF), called Hotazel Solar (100MW), as well as associated grid connection. The proposed location is immediately south (3.5km) of the mine dumps of Hotazel situated in the John Taolo Gaetsewe District Municipality, and some 50km north-west of Kuruman (Figure 1). The proposed facility is on the farm known as the Remaining Extent (Portion 0) of the farm York A 279. The R31 runs along the western and southern boundaries of the study area, while a district line runs east of the eastern boundary. The railway line to Hotazel runs through the western edge of the property.

A central point for the study area is: S27.215906, E22.990659

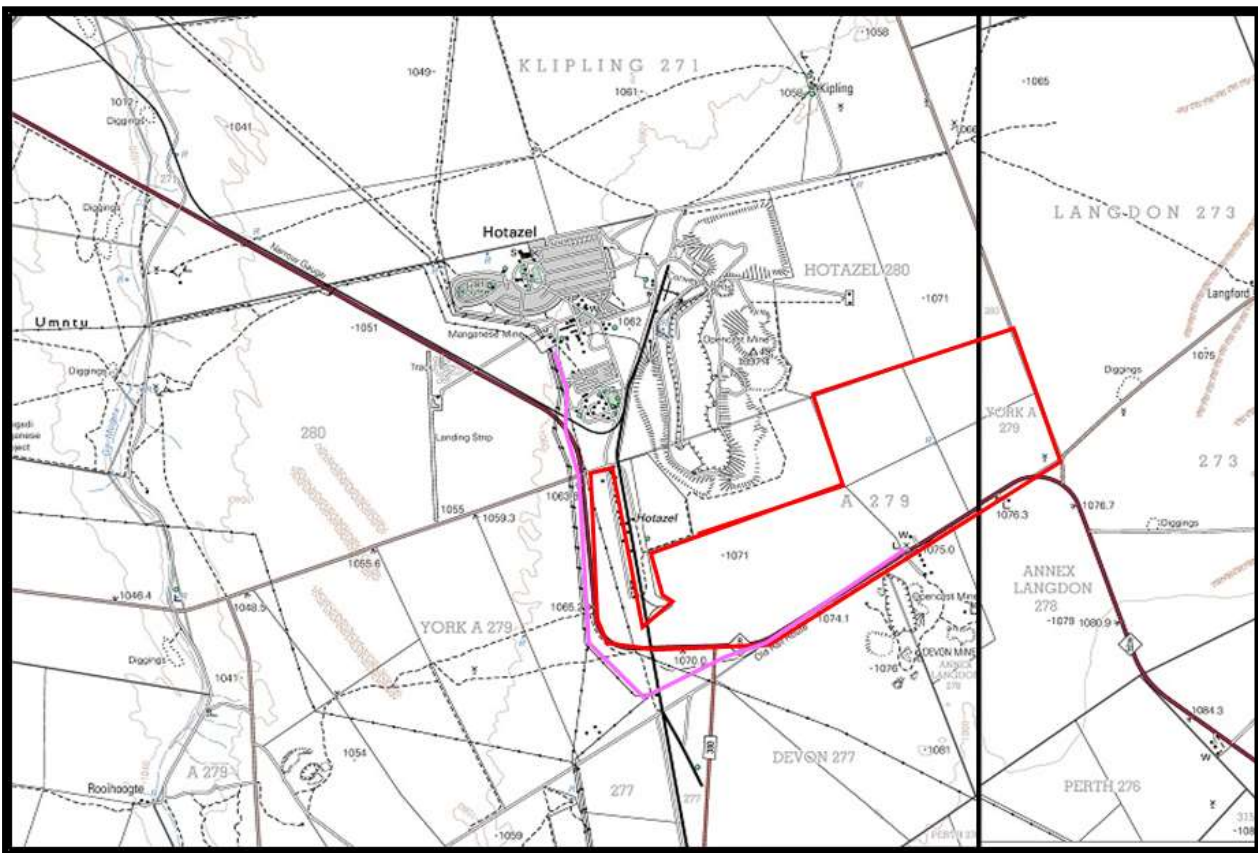


Figure 1: Map sheets 2722BB and 2723AA showing the proposed location of the farm York A 279 (outlined in red) and its position relative to the town of Hotazel. The proposed 132kV powerline (shown in pink) will run to the Hotazel substation, along existing Eskom powerlines (Chief Directorate: National Geo-Spatial Information). Note the position of the major drainage system in the area, the Go-Magara River to the west.

The project will connect to the National Grid via the Eskom Substation at Hotazel. A proposed 132kV powerline from the solar facility will cross over Portion 11 of York A 279 owned by Kudumane Mineral Resources (shown as green in Figure 2) and then cross over the Remainder of the farm Hotazel 280 belonging to the Hotazel Municipality (shown as purple in Figure 2), before connecting to the substation. The maximum length of the overhead powerlines will be 6km.

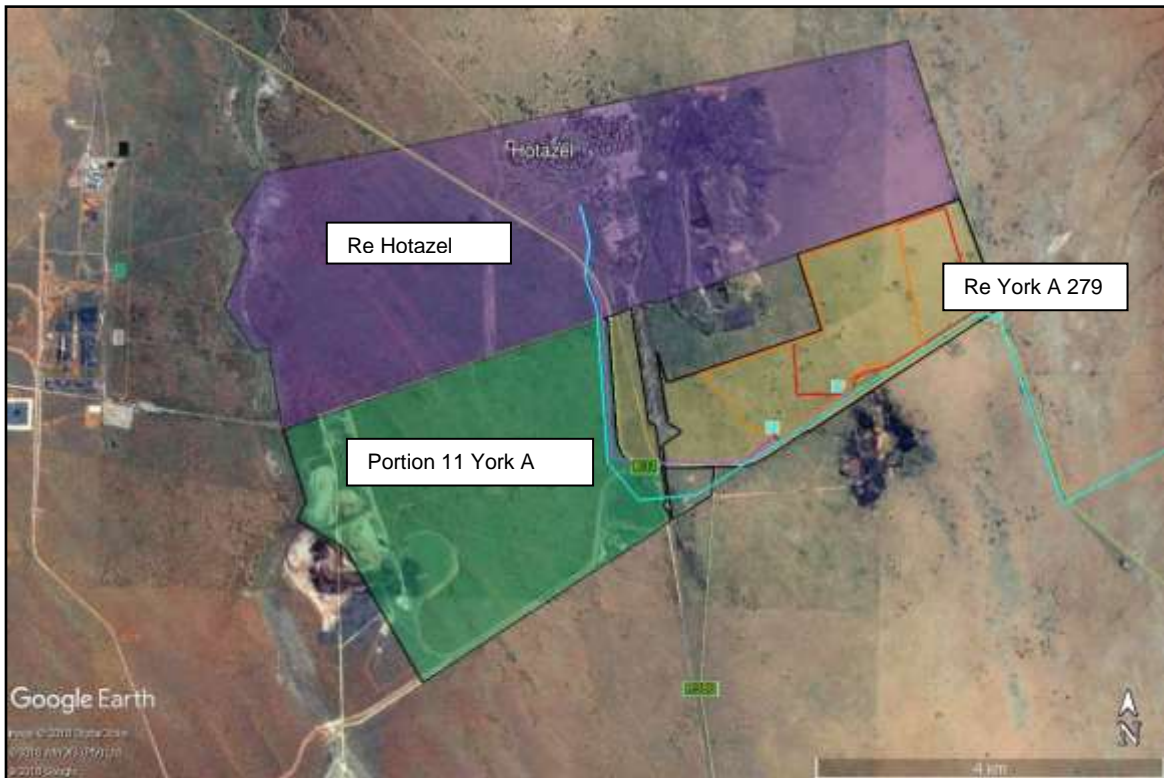


Figure 2: An aerial image of the farm portions which will be crossed by the proposed 132kV powerline from the proposed PV facility to Hotazel substation in the Northern Cape Province.

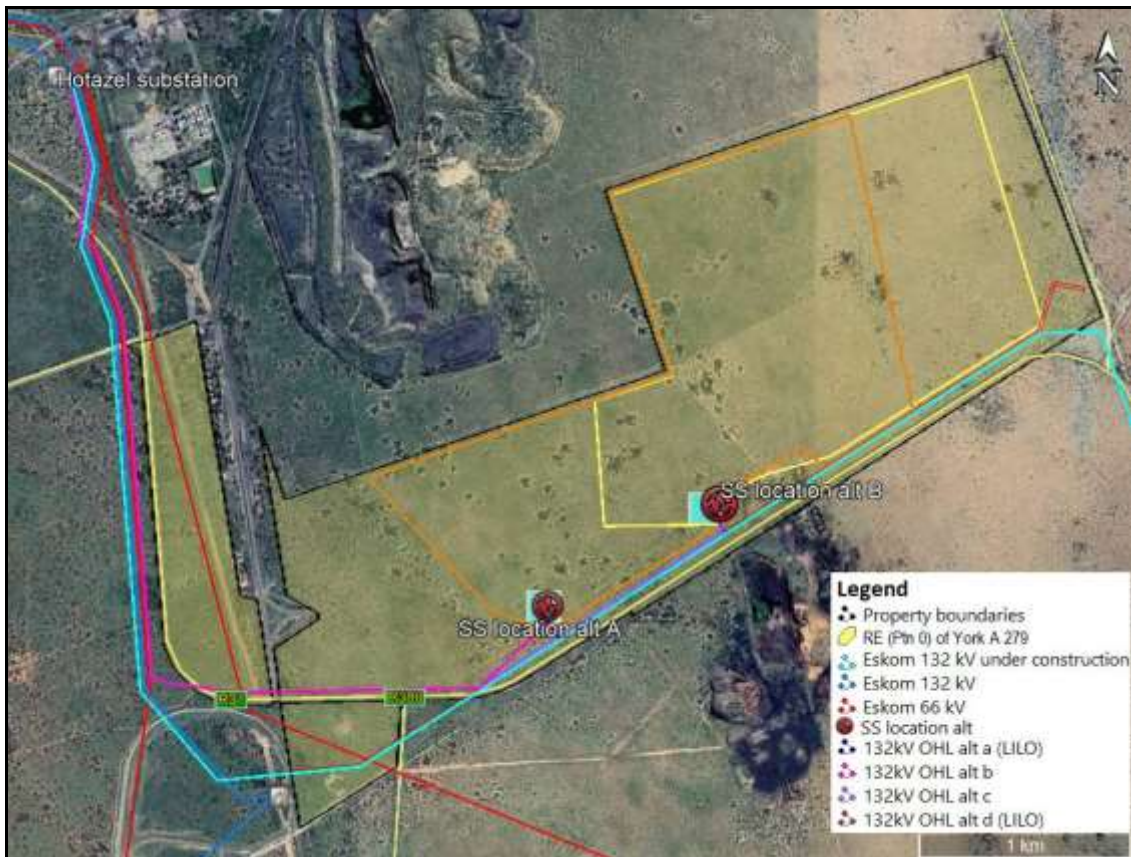


Figure 3: The two alternative solar facility locations are shown: Alternative 1 to the east (outlined in yellow) and Alternative 2, the preferred site, outlined in orange. The location of the two alternative on-site substations are shown as Alt A and Alt B. Alternative B is the preferred option. The proposed 132kV powerline from the solar facility will cross Portion 11 of York A 279 owned by Kudumane Mineral Resources and then run through the Remainder of the farm Hotazel 280 belonging to the Hotazel Municipality.

2. PROJECT DESCRIPTION

The total size of the farm is 636ha and it is proposed that the Hotazel Solar facility will have a net output of 100MW and an estimated maximum footprint of 275ha. The PV facility will cover an estimated area of 250ha, the internal roads about 18ha, the auxiliary buildings 1ha, the substation 1ha, and “other” about 5ha.

The development proposal is that of PV modules mounted on either fixed-tilt or tracking structures.

2.1 Alternatives

In accordance with the minimum requirements prescribed by the Department of Environmental Affairs (DEA), two layout alternatives were identified. They are: Layout Alternative 1 and Layout Alternative 2 (Figure 3).

- Alternative 1 constitutes the preliminary layout within the initial/conceptual area restricted to the east of the property.
- Alternative 2 includes slightly more of the sensitive habitat to the west. However, this alternative would have a shorter grid connection to the Hotazel substation and is therefore the preferred option.

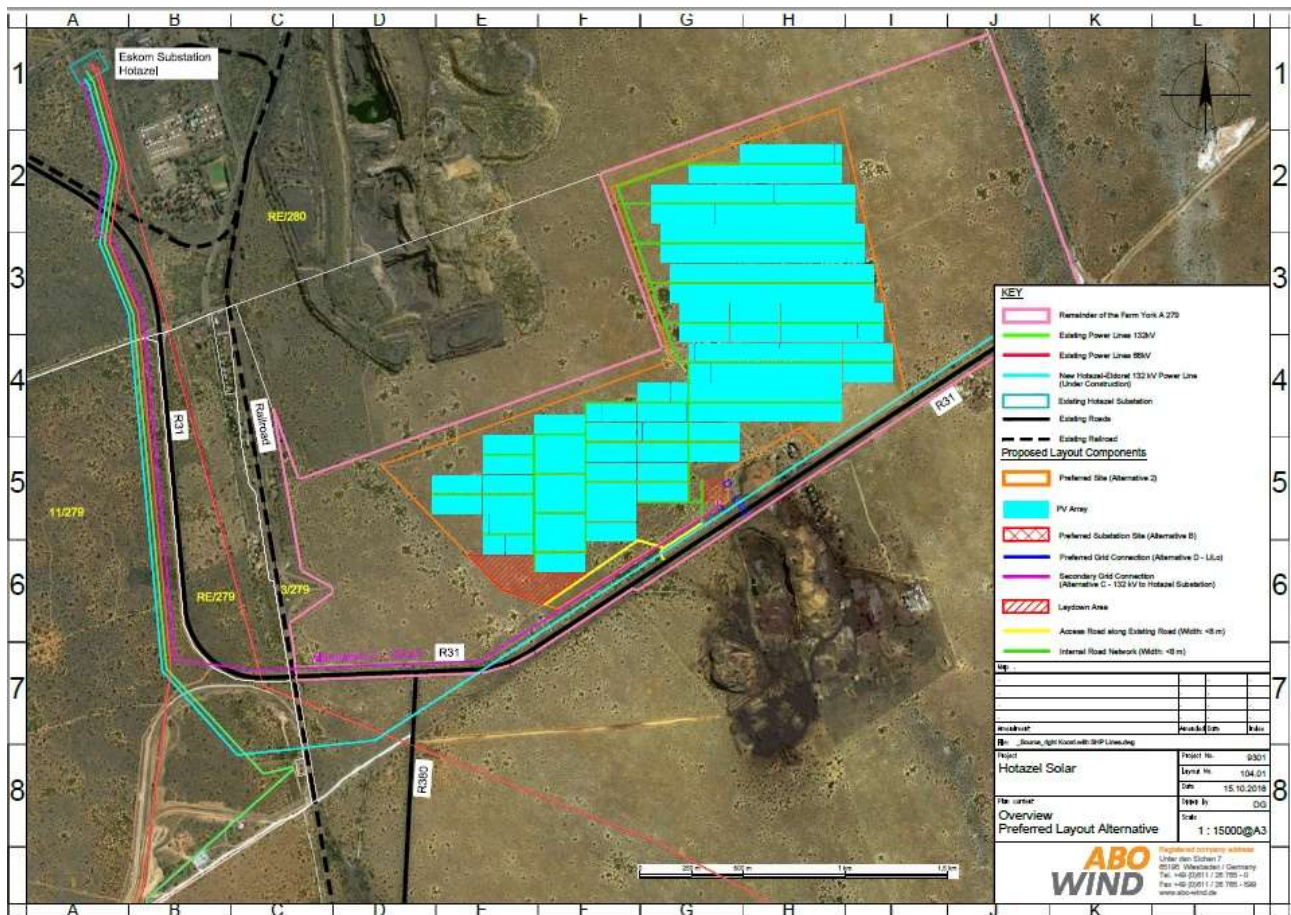


Figure 4: The preferred layout on the Alternative 2.

2.2 Infrastructure

This will include inverter stations, internal electrical reticulation, internal roads, a facility switching station/substation, a 132kV overhead distribution line (OHL), auxiliary buildings, laydown areas, perimeter fencing, and security infrastructure. The facility switching station/substation will locate

the main power transformer/s that will step up the generated electricity to a suitable voltage for transmission into the national grid, via the OHL.

The auxiliary buildings will constitute:

Control building
Offices
2 x warehouses
Canteen and visitors centre
Staff lockers and ablution facilities
Gate house and security offices

A number of inverter stations (80 centralised inverters or 1120 string inverters) will be installed, along the internal access roads and connected to the switching station/substation. Final placement of these inverter stations will need to take the ground conditions into consideration. Interconnecting cabling will be trenched where practical and follow internal access roads. Sensitive areas will be avoided, or alternatively cables will be fastened above ground.

The internal road network of the SEF will be gravelled roads, not exceeding 6m in width, as shown in Figure 4. Roads between the solar modules will be unsurfaced tracks to be used for the maintenance and cleaning of the solar panels.

2.3 Substations

There are two substation options, Substation A and Substation B (Figure 2 & 3). The estimated footprint size of the substation is 1ha. Substation B is the preferred alternative, but final placement of the substation location will take into consideration ground conditions.

2.4 Grid Connection (OHL) and cabling

It is proposed to connect the SEF directly to the Eskom's Hotazel Substation location about 3km to the north-west of the property (Alternative C). However, the option to loop into the new 132kV powerline on the southern boundary of the site will also be investigated (Alternative D) which is also the preferred alternative.

The SEF switching station will be approximately 100m x 100m in size and feature a step-up transformer to transmit electricity via a 132kV OHL directly to the Hotazel Substation. Depending on which of the two layout alternatives selected, there are options for the SEF switching station/substation location and the OHL routing to the Hotazel Substation as shown in Figure 3. The longest alternative (Alternative C from Substation Alternative B) is 6km in length. The OHL will have a maximum height of 24m and a servitude width of between 31m – 51m.

3. HERITAGE LEGISLATION

While the National Department of Environmental Affairs is the decision making authority acting in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA) and Regulations (2014), they must ensure that the evaluation of the statutorily defined broad range of heritage resources fulfils the requirements of the relevant heritage resources authority in terms of Section 38 (8) of the National Heritage Resources Act (Act 25 of 1999) (NHRA) and that any comments and recommendations of the relevant heritage resources authority with regard to proposed development have been taken into account prior to the granting of the consent.

The NHRA provides protection for the following categories of heritage resources:

- Landscapes, cultural or natural (Section 3 (3))
- Buildings or structures older than 60 years (Section 34);
- Archaeological Sites, palaeontological material and meteorites (Section 35);

- Burial grounds and graves (Section 36);
- Public monuments and memorials (Section 37);
- Living heritage (defined in the Act as including cultural tradition, oral history, performance, ritual, popular memory, skills and techniques, indigenous knowledge systems and the holistic approach to nature, society and social relationships) (Section 2 (d) (xxi)).

3.1 Archaeology (Section 35(4))

No person may, without a permit issued by HWC, destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite.

Archaeological is defined as: “material remains resulting from human activity which is in a state of disuse and is in or on land and which is older than 100 years, including artefacts, human and hominid remains and artificial features and structures”.

In terms of the definition, an archaeological survey therefore includes any ruined structures older than 100 years.

3.2 Burial grounds and graves (Section 36(3))

No person may, without a permit issued by the South African Heritage Resources Authority (SAHRA), destroy, damage, alter, exhume or 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.

3.3 Grading

The South African Heritage Resources Agency (SAHRA) have prescribed a system of grading, which provides for assigning the appropriate level of management responsibility to a heritage resource. Grade I and Grade II heritage resources are managed by national and provincial heritage resources authorities, while Grade III resources are intended to be managed by the relevant local planning authority. These bodies are responsible for grading, but any individual may make recommendations for grading.

Table 1: Grading of Heritage Resources

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance	Grade I	High Significance	Conservation, National Site Nomination
Provincial Significance	Grade II	High	Conservation, Provincial Site Nomination
Local Significance	Grade III	High	Conservation, or extensive mitigation
Generally Protected A	Grade IV-A	High/Medium	Mitigation (Part of the site to be retained)
Generally Protected B	Grade IV-B	Medium	Mitigation (test excavation, systematic sampling/monitoring) before destruction
Generally Protected C	Grade IV-C	Low	Recording before destruction

3.4 Consultation

Since this study falls within the context of an EIA, which includes a public participation process, no dedicated public consultation was undertaken. However, informal discussions were held with Mr P Jansen, the landowner of York A 279, and mining officials from Kudumane Mineral Resources.

4. RECEIVING ENVIRONMENT

The proposed Hotazel Solar facility (referred to as “the study area”) is about 3.5km south-east of the town of Hotazel and about 50km north-west of Kuruman. The R31 runs along the western and southern boundaries of the study area, while a district road runs east of the eastern boundary. The railway line to Hotazel runs through the western edge of the property. There are at least two powerlines, a 66kV and a 132kV powerline which run along the southern perimeter of the property, parallel to the road (Figure 3).

According to the geological study, the proposed facility and OHL lines are underlain by Pleistocene to Recent aeolian sands of the Gordonia Formation (Kalahari Group). These soft sands are underlain by hardpan calcretes. The topography of the site is almost level with no features. The vegetation on the property is described as Kathu Bushveld, typically associated with aeolian red sands and calcrete deposits. There are some dense and impenetrable stands of *Acacia mellifera* across the site. They are not visible on satellite imagery but according to the ecologist are encroaching on the site. These dense, thorny clusters prevented evenly spaced survey transects, but this is not a significant limitation in terms of the study. The area is currently utilised for limited agricultural purposes. However, there are a number of manganese mining operations in close proximity to the study area, with the Langdon Devon Manganese Mine to the south, Kudumane Mineral Resources to the west, and the old waste rock dumps of Hotazel clearly visible to the north. There are numerous powerlines which cross the property, both along its southern and western boundaries.



Figure 5: There are large sections of grass cover across the site, particularly on the eastern side.



Figure 6: There are numerous clusters of thorn trees (*Acacia mellifera*) particularly in the western half of the study area, and in places they are impenetrable, and it is impossible to survey under them.



Figure 7: The western half of the farm York A 279 has been bisected by the railway line to Hotazel. The R31 crosses the railway line over the bridge shown to the left, and then travels northward, following the railway line.



Figure 8: To the west of the railway line, large sections of the landscape on the Remainder of York A 279 have been disturbed by the construction of an underground water pipeline which runs parallel to the railway line, and between the railway line and the R31. Note also the 66kV powerline which crosses the site from east to west.



Figure 9: View northwards of the Hotazel waste rock dumps on the horizon. These dumps separate the proposed PV facility from the town of Hotazel.



Figure 10: View in a southerly direction of the OHL crossing the eastern edge of Portion 11 of York A 279, belonging to KMR. The proposed 132kV line will run in parallel with these existing lines.



Figure 11: The substation of Hotazel on the western edge of the town.

5. ARCHAEOLOGICAL CONTEXT

A desktop Scoping Archaeological Impact Assessment has been completed by Nilssen (2018) and the details, specifically those relating to sites further afield, are not repeated here. The archaeological comments below draw on the conclusions of CRM studies conducted within a 20km radius of the proposed facility.

5.1 Early and Middle Stone Age

Important ESA archaeological distributions have been identified and studied around the town of Kathu, about 60km south of the study area (Chazan et al 2012). At Kathu Townlands, dense deposits of ESA cores, flakes and handaxes have been found over an area of 25ha. The artefacts are found directly on the surface of fine-grained ironstone bedrock and are mainly made on this material.

Closer to the study area, Küsel (2009) surveyed an area around Black Rock to the north of Hotazel and noted that stone artefact scatters are very ephemeral in the area and reported only one concentration of stone artefact knapping. These occurred in the pebble and gravel levels overlying the calcrete formations within the ancient river bed of the Ga-Mogara River (Figure 1). The lithics were exposed through excavations for a borrow pit in the river bed. The availability of good quality raw materials appears to have led to significant episodes of stone artefact knapping (i.e. factory sites). Orton (2016/2017), Kruger (2015) and Hutten & Hutten (2013) have all identified a similar mix of ESA and MSA archaeological material along the Go-Magara River, about 5km west of the study area. The artefacts are made on the local cryptocrystalline silica rock types. The formal ESA tools include Acheulian handaxes or large cutting tools (LCT's). The MSA flakes and blades are characterised by the faceted striking platforms that indicate the use of prepared cores. Kruger (2015) observes that the Go-Magara River would have been an important source of water in this arid environment.

Küsel writes that stone tools are frequently found within calcrete zones underlying the modern surface soils of red Aeolian sands, and it is for this reason that they are *generally not observed during surface surveys*.

5.2 Later Stone Age

There have been no reported finds of LSA material in the immediate vicinity of the study area. Wilkins et al (2017) report on LSA material from test excavations at two shelters on Gomahana Hill, which is located on the eastern edge of the Kuruman Hills, some 40km to the south-east from the site. Similarly, rock art sites have been reported from north of Kuruman in areas with rocky outcrops, but none have been reported in the immediate vicinity.

5.3 Early and Later Iron Age

Van Schalkwyk (2015) notes that there does not appear to be any evidence for Early Iron Age occupation of the area, and the earliest people to settle here were of Tswana-speaking origin (Tlhaping and Tlharo), mostly to the north and west of Kuruman around the 1600s (Humphreys 1976). Only Tswana speaking peoples were occupying the area when the first colonist arrived and the primary Tswana settlement of Dithakong was situated north-east of Kuruman. With gradual westward expansion, they had reached the Langeberg by the late 18th century. Humphreys (1976) suggested that they were established in the Postmasburg area by 1800. The Tswana lands were annexed by the British in 1855 and the area became known as British Bechuanaland. The Tswana rose in resistance to British occupation on 1895 but were subjected and their land annexed and divided up for white farmers. No reported Later Iron Age remains have been recorded in CRM studies for this area.

5.4 Historical Background

The first travellers through this area were missionaries, hunters and traders. The area was only sparsely settled until the 20th century, when the farms were surveyed. York 279 as well that of the neighbouring farm of Devon 277, was surveyed in 1914 (Orton 2016). He notes that the farm Hotazel was acquired by SA Manganese, and they were responsible for setting up a small town comprising 30 houses and some offices and stores. The official opening dates to 1959. The heritage of colonial settlement includes farmsteads, shed, kraals, dams, wells etc.

According to Küsel (2009), the first geologist to survey this portion of the Northern Cape was Dr AW Rogers of the Geological Commission of the Cape Colony in 1906. He described the small hill called Black Rock and reported the presence of manganese. The Associated Manganese Mines of South Africa acquired the manganese outcrop in 1940 and commenced mining. Much of the current heritage of the area relates to the history of manganese mining. Küsel (2009) has proposed that due to its significance in the history of manganese mining in South Africa, Black Rock should be proclaimed a National Heritage Site.

5.5 Cemeteries

Küsel (2009) has reported on cemeteries near the mine of Black Rock representing the graves of black mine workers. During their walkdown of the upgrade to the 66kV powerline from Hotazel to Mothibistat substation, PGS Heritage (2016) reported a number of graves but these were all situated to the south of the study area, along the “Moffat-Valley alignment”. Cemeteries are likely to be found in proximity to villages and homestead.

Nilssen (2018) concludes that several of the heritage studies around Hotazel have commented on the almost total absence of heritage resources. Surveys have revealed that there are large tracts of land where virtually no archaeological material occurs (Orton 2016, 2017; Van Schalkwyk 2010, 2016).

6. METHODOLOGY

6.1 Purpose and Scope of Study

This report is conducted in terms of Section 38 (8) of the National Heritage Resources Act, No 25 of 1999 (see section 3 above). Lita Webley was appointed to undertake the archaeological component (AIA) of the Heritage Impact Assessment (HIA) which is being undertaken by Perception Planning.

The AIA complies with the minimum standards set by SAHRA, in terms of the National Heritage Resources Act, No 25 of 1999.

Specifically, the terms of reference are:

- The identification of all archaeological remains (including ruined structures older than 100 years as well as cemeteries/graves) within the footprint of the study area and along the proposed powerline routes;
- The assessment of significance of the archaeological resources as set out in Table 1;
- Assess the potential impacts of the proposed development on the archaeological resources using the prescribed format;
- Propose suitable mitigation measures to minimise possible negative impacts to the archaeological resources, if applicable. This may include additional studies/fieldwork if necessary;
- Provide a report that will meet the requirements of the heritage authorities;
- Provide input into the Environmental Management Program.

This report will be made available to all Interested and Affected Parties as part of the Public Participation Process being undertaken for the EIA process.

6.2 Background Studies

A comprehensive survey of available literature was carried out during the Scoping process to assess the general heritage context of the area (Nilssen 2018). Both published and unpublished articles and reports were consulted. His desktop study also reviewed other Cultural Resource Management (CRM) projects within a 20km radius of the area via the South African Heritage Resources Information Systems (SAHRIS) database. Numerous impact assessments, in addition to a number of proposed solar facilities, have been conducted in proximity to the proposed facility as reflected on the SAHRIS database. The following CRM reports in particular provide valuable information on the heritage resources of the area and were consulted:

- Orton, J. 2016. Heritage Impact Assessment for proposed power lines near Hotazel, Kuruman Magisterial District, Northern Cape. Unpublished report for Aurecon South Africa (Pty) Ltd.
- Orton, J. 2017. Heritage Impact Assessment for the Proposed Hotazel Solar Farm on the Annex Langdon 278, Kuruman Magisterial District, Northern Cape. Unpublished report for Aurecon South Africa (Pty) Ltd

The proposed Hotazel Solar Facility referred to by Orton (2017) is on the opposite side of the road (R31) from the current study.

6.3 Archaeological Field Survey

Lita Webley and Madelon Tusenius undertook an archaeological survey of the Hotazel Solar facility and associated powerlines over a four-day period in October 2018. This is in spring, but due to the arid environment, the season has little impact on plant cover and therefore visibility. As far as possible, Webley and Tusenius walked transects of the study area according to standard archaeological practice. They recorded their tracks and sites by means of two hand-held Garmin GPSmap62s receivers set to the WGS84 datum. All archaeological sites were recorded, described and photographed using a Sony DSC-H9 camera. These tracks are shown on Figure 12. Webley and Tusenius also drove along sections of the proposed access roads and powerline options where walking was not possible (Figure 17).

6.4 Assumptions and Limitations

The study area was accessed via a gate next to the York farmhouse and opposite the York Wash Bay. There were no other easily accessible entry points to the site, and so this meant returning to a central location every day (see tracks on Figure 12).

- There were no significant obstacles to the survey, except for the dense and impenetrable stands of thorn trees (*Acacia mellifera*), which influenced the direction of our track paths,
- Visibility was generally good in areas of low grass cover,
- With respect to our coverage of the proposed powerline, we were able to access a section (1.9 km) of the proposed line which runs along the eastern section of Portion 11 of York A 279 (Figure 3) which belongs to Kudumane Mineral Resources, after receiving permission from the CEO and the Mine Manager. Since the proposed powerline travels through an active mine, we were not able to walk the route on foot due to mine safety considerations. However, Ms Nemakhavhani (the ECO) accompanied us in a mine vehicle along the route of the existing 66 kV line, and also along the fence of the property. The fact that we drove along the proposed powerline route and did not walk, is not seen as a significant limitation (Figure 17),
- The northern section (about 1.2 km in length) of the proposed 132 kV line, as it connects with the Hotazel substation, runs through municipal land (Portion 0/Re Hotazel 280), and this section of the line has already been covered on foot Orton (2016) during his assessment of the proposed powerlines for the proposed Hotazel Solar Park solar facility on the Annex Langdon 278, the farm immediately south of the study area. He did not find any archaeological material, and this report assumes that his assessment was adequate and does not have to be repeated here,
- This report acknowledges that sub-surface archaeological sites, as well as unmarked graves, may occur anywhere on the landscape and may not be visible during site surveys. It is therefore possible, although not likely, that archaeological material and graves may be uncovered during construction of the facility.

We are of the opinion that our coverage of the area was sufficiently broad to identify the distribution of archaeological resources.

7. RESULTS OF THE ARCHAEOLOGICAL SURVEY

Our survey tracks are reflected in Figure 12 and the list of sites identified within the two Alternatives are provided in Table 3 at the end of the report.



Figure 12: Archaeological survey tracks (in white) across the two alternative layouts (Alternative 1 to the east and outlined in red, Alternative 2 to the west and outlined in orange) on the Remainder of York A 279. The on-site substations are shown in turquoise. Note that the sites identified, represented as red dots, occur along the southern boundary of the site, close to the R31.

7.1 Solar Facility Survey

The survey identified a spread of black, iron rich material lying above the red aeolian sands along the R31 road, and under the existing 132 kV and 66 kV powerlines which run along the road (Figure 14). The origins of the material were initially unknown, until Ms Tshifhiwa Nemakhavhani of Kudumane Mineral Resources identified the material as Banded Ironstone Formation or BIF. She explained that the material, together with thick calcrete deposits which overly the manganese in the mining areas, are removed and stored on spoil heaps. Both the calcrete and BIF are used as a base for the construction of roads and the railway line in the area. The stockpile of BIF on York A 279 was dumped there by KMR and is not related to any mining or quarrying on the site (Figure 13).



Figure 13: The stockpile of BIF material which has been dumped on York A 279, near to the worker's cottage.



Figure 14: The BIF used to line the Eskom servitude road across the property. It litters the southern section of the study area, along the R31 and the railway line too.

Site 001/009: A total of six (6) stone artefacts were identified in two clusters, in loose aeolian sands, on the track between the farmhouse of York and the worker's cottage. According to John Almond (see Palaeontology Desktop Study) the artefacts are "most likely to be a Precambrian iron ore of some sort and may be derived from a BIF outcrop area. They have a yellowish-brown streak (like goethite, but unlike haematite - the iron ore most commonly associated with BIF) and they are not themselves finely-banded".

Four of the pieces are irregular cores, there is a chunk with some notching, and a single flake with retouch along its margin. It is not possible to clearly identify these artefacts to a single stone industry. The location of the small scatter of stone tools, in close proximity to the stockpile of BIF, and the widespread distribution of BIF along the R31, suggests that the artefacts have been introduced to the site by mining companies from elsewhere. They have clearly not been flaked in situ.



Figure 15: Four artefacts found at 001.



Figure 16: Two artefacts from 009.

7.2 Powerline Survey

The proposed 132 kV powerline which will connect the onsite Substation A or Substation B with the substation at Hotazel, represented in Figure 17 by the purple line, will run in parallel with an existing 132 kV Eskom line (represented by the blue line). A foot survey (shown in white) was conducted along the route of the proposed line as far as the railway line. The survey along that portion of the line which runs through land belonging to Kudumane Mineral Resources (KMR) was conducted in a mine vehicle, as explained above, due to mine safety considerations.



Figure 17: The route of the proposed 132 kV powerline, from York A 279, across the railway line and R31, through the property of KMR and Municipal land, connecting with the Hotazel substation, a distance of 6km in total. Our tracks are shown in white.

The final portion of the line, where it connects to the Hotazel Substation, and runs through Municipal land, has already been assessed by Orton (2016), see his figure 9. This study assumes that his assessment would have covered the area adequately, and a duplicate survey was not conducted along this last 1km.

No archaeological material was observed along the route of the proposed mine. The terrain is identical to that assessed for the solar facility.

8. IMPACT ASSESSMENT

The main cause of impacts to archaeological sites is direct, physical disturbance of the material itself and its context. The heritage and scientific potential of an archaeological site is highly dependent on its geological and spatial context. This means that even though, for example a deep excavation may expose buried archaeological sites and artefacts, the artefacts are relatively meaningless once removed from the area in which they were found. The impacts are likely to be most severe during the construction period although indirect impacts may occur during the operational phase of the project.

The clearing, levelling, and compaction of the ground to install the PV units for the Hotazel Solar facility will result in the relocation or destruction of all existing surface heritage material. Similarly, the clearing of vegetation for the on-site substation and control room, as well as access roads will impact material that lies buried in the surface sand. The proposed grid connection, over a distance of 6km, has the potential to have a permanent negative impact on heritage resources if they are present. Since heritage sites, including archaeological sites, are non-renewable, it is important that they are identified, and their significance assessed prior to construction.

It is important to note, that due to the localised nature of archaeological resources, that individual archaeological sites could be missed during the survey, although the probability of this is low. Further, archaeological sites and unmarked graves may be buried beneath the surface and may only be exposed during earth-moving and construction.

The purpose of the AIA is to assess the sensitivity of the area in terms of archaeology and to avoid/or limit the potential impacts of the development by means of mitigation measures.

8.1 Impacts to Archaeology on Alternative 2

The survey identified a small scatter of banded ironstone artefacts (of unknown affiliation), near the York farmhouse. They fall outside the study area. It has been concluded that they are not in situ, and that they have been introduced from elsewhere. Their origins are unknown, but they were probably brought in with the stock pile of BIF which is found on the site. They have been assigned a "Generally Protected C" grading, which means that they may be destroyed. No further recording is required.

8.2 Impacts on Colonial Period Heritage

The 1:50 000 maps and Google imagery confirm that there are no farm buildings or structures on the land identified for the solar facility. The farmhouse of York A 279, located on the R31, is of recent history and no historical archaeological material was identified during the survey. It is not anticipated that there will be any impacts to the Built Environment.

8.3 Impacts on Cemeteries and Graves

No isolated graves or cemeteries were identified during the survey. However, the possibility of unmarked archaeological and/or historical graves cannot be excluded. The landowner was interviewed with respect to graveyards on the property and confirmed that none were present.

8.4 Impacts of Powerlines and Access Roads

Potential impacts caused by a 132kV powerline and the power line access roads are likely to be limited and local. The access road required for a 132kV powerline is likely to be a 'two-track' which generally only requires limited physical disturbance of the ground surface. Due to the very loose sands in the area, Eskom as resorted to distributing a layer of BIF on the surface (Figure 14) which will protect any archaeological material which may occur beneath the soil surface.

While it was not possible to walk down the entire length of the proposed powerline, inferences may be drawn from the survey of the proposed solar facility and from other CRM projects undertaken in proximity to the site. It is concluded that the impacts will be negligible.

Table 2: Potential impact Archaeology – Alternative 2

Impact Phase: Construction of PV facility and infrastructure - Archaeology		
Nature of Impact: Clearing and levelling the ground for solar panels, access roads, cabling, substation and powerlines may impact archaeological resources.		
	Without Mitigation	With Mitigation
Nature/Type	Negative & Direct	Positive
Extent	Local (2)	On-site (1)
Duration	Permanent (5)	Long-term (4)
Magnitude	Low (3)	Low (2)
Probability/likelihood	Improbable (2)	Improbable (2)
Significance	Minor (20)	Minor (14)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: If during ground clearance or construction, any graves or dense accumulations of stone tools are uncovered then the ECO should report this to SAHRA (Tel: 021 462 4502)		
Operational Phase: n/a		
Decommissioning Phase: n/a		
Cumulative impacts: n/a		

Further impacts are not expected during the operational or decommissioning phase of the project.

9. CUMULATIVE IMPACTS

A number of solar facilities have been proposed for this general area, these include the Hotazel Solar Park facility about 4 km south of Hotazel (Orton 2016/2017), the Kagiso Solar Power Plant some 8km south and the Adams Solar PV project some 21 km south of Hotazel. However, the extensive manganese mining in the area is considered to have the same cumulative impacts to archaeology as the various solar facilities which have been proposed. Since archaeological resources occur so infrequently in the region, cumulative impacts are considered to be of no concern.

10. DISCUSSION

Studies further to the west, along the Go-Magara River have confirmed the presence of large scatters of ESA and MSA material (Figure 1). However, all archaeological studies to the south of Hotazel in the general vicinity of the study area have confirmed the almost total absence of any archaeological material.

10.1 Solar Facility

There are no river systems or drainage lines in the study area which might have encouraged settlement in the area. The survey did not identify any archaeological material, with the exception of approximately six (6) stone artefacts made on a black banded ironstone. The location of the small scatter of stone tools, in close proximity to the stockpile of BIF, and the widespread distribution of BIF along the R31, suggests that the artefacts have been introduced to the site from elsewhere. They have clearly not been flaked in situ. Their significance is therefore considered to be LOW (Generally Protected C). The impact of the proposed development is likely to be very low.

10.2 Powerlines

The foot survey confirmed that there are no archaeological resources were identified along the route of the proposed 132kV powerline. The spread of BIF may have introduced archaeological material from elsewhere, but this will be secondary deposition.

11. RECOMMENDATIONS

Indications are that in terms of archaeological heritage, impacts to either Alternative 1 or Alternative 2 are expected to be negligible. The study area is considered to be of very low heritage significance. It is recommended that the project be authorised with the following conditions included in the EMPr:

- If during ground clearance or construction, any archaeological material or human graves are uncovered, work in that area should be stopped immediately and the ECO should report this to SAHRA (Tel: 021 462 4502). The heritage resource may require inspection by the heritage authorities and it may require further mitigation in the form of excavation and curation in an approved institution.

12. ACKNOWLEDGEMENTS

Mr Pieter Jansen of the farm York A 279 was consulted about the history of the property. Caesar Nokwe and Tshifhiwa Nemakhavhani of Kudumane Manganese Resources (KMR) kindly assisted with access to the proposed powerline which crosses through their property (Portion 11 of York A 279).

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Table 3: List of archaeological sites recorded during the field survey.

Local Site Name	GPS co-ordinates Latitude	Longitude	Site description	Significance
001	-27.222609°	22.991618°	4 artefacts on fine-grained, banded ironstone, 3 irregular cores and 1 retouched flake	Generally Protected C
009	-27.222510°	22.991922°	1 core and 1 notched piece on fine grained banded ironstone	Generally Protected C
The GPS points below indicate widespread locations of BIF, along the R31. They are not archeological				
002	-27.228090°	22.984471°		
003	-27.227879°	22.984889°		
004	-27.223431°	22.990704°		
006	-27.229808°	22.980351°		
007	-27.231684°	22.977960°		
008	-27.231761°	22.974086°		
010	-27.215257°	22.997197°		