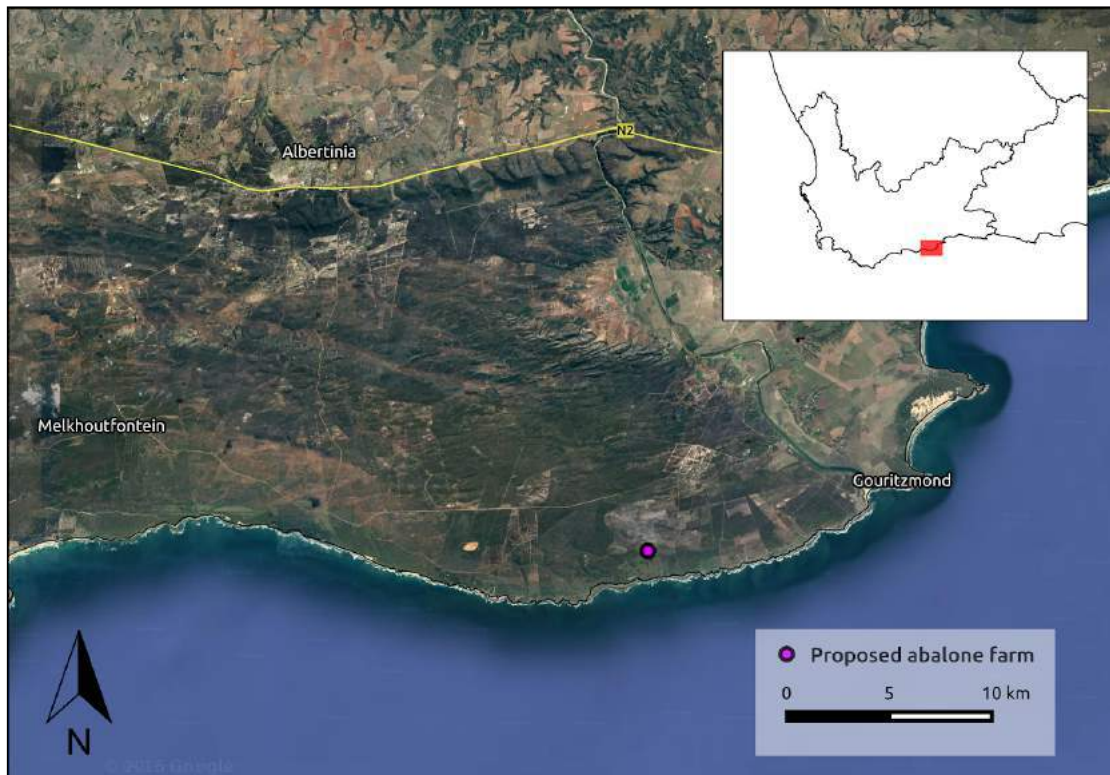


REVISED & UPDATED HERITAGE IMPACT ASSESSMENT

In terms of Section 38(8) of the NHRA for the PROPOSED DEVELOPMENT OF THE GOURITZ ABALONE FARM, PORTION 6 OF FARM 453 LANGE FONTEIN, HESSEQUA MUNICIPALITY

HWC Ref: 16100429AS1006E



Prepared by



CTS HERITAGE

For PHS Consulting

July 2018



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SUMMARY

It is proposed that an abalone farm and photovoltaic facility be built on Portion 6 of Farm Langefontein 453 near Gouritsmond in the Hessequa Municipality by the proponent, Aquunion (Pty) Ltd. The area in general has a mix of tourism, conservation and agricultural uses.

During the Archaeological Impact Assessment (AIA) (Kaplan 2016), a total of 36 sites (shell middens, fish traps, stone walling and a possible grave) were recorded. Furthermore, with the presence of ruined buildings in the area (Kaplan 1995), it is noted that it is possible that graves associated with these structures may exist within the development area. Palaeontologically, the area is underlain by formations of low fossil sensitivity, as well as a significant portion of unknown fossil sensitivity in the Wankoe Formation (SAHRIS Palaeosensitivity Map 2016). Considering the limited depth of bulk earthworks and the inability to foresee discoveries of high palaeontological significance, the Palaeontological Impact Assessment (PIA) (Pether 2016) has rated the palaeontological sensitivity as moderate, with a magnitude of medium. In addition to the archaeological and palaeontological concerns, the proposed development falls in a relatively rural coastal agricultural landscape. Additional design inputs have therefore been taken into account to minimise the intrusion of an abalone farm on the cultural landscape with various mitigatory measures by J.d.V Landscape Studio such as the style, massing and form of new buildings, fencing and road designs, landscaping and planting of appropriate indigenous species (Appendix 8).

This revised HIA addresses the amendments requested by HWC in response to the original HIA (see interim comment on 25 May 2017, Appendix 6) due to:

- *There is no evidence in the HIA that indicates the walkthrough for the P.V. Solar Plant took place, even though there is a conclusion in the identification of heritage resources in this area of study. Evidence of the walkthrough must be submitted as well as site photographs of the area where the proposed photovoltaic solar energy farm is to take place. (It was noted by a member of Committee that there was a supplemental archaeological report done that included the P.V. facility and the house; however, this has not been mentioned in the final HIA. This needs be included in a revised HIA).*
- *There is a building in the development footprint that is possibly older than 60 years and the building has not been assessed in the HIA (i.e. history of occupation, when it was built, contextual photographs etc.).*
- *HOMs notes and commends the mitigation strategies of the VIA however would recommend that the sketch plans of the proposed interventions be submitted to HWC for approval as there are concerns with mass and scale within the rural cultural landscape.*
- *In respect of the last bullet above it was noted that; other than a description of the cultural landscape, which was provided for on pages 14 and 15 of the HIA, the landscape has not been assessed in terms of its significance, nor indeed was on impact of the development on this significance, if any, provided for.*

Three project alternatives are proposed:

- **ALTERNATIVE 1:**

An approximate 750 ton abalone farm, in one phase of approximately 18 ha. This alternative was the applicant's first concept and had limited specialist input.

- **ALTERNATIVE 2: PREFERRED**

An approximate 440 ton abalone farm, comprising of two phases of approximately 16 ha.

Note that this alternative has evolved with specialist input, resulting in “no development” areas across the site. Specialist comment has also resulted in the creation of two smaller production areas with ecological no-go areas in between. The farm has been set back from the coast as recommended by the coastal setback line and climate change specialist. Important (visible) archaeological sites have been avoided. The solar farm has also been shifted north on the farm, to manage the potential visual impact that the solar array may have on neighbouring landowners, and to allow optimal functionality.

- **ALTERNATIVE 3:**

No-go alternative.

The proposed construction at the Gouritz Abalone Farm will result in sustainable development, local economic growth, job creation and skills transfer. There is a market demand for farmed abalone for export. Due to the high archaeological sensitivity of the area in which the farm is located, however, the proposed development is likely to impact on significant archaeological heritage resources.

Alternative 2 (preferred) has evolved with guidance from the specialist team and therefore includes ‘no development areas’, buffers, and test excavations for potential archaeological materials. This has resulted in a smaller alternative with less impacts than the former alternative. The coastal waters discharge permit (CWDP) will ensure that effluent water quality is monitored and adheres to acceptable standards. Mitigatory measures have also been introduced to soften and break up the spatial layout, massing and architectural design in order to retain as much of the rural landscape character of the area.

The impacts of the proposed development of **Alternative 2** can be mitigated through the implementation of the recommendations below.

- Shovel testing must be undertaken to determine the significance of subsurface archaeological deposits. The focus of test excavations will be on the narrow dune cordon in the southwestern portion of the proposed development site. This will require the submission of a workplan to HWC for approval.
- The historic stone wall (SAHRIS Site ID: 99004) alongside the gravel road (inside the footprint area) must be protected and incorporated into the final development proposal. A 10m protective buffer is required.
- The possible grave/burial (SAHRIS Site ID: 99002) in the Eskom servitude must be avoided. The ‘grave’ must be demarcated (possibly enclosed inside a small fence).



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- Bulk earthworks (i. e. excavations for building foundations, terracing cut backs, & services) must be monitored by a professional archaeologist. The site must be inspected once a week by the archaeologist during the construction phase of the project.
- It is not necessary for the archaeologist to monitor vegetation clearing operations, but the existing structures must not be impacted or altered as part of the proposed development.
- The Environmental Control Officer (ECO) must be briefed on site by the archaeologist, prior to the commencement of site clearing. The site must also be inspected once vegetation clearing has been completed.
- If any unmarked human remains are exposed or uncovered during excavations and earthworks, these must immediately be reported to Heritage Western Cape (Att: Mr Andrew September), or the archaeologist (Jonathan Kaplan 082 321 0172).
- The HWC Fossil Finds Procedure must be implemented.
- The mitigation recommendations included in section 5 of the VIA Report (PHS Consulting, 2017, Annexure 4) must be implemented and adhered to.
- The mitigation recommendations in Site and Landscape Development Plan by J.d.V Landscape Studio (Annexure 8) must be adhered to pertaining to the landscaping, massing and architectural design guidelines.
- The above recommendations must be incorporated into the Environmental Management Plan (EMP) for the proposed development.
-

Any additional excavation work that occurs after the completion of the proposed development, that may not trigger a NEMA process, is likely to impact on archaeological resources and will therefore require a permit in terms of section 35 of the National Heritage Resources Act (Act 25 of 1999).

Any proposed alterations to either existing structure within the development footprint during the Operational Phase will require an application to HWC in terms of section 34 of the National Heritage Resources Act (Act 25 of 1999).



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THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

I Jenna Lavin, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- 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, 2010 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, 2010 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R. 543) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 71 of GN No. R. 543.

Signature of the specialist

CTS Heritage

Name of company

05 April 2018

Date



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COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- (a) details of- (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix 9
(b) declaration that the specialist is independent in a form as may be specified by the competent authority;	Page 4
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 2
(cA) an indication of the quality and age of base data used for the specialist report;	Appendix 1
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 1.2
(d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 2.2
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 2
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 4 and 5
(g) an identification of any areas to be avoided, including buffers;	Section 4 and 5
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 4 and 5
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 4.1
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment or activities;	Section 4 and 5
(k) any mitigation measures for inclusion in the EMPr;	Section 7
(l) any conditions for inclusion in the environmental authorisation;	Section 7
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 7
(n) a reasoned opinion- (i) as to whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 7
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 6
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Appendix 5



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(q) any other information requested by the competent authority.	Appendix 6
2) Where a government notice <i>gazetted</i> by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	NA



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1. INTRODUCTION

1.1 Background Information on the Project

It is proposed that a 440 ton abalone farm and photovoltaic facility will be built on an area of 16 to 18 ha of Portion 6 of Farm Langefontein 453 near Gouritsmond in the Hessequa Municipality. PHS consulting is the Environmental Assessment Practitioner managing the process for this project.

The majority of fixed infrastructure will be set back above the road separating the farm from the coastline, with the exception of the pumps and pipelines. Due to its remote location, a package plant will be required for sewage treatment. The electricity will be supplemented by an onsite solar array. An additional borehole may be required to supplement the freshwater supply. Refuse will be sorted on site and transferred to the local municipal waste disposal facility (Draft BAR, 2016).

The following additional activities are proposed:

- 7.1 ha production area, split into two phases
- Phase one – 3.7 ha, 230 ton production
- Phase two – 3.4 ha, 210 ton production
- Hatchery (3400 m²)
- Pumphouse and sump – 500 m², with a total pumping capacity of 12 000m³/h
- Filtration reservoir – 530 m², includes drum filters for the filtering of incoming seawater
- Basket cleaning area – 1000 m² for the cleaning and repairing of the abalone baskets
- Split and grading rooms – 95 m² x 8 rooms for the splitting and size grading of the abalone stock
- Blower and feed stores – 35 m² x 16 rooms, used to securely house feedstock away from vermin / pests.
Blower rooms – soundproof for air supply
- Diesel store – 173 m², on site diesel storage of 80 000 l
- Refuse area and package plant – 600 m²
- Power transmission room – 800 m² for back up generators and main distribution systems
- Canteen – 1025 m², containing canteen, ablutions and lockers for employees
- Workshop – 450 m² for maintenance and repairs
- Parking area – 3930 m², comprising entrance access and parking
- Admin / office building – 600 m² for admin staff
- Transfer and pre-processing building – 1100 m², to transfer animals from one farm to the next and to prepare animals for transport for processing
- Effluent / outgoing channel / pipeline – transfers effluent seawater, possible surf zone discharge or beyond surf zone, dependent on the conditions of the CWDP
- Solar array of approximately 6.14 ha with an output capacity of 2.2 MW
- Inverter room – 225 m², used to house inverters to convert solar to usable power and step up into Eskom line at 11kV



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- Eskom overhead line - already existing
- Jeep track to solar farm / P.V. - 1.7 km, two track informal road for servicing the site
- Borehole



Figure 1. Landscape site plans for the proposed abalone farm.

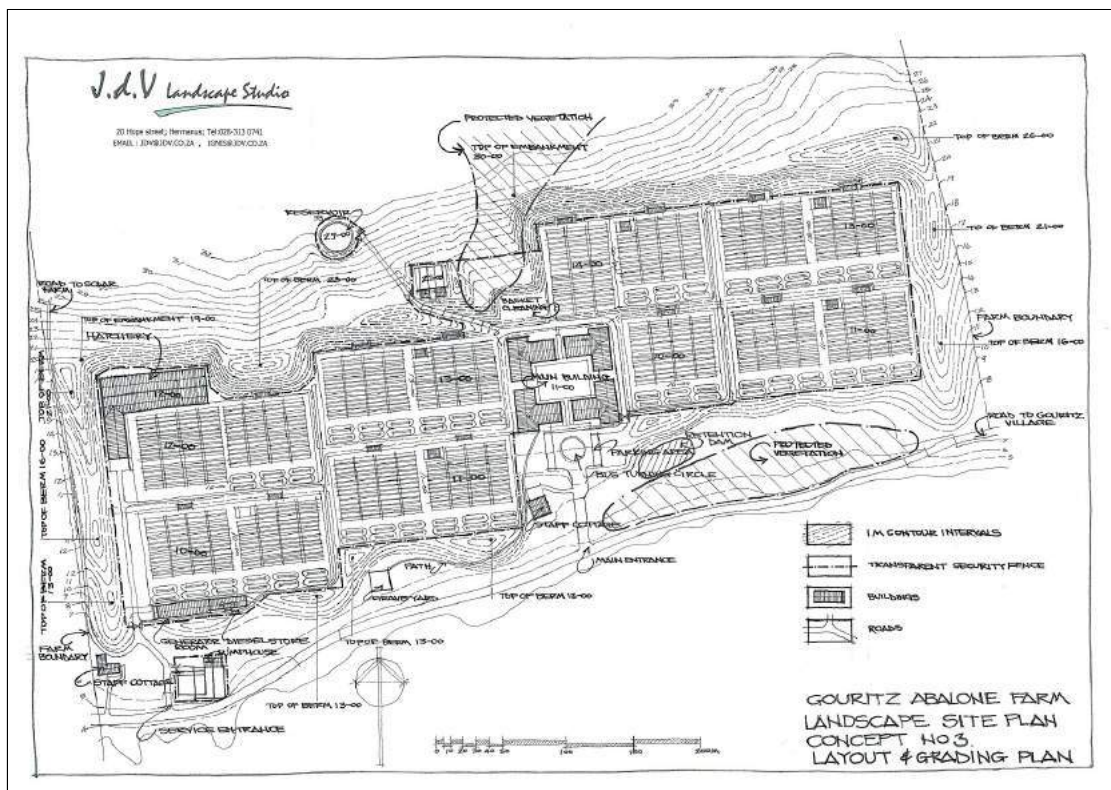


Figure 2. Landscape site plans for the proposed abalone farm.

1.2 Description of Property and affected Environment

The area proposed for development is located on a coastal farm situated approximately 10 km from Gouritsmond and borders the Gourikwa Private Nature Reserve to the west. The site is currently vacant, however, there is evidence of previous agricultural activities having taken place on site. The property on which the abalone farm is proposed is separated from the coast by a public dirt road. The coastal strip south of the access road is classified as a Critical Biodiversity Area.

Surrounding the farm, land use includes agriculture, nature conservation and tourism. The northern part of the farm, and the area proposed for the P.V. facility, is north facing on a slope behind the upper hill slopes of the property about 1.2 km inland from the coast and is covered in natural veld (Restio, grassland, groundcover, Proteas & Fynbos) with a soft sandy substrate. No springs or streams exist in this area, nor any rocky outcrops or other significant landscape features. The southern part of the farm along the coast is situated on vegetated windblown sands and low dunes backing a rocky intertidal shoreline, about 10 kms southwest of the mouth of the Gouritz River (Figures 4-8 in Appendix 2, AIA). Existing infrastructure comprises two holiday cottages, some old farming infrastructure (concrete drinking trough), a barely visible demolished building, fencing, informal roads/tracks and an Eskom servitude. A small dam/old excavation pit occurs in the northeast on the lower slopes of the proposed development site.

The majority of the site is covered in very dense vegetation on a substrate of dark brown coversands. Informal access roads have recently been constructed (mostly bush cut/tractor trampled) to facilitate planning and access. Protected Milkwood trees cover the upper slopes of the property. The site is underlain by deep coastal sands which stretch from the seashore northwards to beyond the study site. The study site can be described as a gentle slope, rising from the seashore northwards to the top of the coastal escarpment. The lower portion, at roughly sea level and along the road, is relatively flat behind which the landscape rises fairly steeply. There is evidence of past use of the land for grazing.



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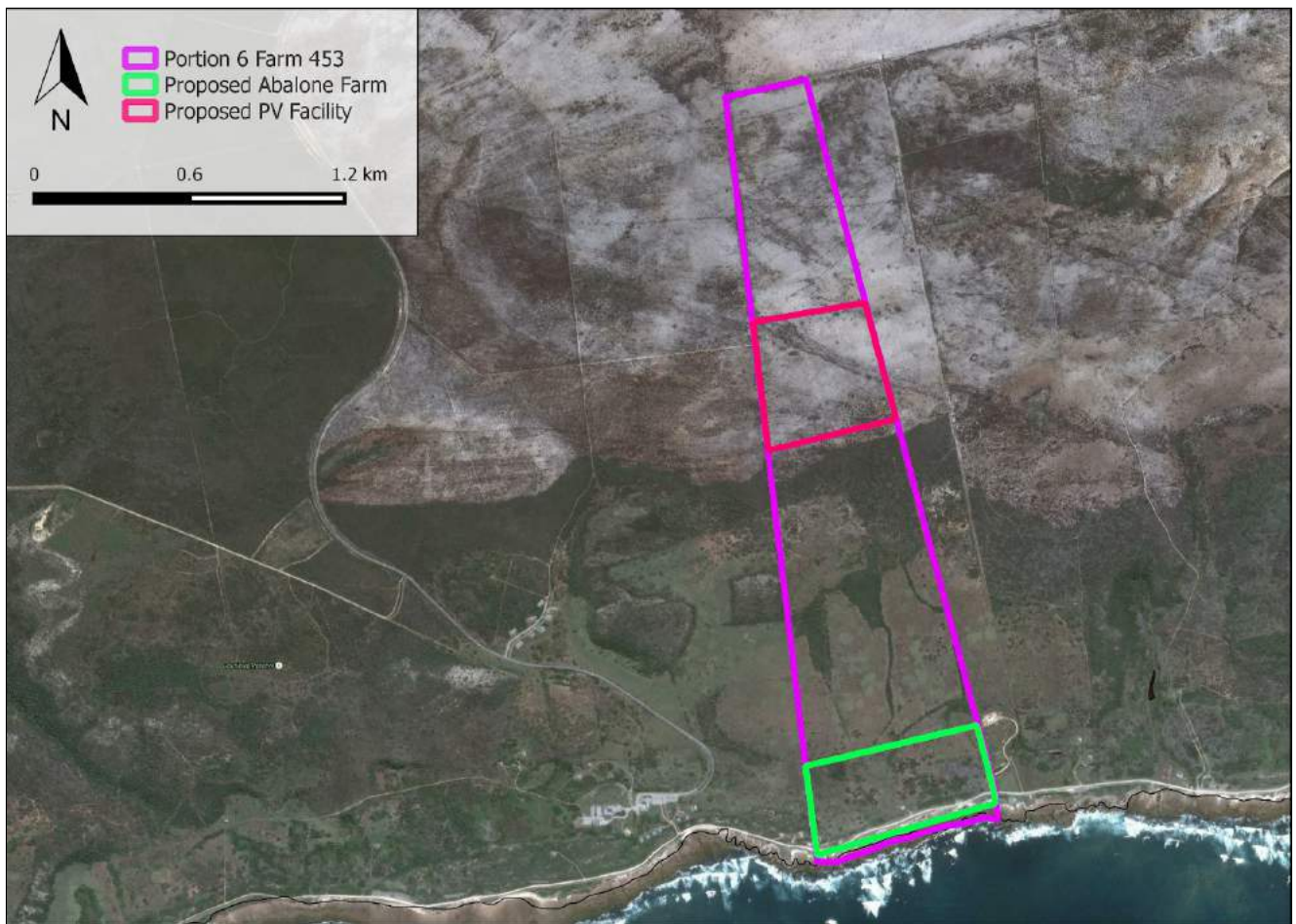


Figure 3. The Farm Langefontein 453/6 with the proposed development indicated (Alternative 2)



Figures 4 and 5. Close up images of the area proposed for the Abalone Farm (left) and the P.V. facility (right) from the Heritage Screener (Annexure 1)

2. METHODOLOGY

2.1 Purpose of HIA

The purpose of this Heritage Impact Assessment (HIA) is to satisfy the requirements of section 38(8), and therefore section 38(3) of the National Heritage Resources Act (Act 25 of 1999). This HIA is drafted in response to the “Response to NID” letter received from HWC dated 28 October 2016. HWC requires that an HIA be submitted with specific reference to impacts on archaeological and palaeontological heritage resources, and visual impacts.

2.2 Summary of steps followed

- A desktop study (Heritage Screener, Appendix 1) was conducted for the proposed development area
- An archaeologist was contracted to conduct a survey of archaeological resources likely to be impacted by the proposed development (AIA, Appendix 2). The season during which the survey was undertaken does not impact on the findings in any way.
- A palaeontologist was contracted to assess palaeontological resources likely to be disturbed by the proposed development through a desktop assessment (PIA, Appendix 3)
- A Visual Impact Assessment was undertaken (VIA, Appendix 4)
- A Site and Landscape Development Plan was drawn up by J.d.V Landscape Studio (Appendix 8)
- The identified resources were mapped and assessed to evaluate their heritage significance in terms of the grading system outlined in section 3 of the NHRA (Act 25 of 1999)
- Alternatives and mitigation options were discussed with the Environmental Assessment Practitioner
- The report was circulated to the Local Authority and registered Conservation Bodies for comment for 30 days from 15 November 2016 to 15 December 2016.
- Comments received as part of the commenting period were integrated into the report and the report was amended accordingly.

3. HISTORY AND EVOLUTION OF THE SITE AND CONTEXT

3.1 Definition of the property

An abalone farm and P.V. facility are proposed for development on portion 6 of the farm Langefontein 453. Situated 28 km southwest of Mossel Bay in the Hessequa Municipality between the Gouritz River and Stillbay, the farm itself is approximately 1 407,704 ha.



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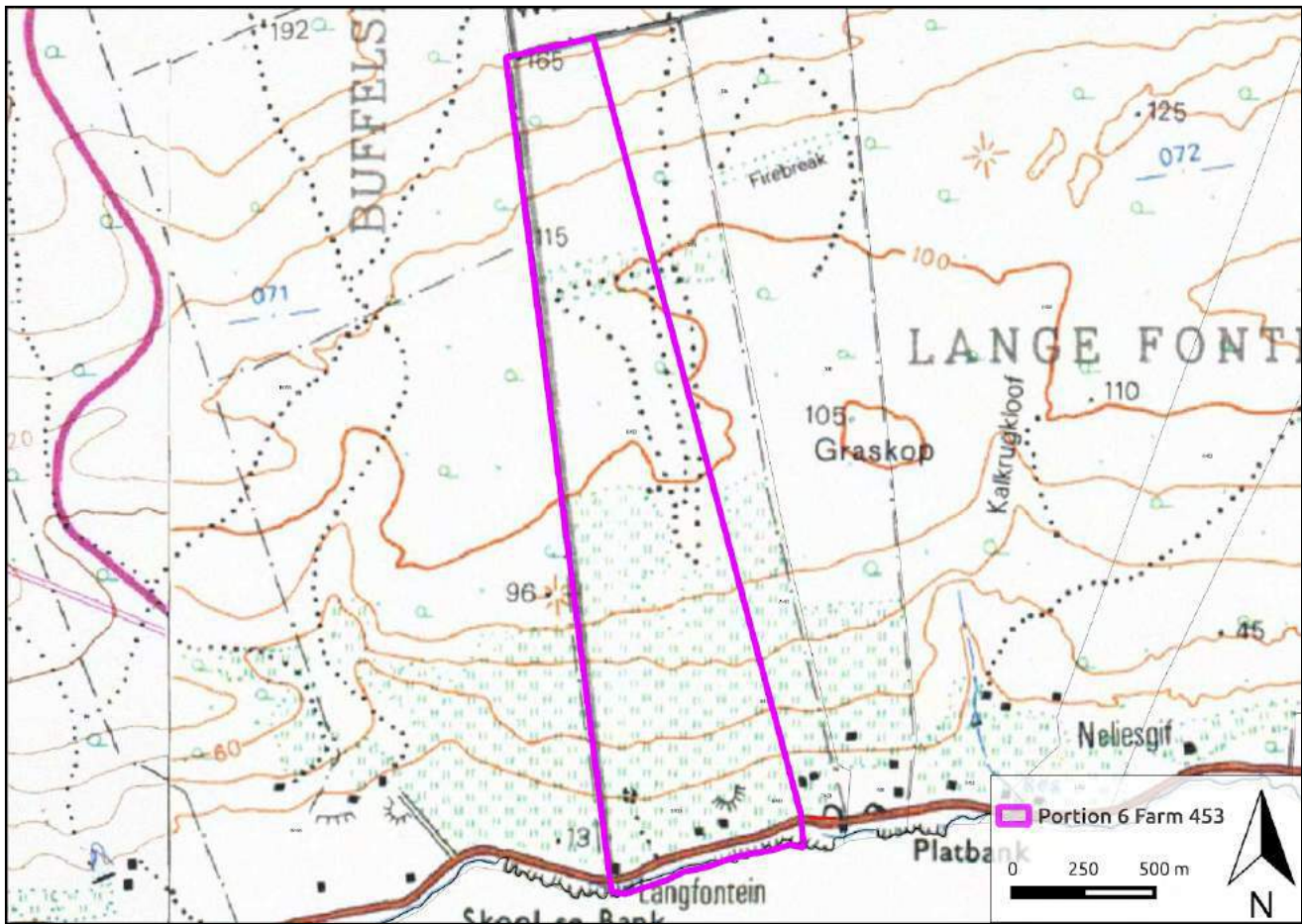


Figure 6. Topographical map of Farm Langefontein 453, Portion 6

3.2 Geology, geomorphology, climate and vegetation

The proposed abalone farm site is situated on vegetated windblown coversands and low dunes backing a rocky sandstone intertidal shoreline, at the foot of the gently concave coastal slope of a broad rounded ridge composed of ancient dune sands which rises to over 100 m above sea level. Pale Quaternary aeolian coversands extend from the edge of the rocky shoreline and overlap older Wankoe Formation aeolianites. Beneath the Quaternary coversands are raised beach deposits of the Klein Brak Formation which may be present in the form of terraces, beach ridges and gravel beds, and overlying the eroded Wankoe aeolianites and the sandstone bedrock. The new site for the solar P.V. array on the crest of the Wankoe Formation salient is mantled by thin Quaternary coversands derived from weathering of the underlying Wankoe Formation aeolianites.

The vegetation affected by the proposed abalone farm and P.V. facility includes Blombos Strandveld along the coastline, Canca Limestone Fynbos and Albertinia Sand Fynbos, only the last of which is considered to have a “*vulnerable*” conservation status in terms of the South African National Biodiversity Assessment. The average annual temperature in Gouritsmond is 17.6 °C, while the rainfall averages 479 mm (climate-data.org, 2016).

3.3 Archaeological and Historical Background of the southern Cape

The southern Cape coast has been occupied for roughly 1 million years. *Homo sapiens* is likely to have evolved before 160,000 years ago (Jerardino and Marean 2010). The period between this point in time and the start of the Holocene at approximately 11,000 years ago is significant for understanding how humans have evolved. Our complex behavioural and cultural traits all developed during this time and are associated with the development of cognition and ‘modernity’ (Deacon and Deacon 1999, Marean et al 2014). This area of Africa is particularly interesting in terms of human origins, because, while the rest of the continent experienced extreme climatic variability during various periods of glacial maxima and marine transgressions, small pockets of South Africa could sustain thriving human populations.

Studies done along the southern Cape coastline have shown that the evolution of humans during the Middle and Later Stone Age depended largely on rich and varied resources (especially the more focussed and successful exploitation of coastal resources), optimal environmental patterns and the types of adaptive responses that humans had to pressure and population stress (Parkington 1984, 1986, 1988, 2008, Klein et al 2004, Steele and Klein 2005/2006, Högberg 2016). Extensive research has been conducted for the period between 160-50,000 years ago (Fisher et al 2010, Marean et al 2014). It has been suggested that the unique environmental and resource-rich nature of this area was a major factor which helped to sustain small populations of *Homo sapiens* that took advantage of the rich marine shellfish resources along the coast, large game on the open coastal plains, and smaller fauna abundant in the shrubland of the Fynbos Biome (Henshilwood and Marean 2003, Marean et al 2007, 2010). Additionally, carbohydrate-bearing plants such as geophytes within the highly diverse Cape Floral Region are known to have been a common food source for hunter-gatherers during both the Middle and Later Stone Age (Deacon and Deacon 1999, Parkington 2001b, de Vynck et al 2016). All these resources together (and their availability at different times during the year) would have offered mobile hunter-gatherers a varied diet of protein- and carbohydrate-rich foods.

The Later Stone Age, which lasted from roughly 40,000 years ago until historical times, is the final cultural period of southern African hunter-gatherer peoples after the evolution of human ancestors through the Early Stone Age (~ 3.3 million years ago (McPherron et al 2010, Harmand et al 2015) until ~250,000 years ago) and the Middle Stone Age (250,000 to ~40,000 years ago). The Later Stone Age is characterised as having a mixture of various types of stone tool industries as well as better-preserved organic materials (Goodwin and van Riet Lowe 1929, Deacon J. 1982, Barham and Mitchell 2008), and is significant in that it holds key evidence for the final stages of the modernisation of humans in terms of behaviour, adaptation to major environmental changes, technological advancements and symbolic development (Deacon, J. 1982, 1984, Barham and Mitchell 2008). The dense shell middens found along the shorelines of the southern Cape coast demonstrate the sustained exploitation of coastal resources over several thousands of years (Kaplan 1995, Parkington 2006) and hold a wealth of information about the diet, behaviour and technology of San hunter-gatherers.



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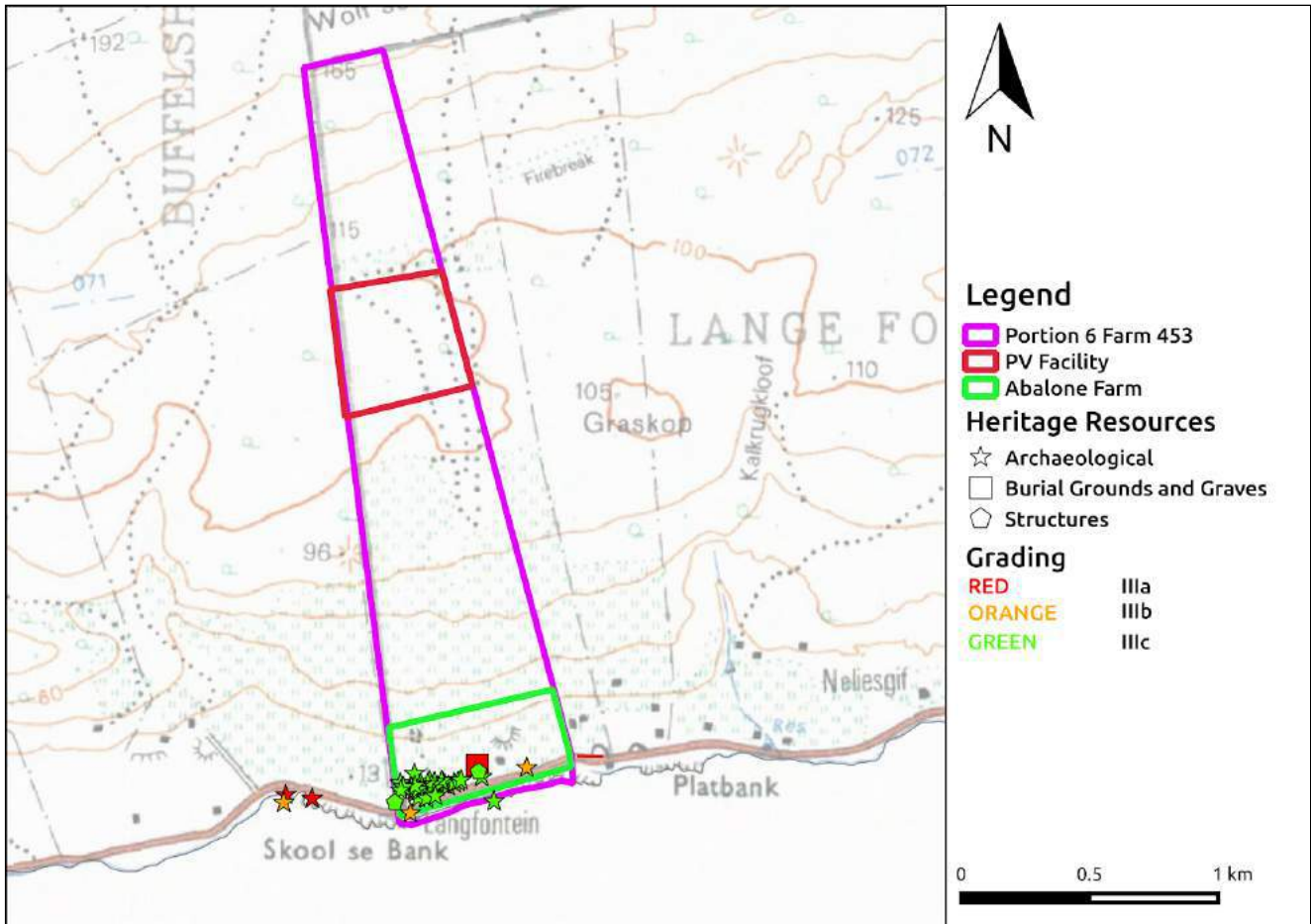


Figure 7. Map of recorded heritage resources near/within the proposed Gouritz abalone farm (Annexure 1).

Rapid sea level rise at around 13,000 years ago inundated a large portion of the coastal plains along the southern coast and many archaeological sites there have been lost. Following the Later Stone Age, research has been done on the more recent historical past, particularly towards understanding Khoi and San ethnographies to inform the more distant past (Bleek and Lloyd 1911, Bleek and Lloyd 1924, Bleek 1935, Wiessner 1984, Deacon and Dowson 1996).

Historically, the town of Gouritsmond was named after the Gouriqua Khoikhoi people that lived in the area. This seaside fishing village was established in 1915, however, the areas surrounding the river mouth were colonised by farmers by the early 1700s (Hessequa Tourism 2015).

3.4 Background history of Langefonteyn Farm 453

Buffelshoek 455 (now the Gourikwa Reserve to the west) and Langefonteyn 453 were settled by the Botha family during the mid 19th century. Daniel Botha, the original owner, kept Buffelshoek and divided Langefonteyn



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into smaller farms for each of his sons. Portion 6 of Langefonteyn 453 was formed and transferred to LM Botha in 1879.

Due to the many newly formed farm portions, settlement by new families increased along the coastline at the end of the turn of the 20th century. The central cottage was built during this period and most of the buildings built in the area at this time were simple farm cottages. The farm was used for subsistence fishing and farming with cattle, sheep, vegetables and planted pastures for cattle feed until the end of the 1970s.

A primary farm school was built on Portion 6 of Langefonteyn 453 c.1940 and was used for approximately 35 years. The cottage in the southwestern corner of the farm was the school building. Daniel Botha and his wife, brother and 3 children are buried on Langefonteyn in the cemetery, as well as 6 unknown sailors that were washed ashore c.1900. Buffelshoek was sold to Krygkor while most of the Langefonteyn farms were sold to the Reins family for use as a nature reserve in the late 1980s. The Reins family purchased Buffelshoek in the 1990s and Langefonteyn and Buffelshoek were once again being owned by one individual for a brief period of time. The area remained undeveloped and most of the structures were neglected along this stretch of coastline (see brochure in Appendix 7).

Buffelshoek was then sold onto the owners of the Gourikwa Reserve in the latter part of 2000 and a number of upgrades to the reserve took place. Portions of Langefonteyn were then sold off by the Reins family and Aquinion (Pty) Ltd purchased Portion 6 of Langefonteyn 453 in 2016.



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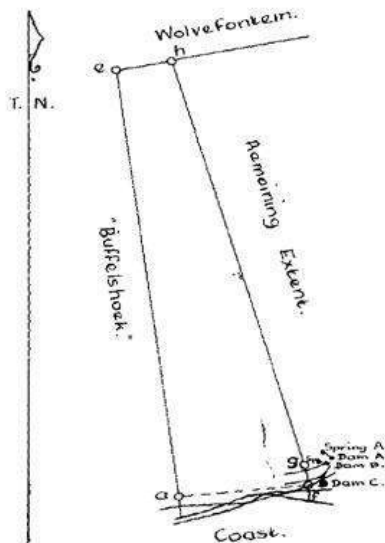
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1502/1899

The numerical data of this diagram are sufficiently consistent.

(Sgd) J.J. Bosman.

Examiner of diagrams.



Sides.		Angles.	
af	184.19	a	91.6.50
cg	34.55	f	85.43.10
gh	716.30	g	175.2.30
he	81.40	h	92.24.50
ea	731.92	e	95.42.40
Co-ordinates.			
	Y's		X's
a	0.00		0.00
f	+ 184.16	-	3.58
g	+ 182.25	+	30.91
h	+ 81.00	+	740.02
e	- 0.00	+	731.92
Rectilinear Area - 165 Morgen.			
Area as per Beacons - 171 Mor.			
407.5 Sq.Roods.			

Portion 6 of the farm Lange Fonteyn No. 453 RIVERSDALE

The above diagram let a Coast f g h e represents 172 Morgen & 53 Sq.Roods of Land, being Lot 4 of the portion of Langefontein situate in the Division of Riversdale F.C. Kafferkuil's River and transferred to J.L.H.Botha & others on the 27th February, 1879.

Bounded Nwds. by Wolffontein.
S " " Coast.
E " " Remaining Extent.
W " " Buffels-hoek.

Framed from actual Survey by me, (Sgd) C.E. Blore.
Govt. Surveyor.
Mossel Bay.
February, 1899.

Transfer 4585

14th June, 1899.

Marthinus C. Botha.

Marthinus C. Botha

C

AK-ABC
453/6 M.R.

Figure 8. SG Diagram, 1899.

4. IDENTIFICATION OF HERITAGE RESOURCES

4.1 Summary of findings of Specialist Reports

The Archaeological Impact Assessment conducted by Kaplan (2016, Annexure 2) notes that the proposed abalone farm is likely to impact on buried shell midden deposits, thinly disturbed stone tool collections, historical stone walling, a possible burial/grave near the entrance to the farm and the remains of a small fishtrap in the intertidal zone (Figure 7). Furthermore, unmarked burials, or buried shell middens and artefact sites may be exposed or uncovered during project-related earthworks and excavations. No archaeological resources were located in the northern portion proposed for the P.V. facility.

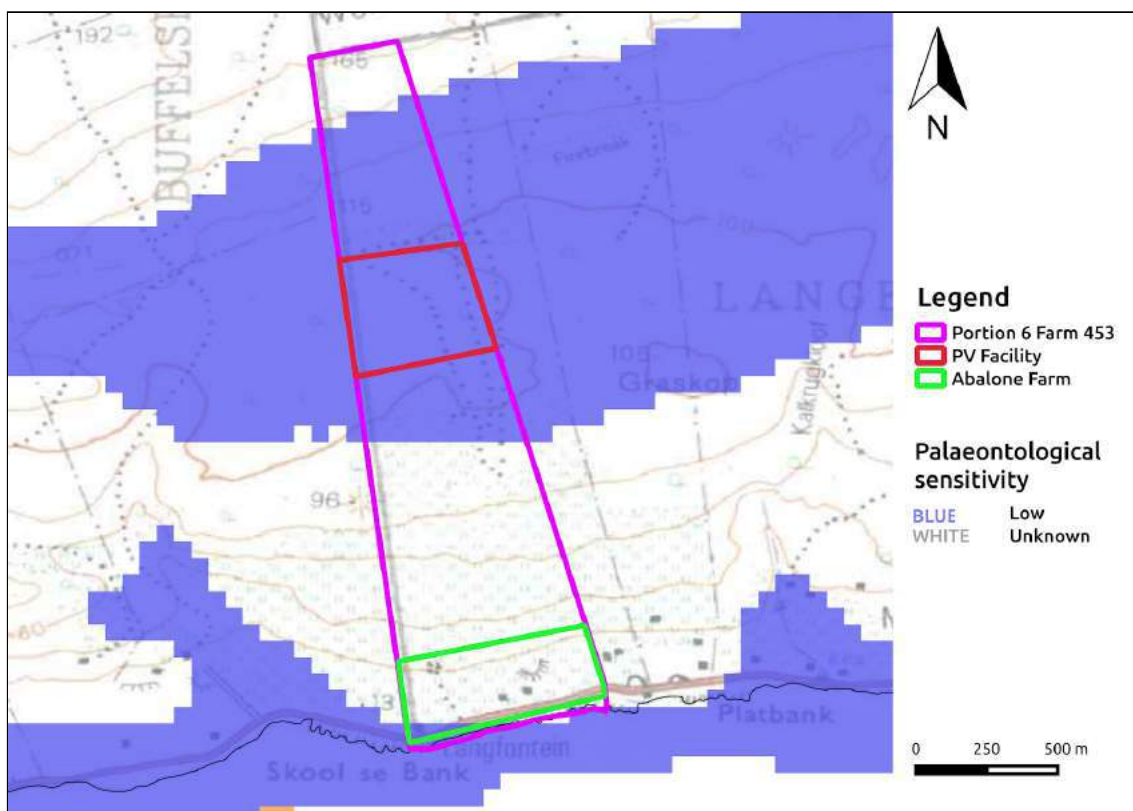


Figure 9. Palaeontological sensitivity of Farm Langefontein (See Annexure 1)

A Palaeontological Impact Assessment was completed by Pether (2016, Annexure 3) to ascertain the likely impacts on palaeontological resources. According to Pether, it is expected that the Wankoe Formation aeolianites will be intersected, with an impact to Quaternary coversand raised beach deposits of the Klein Brak Formation. The sparse, vertebrate fossil bone material that has been found in the coastal aeolianites is of profound scientific value and international interest. However, in consideration of the relatively limited depth of bulk earthworks it is not likely that a major fossil find will be made nor can it be predicted. The palaeontological sensitivity has therefore been rated as **MODERATE**, with a magnitude of **MEDIUM** (Pether 2016). The marine fossil shell content of the raised beaches of the Klein Brak Formation is of **LOW** palaeontological sensitivity. Due



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to the exposed coastal setting, the shell assemblages expected to be impacted are those comprised of modern species, the fossils of which are abundant, easily sampled and, in addition, natural exposures of these assemblages occur in many places along the coast.

A Visual Impact Assessment was conducted by PHS Consulting (2017, Annexure 4) as well as a Site & Landscape Plan by J.d.V Landscape Studio (Annexure 8). The majority of the site is covered in very dense vegetation on a substrate of dark brown coversands. The site is underlain by deep coastal sands which stretch from the seashore northwards to beyond the study site. The study site can be described as a gentle undulating slope, rising from the seashore northwards to the top of the coastal escarpment. The lower portion, at roughly sea level and along the road is relatively flat after which the landscape increases in steepness fairly quickly.

- Sea & Coastal Plain – Scenic value and visually exposed. An elevated stone mound and coastal thicket exists parallel to the road and the plain with screening qualities.
- Coastal slopes – Visually exposed with scenic value.
- Hills - Ridges visually sensitive and have scenic value. Valleys are visually absorptive.

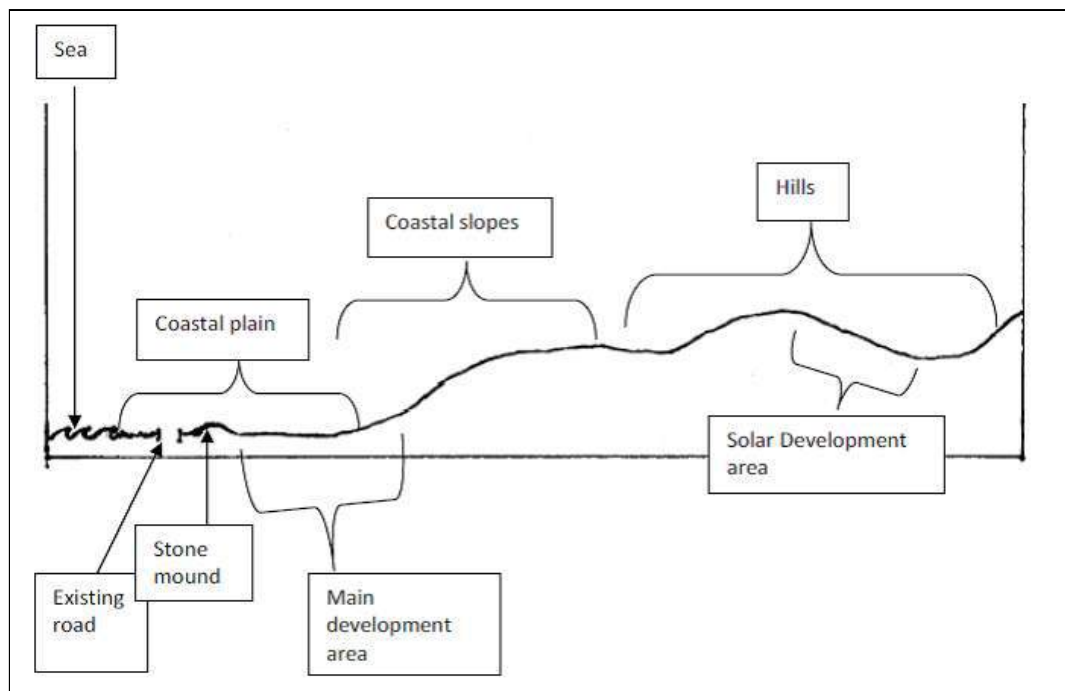


Figure 10. Schematic representation of the terrain



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Figures 11-14. Various 3D design angles of the proposed abalone farm.



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The hill basin where the solar array is to be located is within a view shadow and is therefore not visible to receptors. The proposed abalone farm is located on the coastal plain behind a secondary stone mound viewshed at the base of the coastal slopes and is therefore hidden from road users.

The proposed abalone farm is located at the foot of a gentle slope which limits visibility from the north, northeast and northwest. The proposed solar array indicated will be located on a northern slope which limits visibility from the south, southeast and southwest. Due to the continuous rise in the landscape, views from the north are also blocked. It is therefore anticipated that the solar component will not be visible to any receptors.

The assessment revealed that for the farm site next to the coastline, three limited view corridors exist:

1) **Narrow corridor northwest to southeast.** The receptors here are the Gouriqua Reserve houses located approximately 1.35 km from the proposed development with very limited sporadic views of the development area (due to the topography).

2) **Corridor from the west to the east.** The receptors here are Gouriqua Reserve infrastructure approximately 580m west of the development boundary. Due to the topography, the receptors are located in a slight dip relative to the proposed development area. In addition, the unit's primary scenic views are towards the southeast and the west. As such, views of the proposed development site are limited. The development is proposed to the east of the receptors and not in line with the orientation of the reserve units.

3) **Corridor from the east to west.** Although receptors within the corridor from the east are located within the zone of visual influence, visibility is negligible due to distance and topography. However, the proposed development will be visible from the direct neighbour located to the east of the development.

The assessment also revealed that for the solar array site, two view corridors exist from the east and west. The site is located in a natural basin with no receptors located to the east or west from the proposed solar array site.



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Figure 15. View of some of the buildings to the west on the Gourikwa Reserve.



Figure 16. View of the farm to the east of Ptn 6 of Langefontein 453.

4.2 Heritage Resources identified

The **Archaeological Impact Assessments** (Kaplan 1995, 2016) that have been carried out on this farm have identified 36 sites of significance within the farm boundary:

Structures

GRTZ36 and GRTZ37 (SAHRIS Site IDs: 105774 and 105775)

Two structures older than 60 years exist on the property proposed for development. GRTZ37 (SAHRIS Site ID 105775) includes a structure and an outbuilding (see Figures 17-22). The author has not been able to determine the exact year of construction when this structure was built, however, it is an early 20th century farm cottage with relatively thick walls, a loft door and window and evidence for stone-built foundations (see the plinth visible in Figure 20). According to Mr Rein, the previous owner of the property, this structure was used for staff accommodation and has been subject to internal alterations in addition to the external alterations and additions visible. No additions, alterations or demolitions are proposed and the building has been incorporated into the design layout of the development proposal.

Grading: Local, Low (Grade 3C)



Figure 17. Image showing GRTZ37 (left) and GRTZ36 (right)



Figure 18. GRTZ37 (1,2) & GRTZ36 (3,4)



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Figures 19 and 20. Close up images of GRTZ37



Figures 21 and 22. Outbuilding of GRTZ37 and site context shot

The second structure, GRTZ36 (SAHRIS Site ID 105774), located on the southwestern corner of the proposed development area, is an L-shaped structure that was previously used as a school, however, in the recent past it has been used as a holiday home. This structure is older than GRTZ37 (Figures 23-25). Neither structure will be impacted or altered by the proposed development. This building will be used for the manager's residence while GRTZ37 will be used as a visitors/information centre.

*Grading: Local, Low (**Grade 3C**)*



Figure 23. View of GRTZ36



Figures 24 & 25. Various views of GRTZ36

Burial Grounds & Graves

GRTZ01 (SAHRIS Site ID: 99002) & GRTZ38 (SAHRIS Site ID: 127255)

A possible grave was found in the Eskom servitude near the entrance to the farm. Comprising several round quartzite boulders, no grave goods such as glass jars were found and no head or footstone indicating a Christian burial is visible, suggesting that the feature might represent a pre-colonial burial. Some shellfish fragments (GRTZ02) were recorded a few metres from the stones.

Grading: Medium to High local significance (Grade 3A)

GRTZ38 is an historical cemetery created for the owners' family and relatives who lived on the farm in the past. The cemetery has been incorporated into the development plan with access via a designated footpath from the main complex. *Grading: Medium to High local significance (Grade 3A)*



Figure 26. Farm cemetery, GRTZ38

Stone Walling

GRTZ03 (SAHRIS Site ID: 99004)

A dry packed, partially collapsed, cobble stone wall was recorded 20m from the property fence alongside the coastal road. The standing wall is about 1m high and approximately 30m long. Assuming the feature is a boundary wall, it most likely dates to the late 1800s / early 1900s and may be contemporaneous with the tidal fishtrap (GRTZ07) – constructed with the same round beach cobbles. The surrounding wind shorn vegetation is extremely dense.

Grading: Local, Medium (Grade 3B)

Fish Traps

GRTZ07 (SAHRIS Site ID: 99011)

The remains of a fishtrap were found in the intertidal zone. The walls have mostly collapsed, but some form still exists. Research by Hine (2008) has indicated that fishtraps on the southern Cape coastline were constructed by “bywoners” in the late 1800s and early 1900s who rented properties from absent farmers at the time.

Grading: Medium (Grade 3C)

Artefacts

GRTZ21 (SAHRIS Site ID: 99025)

A few fragments of shell and quartzite stone were identified in the back dune area behind the dune cordon.

Grading: Medium (Grade 3C)

Shell Middens

RNR 1 (SAHRIS Site ID: 98974)

“Reins Nature Reserve archaeological site 1” is a shell midden site containing abundant scatters of fragmented and crushed marine shell, numerous stone artefacts, pieces of ostrich eggshell and pottery. The bones of seal, small antelope and bird (cormorant) were also found (Kaplan 1995, Annexure 3).

Grading: Medium (Grade 3B)

SAHRIS Site IDs: 99003, 99005, 99006, 99007, 99012 - 99024, 99026 - 99039

It is clear that most of the remains are concentrated on the narrow, frontal dune cordon in the southwestern portion of the proposed development site, alongside the coastal road. Shellfish deposits are visible on patches of soft brown sands inside the fence line and alongside the coastal track, while an extensive, albeit patchy, scatter of fragmented shellfish is visible on the flat top of the dune cordon itself. Most of the shellfish on the dune cordon appears to be *in situ*, while some compacted shell also appears in places.

In contrast, much of the shellfish on the loose brown sands below the dune cordon is associated with burrowing and dune mole rat activity, indicating that shell midden deposits occur below the surface sands, extending into



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the dune slack area as well. As with most of the shell midden deposits recorded so far in the southern Cape, the shellfish identified on this site is dominated by *Turbo sarmaticus* whose habitat is intertidal while some limpets such as *Scutellastra longicosta* and *S. cochlear* (both low – mid & infratidal species), were also recorded. Operculum (the hard knobbly foot bone of *T. sarmaticus*) is, not surprisingly, present, while a few fragments of perlemoen (*Haliotis*), and some whelk and low spring tide periwinkle (*Diloma sinensis*) were also recorded.

Table 1: Details of Archaeological sites with SAHRIS Site IDs known in the vicinity of the proposed abalone farm.

No.	SAHRIS SITEID	Site Name	Site Type	Grading	Latitude	Longitude
1	98974	RNR 1	Shell Midden	Grade IIIb	-34.384779	21.766872
2	99002	GRTZ01	Burial Grounds & Graves	Grade IIIa	-34.38311	21.76971
3	99003	GRTZ02	Shell Midden	Grade IIIc	-34.383517	21.7699
4	99004	GRTZ03	Stone walling	Grade IIIb	-34.3832	21.7718
5	99005	GRTZ04	Shell Midden	Grade IIIc	-34.383867	21.768033
6	99006	GRTZ05	Shell Midden	Grade IIIc	-34.383783	21.768233
7	99007	GRTZ06	Shell Midden	Grade IIIc	-34.383783	21.768333
8	99011	GRTZ07	Intertidal	Grade IIIc	-34.384367	21.770417
9	99012	GRTZ08	Shell Midden	Grade IIIc	-34.383833	21.768483
10	99013	GRTZ09	Shell Midden	Grade IIIc	-34.383733	21.768733
11	99014	GRTZ10	Shell Midden	Grade IIIc	-34.383683	21.7689
12	99015	GRTZ11	Shell Midden	Grade IIIc	-34.383633	21.769017
13	99016	GRTZ12	Shell Midden	Grade IIIc	-34.383717	21.768267
14	99017	GRTZ13	Shell Midden	Grade IIIc	-34.38365	21.7682
15	99018	GRTZ14	Shell Midden	Grade IIIc	-34.3837	21.7679
16	99019	GRTZ15	Shell Midden	Grade IIIc	-34.383917	21.767867
17	99020	GRTZ16	Shell Midden	Grade IIIc	-34.3838	21.767767
18	99021	GRTZ17	Shell Midden	Grade IIIc	-34.383667	21.767683
19	99022	GRTZ18	Shell Midden	Grade IIIc	-34.38375	21.767617
20	99023	GRTZ19	Shell Midden	Grade IIIc	-34.383767	21.767317
21	99024	GRTZ20	Shell Midden	Grade IIIc	-34.3838	21.767133
22	99025	GRTZ21	Artefacts	Grade IIIc	-34.3834	21.76705
23	99026	GRTZ22	Shell Midden	Grade IIIc	-34.383883	21.766933
24	99027	GRTZ23	Shell Midden	Grade IIIc	-34.383983	21.76705
25	99028	GRTZ24	Shell Midden	Grade IIIc	-34.384083	21.767067
26	99029	GRTZ25	Shell Midden	Grade IIIc	-34.384017	21.767467
27	99030	GRTZ26	Shell Midden	Grade IIIc	-34.38425	21.767517
28	99031	GRTZ27	Shell Midden	Grade IIIc	-34.38425	21.767217
29	99032	GRTZ28	Shell Midden	Grade IIIc	-34.384017	21.767233
30	99033	GRTZ29	Shell Midden	Grade IIIc	-34.38395	21.7672
31	99034	GRTZ30	Shell Midden	Grade IIIc	-34.383833	21.767067
32	99035	GRTZ31	Shell Midden	Grade IIIc	-34.383733	21.76645
33	99036	GRTZ32	Shell Midden	Grade IIIc	-34.383867	21.766583
34	99037	GRTZ33	Shell Midden	Grade IIIc	-34.383983	21.766467
35	99038	GRTZ34	Shell Midden	Grade IIIc	-34.384267	21.767567



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36	99039	GRTZ35	Shell Midden	Grade IIIc	-34.384183	21.767933
37	105774	GRTZ36	Structure	Grade IIIc	-34.3843872667	21.7661924135
38	105775	GRTZ37	Structure	Grade IIIc	-34.3833464251	21.7697783898
39	127255	GRTZ38	Burial Ground	Grade IIIa	-34.383779	21.768237

Cultural Landscape

According to the Visual Impact Assessment (PHS Consulting, 2017, Annexure 4) and the Site & Landscape Plan by J.d.V Landscape Studio (Annexure 8), the visual significance rating for the area is based on the scenic value of the Hessequa Coastline. The same could be said for the heritage significance of the Gouritz cultural landscape. According to the ICOMOS SA Declaration on Museums and Cultural Landscapes 2016, "The concept of cultural landscapes refers to spaces where there is an interaction between human culture and places. This approach considers not only the sum of the individual parts, but the relationship between ecological and cultural systems. It acknowledges that people impact on nature and that the natural environment provides a framework within which culture evolves." Further, "the concept of cultural landscapes views the landscape holistically, and is a planning and managing tool used to describe elements of a landscape and the cultural value attached to them. It provides a conceptual framework for the heritage sector to contribute to an integrated development plan that takes into account heritage conservation, spatial planning and sustainable social, economic and environmental development."

The sparsely developed surrounding agricultural area and the interface with the coastline has shaped this landscape. The built environment is currently characterised by old farm houses, some ruined and dilapidated, with newer small agricultural and holiday home structures being established in pockets along the coastline. The dearth of intense development along the coastline between Gouritsmond and Still Bay has resulted in the retention of the landscape's wilderness integrity, however recent tourism development along this coastline is beginning to alter this pattern. The neighboring Gourikwa Reserve to the west is the predominant tourist attraction in the immediate area and extensive tourism infrastructure has been developed there already. Other smaller tourism establishments exist between the site and Gouritsmond in addition to lifestyle, agricultural and conservation farms. The coastline is popular for its shore angling and is frequented by local and visiting fishermen.

In light of the above, the cultural landscape significance of the area relies on the interaction between rural, agricultural and tourism development and large wilderness spaces. Impacts to the cultural landscape significance of this area can therefore be managed by ensuring that this interaction is respected in the proposed development. Sufficient wilderness space is being retained on the property and the VIA and Site & Landscape Plan recommends that the development should conform to the local architecture. The abalone farm development along the coastline remains in keeping with the current location of buildings situated on adjacent properties and the massing of buildings has been kept to one storey besides the slightly higher pitched building housing the proposed hatchery. While the P.V. development is not a typology that is common in this cultural



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landscape, its impacts will be minimised due to its remote location and visual screening by the landscape (see the attached sketch plans of the proposed interventions). Detailed design proposals for the buildings, roofs, paving, roads, fences and indigenous vegetation landscaping are included in Appendix 8 to ensure the abalone farm retains the character of a rustic, rural farm rather than an industrial development.

4.3 Mapping of heritage resources

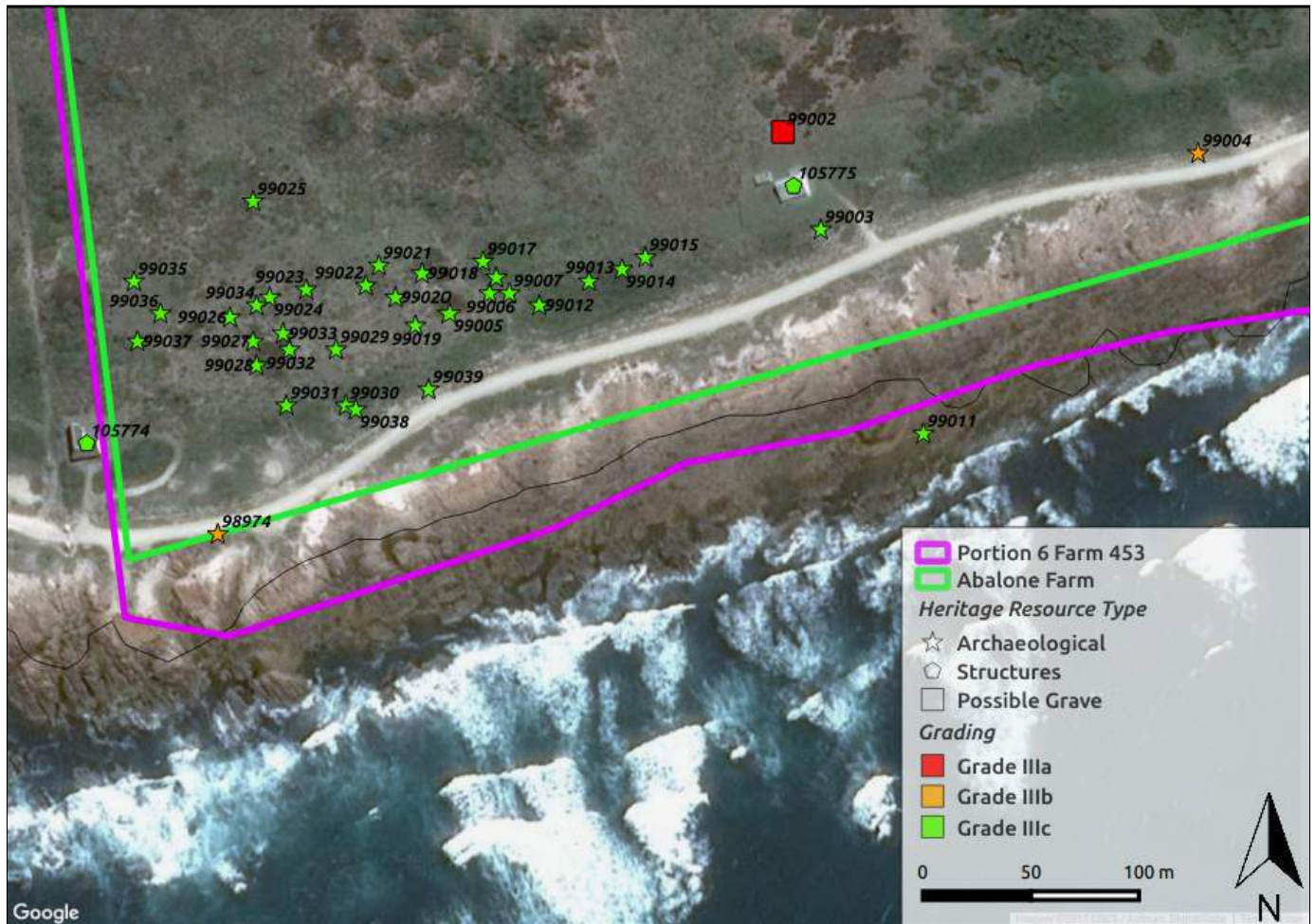


Figure 27. Revised Site Layout Plan indicating the boundary of proposed Alternative 2 (preferred) in relation to identified heritage resources (with SAHRIS site IDs indicated)



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Figure 28. Constraints Map from the VIA (Annexure 4) indicating the areas suitable for development within the proposed Alternative 2 (preferred) in relation to identified heritage resources (post-archaeological survey). Trackpaths marked in red.



Figure 29. Archaeological survey trackpaths covering the abalone farm and the P.V. facility.



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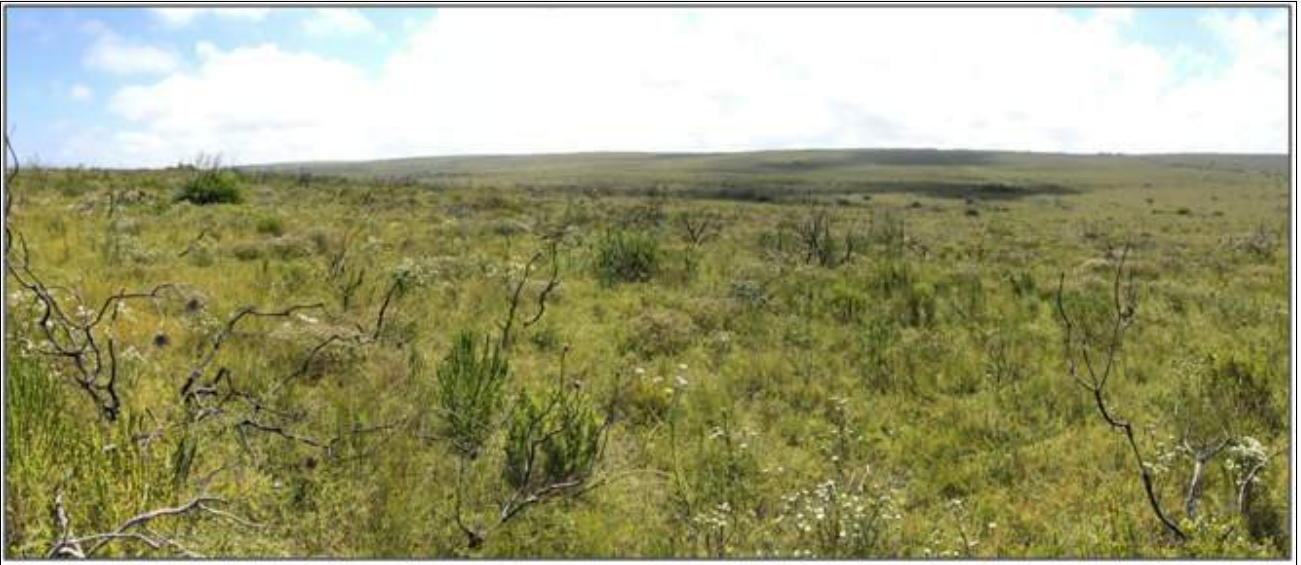


Figure 30. Proposed location site for the new solar array. View facing northeast



Figure 31. Proposed location site for the new solar array. View facing northeast



Figure 32. Proposed location site for the new solar array. View facing north



Figure 33. Proposed location site for the new solar array. View facing northeast

5. ASSESSMENT OF THE IMPACT OF THE DEVELOPMENT

5.1 Assessment of impact to Heritage Resources

The impact of the proposed development will be limited, and will most likely occur during the Construction Phase of the project (i. e. excavations for building foundations, terracing cutback, installation of services, etc).

Impacts during construction

The following impacts are anticipated for the **Photovoltaic facility**:

- Considering the paucity of archaeological sites in this area of the farm, significant impacts on archaeological resources are not anticipated.
- Considering the low fossil sensitivity of this area of the farm, negligible impacts on palaeontological resources are anticipated.
- Considering the visual impacts on the cultural landscape, the P.V. facility has been scaled down and placed on a north-facing leeward slope formed by the undulating dune cordon to shield the visual impact of the facility when viewed from the coast. The impact of the P.V. facility is not permanent on the visual experience of the landscape as it can be removed once the facility has run its economic course as opposed to archaeological resources which are non-renewable.

The following impacts are anticipated for the **abalone farm**:

- Construction activities, including bulk earthworks (for example foundation excavations for buildings, terrace cuttings etc), and excavations for services (water pipelines & installation of cables for the solar array), will likely impact on fragile heritage resources (refer to impact assessment table 2).
- Unmarked (Later Stone Age) human remains may also be uncovered.



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- Although structures of some heritage significance fall within the development footprint, these will not be altered or impacted by the proposed development.
- Impacts on the rural cultural landscape will be made as the development entails a denser, more concentrated form of operations than the currently loose-knit farmsteads and outbuildings which dot the area.

Table 2: Impacts to archaeological resources during the Construction Phase from Appendix 2

Potential impact on archaeological resources	
Nature of impact	Damage to, or destruction of archaeological resources
Extent and duration of impact	Localized short term
Intensity of impact	Potentially high – particularly raised dune cordon
Probability of occurrence	Probable
Degree to which impact can be reversed	Reversible
Irreplaceability of resources	Low
Cumulative impact prior to mitigation	High
Significance of impact pre-mitigation	Potentially High
Degree of mitigation possible	High
Proposed mitigation	Test excavations to be carried out to determine significance of sub surface archaeological deposits. If exposed, burials must be removed/left alone Bulk earthworks to be monitored by a professional archaeologist
Cumulative impact post mitigation	Low
Significance after mitigation	Insignificant

Operational Impacts

Once the development is complete, there are unlikely to be additional impacts to archaeological heritage resources. However, impacts are likely in terms of visual impacts and impacts to the cultural landscape. Recommendations are included in the VIA and Site & Landscape Development Plan reports to mitigate these impacts.

Table 3: Impacts to archaeological resources during the Operational Phase from Appendix 2

Potential impact on archaeological resources	
Nature of impact	Damage to or destruction of archaeological resources
Extent and duration of impact	Insignificant
Intensity of impact	Very Low
Probability of occurrence	Very Low
Degree to which impact can be reversed	Very Low
Irreplaceability of resources	Very Low
Cumulative impact prior to mitigation	Very Low
Significance of impact pre-mitigation	Very Low
Degree of mitigation possible	Very Low
Proposed mitigation	None required
Cumulative impact post mitigation	Low
Significance after mitigation	Insignificant

It must be noted that any additional excavation work that occurs after the completion of the proposed development, that may not trigger a NEMA process, is likely to impact on archaeological resources and will therefore require a permit in terms of section 35 of the National Heritage Resources Act (Act 25 of 1999).

Any proposed alterations to existing structures within the development footprint during the Operational Phase will require an application to HWC in terms of section 34 of the National Heritage Resources Act (Act 25 of 1999).

5.2 Sustainable Social and Economic Benefit

The closest town to the proposed development area is Gouritsmond, which consists of a small coastal community. The area proposed for development is surrounded by active agriculture, conservation and tourism activities. Employees will be sourced from Riversdale, Albertinia and other, larger towns nearby. The proposed development is in line with the planning policies and IDP for the municipal area, in that it promotes job creation, investment in the area, skills transfer, sustainable seafood harvesting, alternative energy use (solar) and sustainable development.

Table 4: Details of Socio-Economic Benefits of the proposed development from the BAR

What is the expected capital value of the activity on completion?	R 350,000,000.00	
What is the expected yearly income or contribution to the economy that will be generated by or as a result of the activity?	R 150,000,000.00	
Will the activity contribute to service infrastructure?	YES	NO
How many new employment opportunities will be created in the construction phase of the activity?		
What is the expected value of the employment opportunities during the construction phase?	R	
What percentage of this will accrue to previously disadvantaged individuals?		
How will this be ensured and monitored (please explain):		
How many permanent new employment opportunities will be created during the operational phase of the activity?	200	
What is the expected current value of the employment opportunities during the first 10 years?	R 150,000,000.00	
What percentage of this will accrue to previously disadvantaged individuals?	66 %	
How will this be ensured and monitored (please explain):		
<ul style="list-style-type: none">• ABALONE FARMING IS A HIGHLY LABOUR INTENSIVE ACTIVITY. THE FARM NEEDS LABOUR TO OPERATE.• THIS IS UNLIKELY TO CHANGE DRAMATICALLY IN THE NEXT 10 YEARS.		

5.3 Proposed development alternatives

ALTERNATIVE 1:

An approximate 750 ton abalone farm, in one phase comprising of the following:

- 12 ha production area



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- Hatchery
- Pumphouse
- Sump located at -2m sea level, gravity fed with 4 x 1.2 M pipelines
- Generator room
- Canteen 1 to cater for 180 employees
- Canteen 2 to cater for 180 employees
- Workshop
- Parking area
- Admin and processing
- Effluent / outgoing channel / pipeline
- 4 MVA solar array of approximately 6 ha
- Solar control and grid tie in room
- Borehole

Total area = approximately 18 ha

This alternative was the applicant's first concept and had limited specialist input.

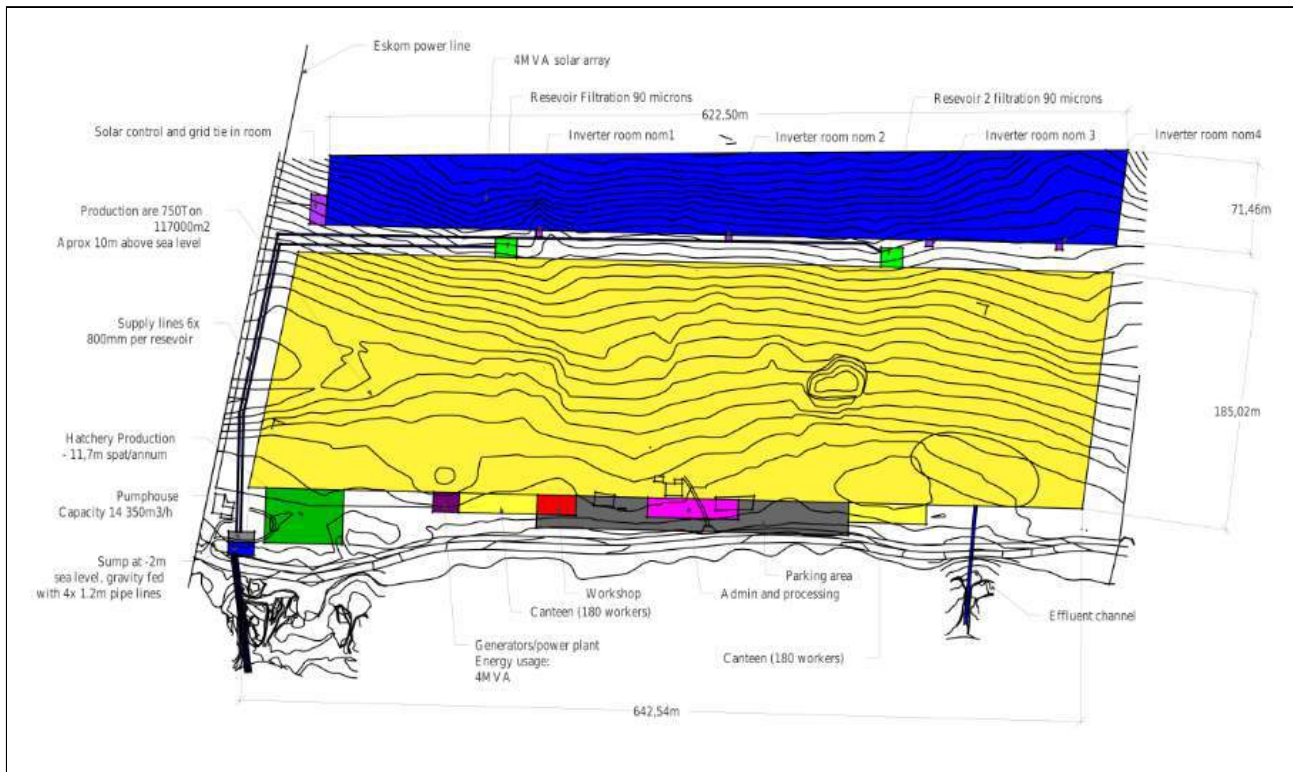


Figure 34. Site Layout Plan indicating proposed Alternative 1

ALTERNATIVE 2: PREFERRED

An approximate 440 ton abalone farm, comprising of two phases. (Note that the sizes and volumes described below are approximate):

- 7.1 ha production area, split into two phases
- Phase one – 3.7 ha, 230 ton production
- Phase two – 3.4 ha, 210 ton production
- Hatchery (3400 m²)
- Pumphouse and sump – 500 m², with a total pumping capacity of 12 000m³/h
- Filtration reservoir – 530 m², includes drum filters for the filtering of incoming seawater
- Basket cleaning area – 1000 m² for the cleaning and repairing of the abalone baskets
- Split and grading rooms – 95 m² x 8 rooms for the splitting and size grading of the abalone stock
- Blower and feed stores – 35 m² x 16 rooms, used to securely house feedstock from vermin / pests.
Blower rooms – soundproof for air supply
- Diesel store – 173 m², on site diesel storage of 80 000
- Refuse area and package plant – 600 m²
- Power transmission room – 800 m² for back up generators and main distribution systems
- Canteen – 1025 m², containing canteen, ablutions and lockers for employees
- Workshop – 450 m² for maintenance and repairs
- Parking area – 3930 m², comprising of entrance access and parking
- Admin / office building – 600 m² for admin staff
- Transfer and pre-processing building – 1100 m², to transfer animals from one farm to the next and to prep animals for transport for processing
- Effluent / outgoing channel / pipeline – transfers effluent sea water, possible surf zone discharge or beyond surf zone, dependent on the conditions of the cwdp
- Solar array of approximately 6.14 ha with an output capacity of 2.2 MW
- Inverter room – 225 m², used to house inverters to convert solar to usable power and step up into Eskom line at 11kV
- Eskom overhead line - already existing
- Jeep track to solar farm / P.V. – 1.7 km, two track informal road for servicing the site
- Borehole

Total area = approximately 16 ha

Note that this alternative has evolved with specialist input resulting in no development areas across the site. Specialist comment has also resulted in the creation of two smaller production areas with ecological no-go areas in between. The farm has also been set back from the coast as recommended by the coastal setback line



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and climate change specialist. Important archaeological sites have also been avoided. The solar farm has also been shifted north on the farm to manage the potential visual impact that the solar array may have on neighbouring landowners and to allow optimal functionality.

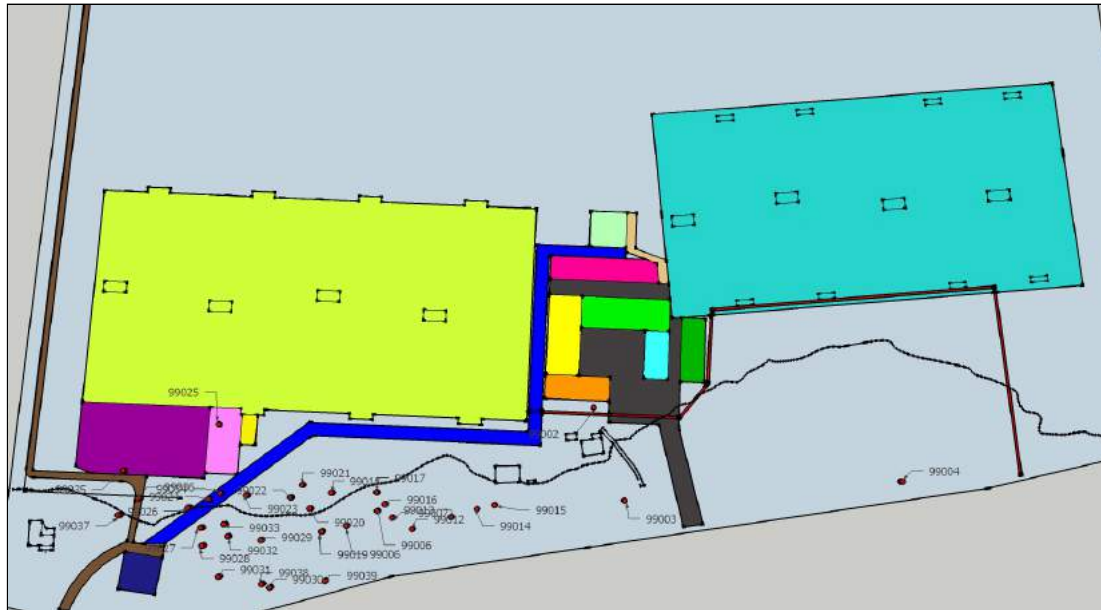


Figure 35. Revised Site Layout Plan indicating the infrastructure layout of proposed Alternative 2 (preferred) in relation to identified heritage resources (pre-archaeological survey) with their SAHRIS site IDs indicated.

Most of the sites identified by Kaplan (2016) fall below the 7 m contour line and, as such, it is agreed that the majority of the infrastructure for the proposed development will be located above the 7m contour line. This complies with the recommendations of the coastal setback engineers. The proposed no. 9 pumphouse (Figure 35) is located within the 100 metre visual constraints buffer that has been identified for the proposed development. The location of the pumphouse in Alternative 2 will not impact any of the sites identified in Kaplan's report (2016).

The no. 17 water lines (Figure 35) will impact some of the resources identified by Kaplan (2016), and, as such, archaeological monitoring is recommended to mitigate this impact. The location of the pump itself must be below the 7m contour line, and, due to the position of intake and height above sea level, must be located in the southwest corner of the proposed development area. In this regard, while identified resources will be impacted by the installation of the pump and water lines, this impact can be mitigated through test excavations and archaeological monitoring as per the recommendations below.

In addition, it is noted that Alternative 2 will have a medium to low significance impact overall, with the solar array impacts being *improbable* and the impacts of the proposed abalone farm *probable* over the short to



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medium term. Alternative 2 will have a local *moderate to marginal visibility*, as well as *medium to high compatibility* where effective screening and design influence is possible due to the solar array location and by implementing design and layout guidelines as mitigation.

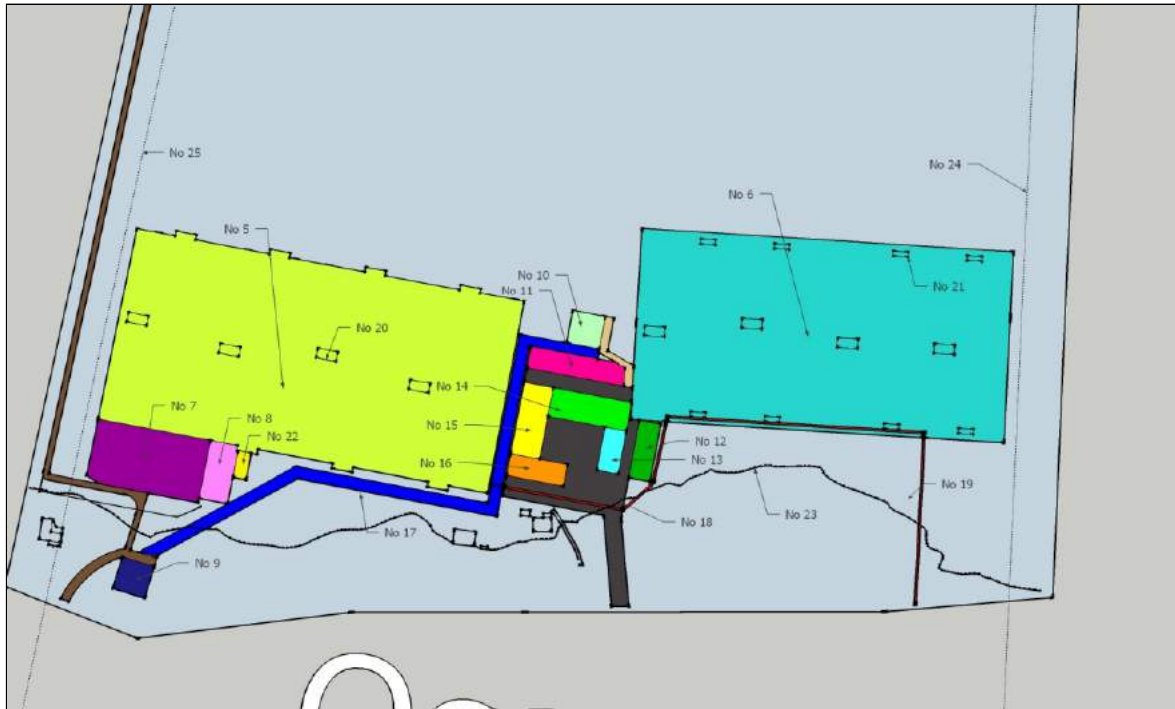


Figure 36. Revised Site Layout Plan indicating the infrastructure layout of proposed Alternative 2 (preferred).

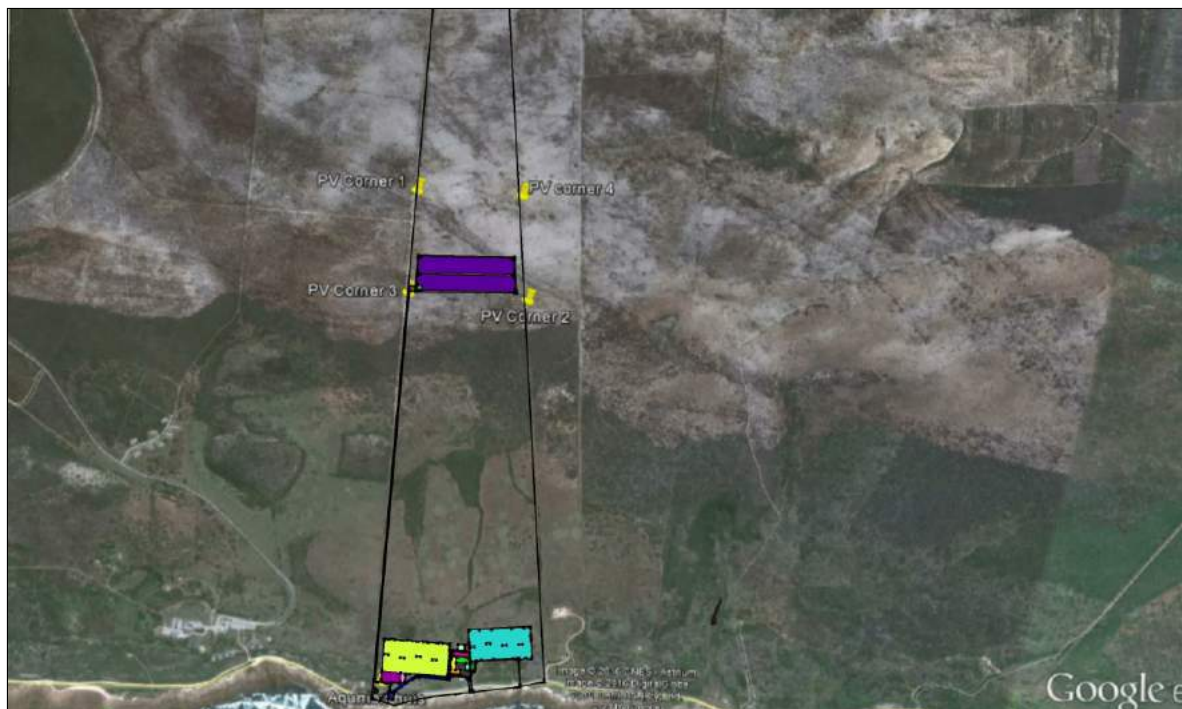


Figure 37. Site Layout Plan indicating the proposed Alternative 2 (preferred)



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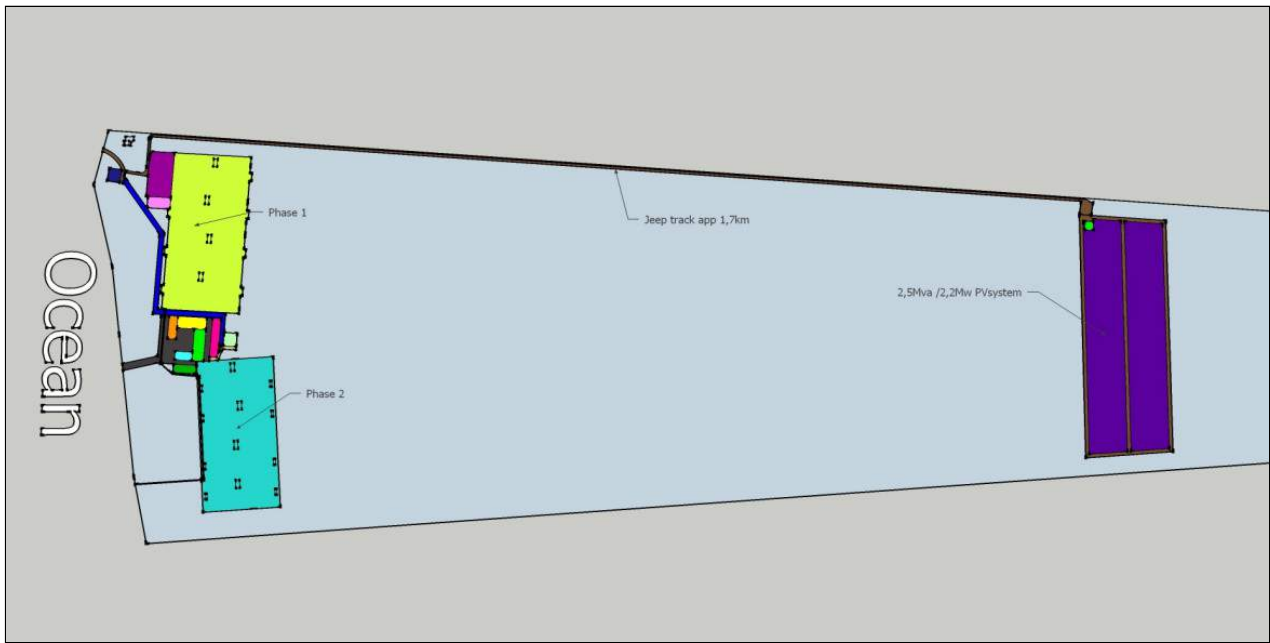


Figure 38. Site Layout Plan (close up) indicating the proposed Alternative 2 (preferred)

ALTERNATIVE 3:

No-go alternative.

6. RESULTS OF PUBLIC CONSULTATION

The Integrated HIA was provided to the Local Authority for consultation from 26 January 2017 to 26 February 2017. According to the HWC website (<http://www.hwc.org.za/conservation-bodies>) there are no Heritage Conservation Bodies registered for this area. In addition, the HIA has been circulated as part of the Public Participation Process for the Draft BAR (see Table 5 below). Please see Appendix 5 for evidence of the PPP.

No comment from the Local Authority has been received by 7 March 2017.

On 8 March 2017, the EAP attended a meeting with the Local Authority as well as a public meeting in Gouritsmond for this project. The main issues raised related to socio-economic change and the access route through town. No heritage comments were received.



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Table 5: Details of Draft BAR PPP from the Draft BAR

1. Were all potential interested and affected parties notified of the application by -			
(a) fixing a notice board at a place conspicuous to the public at the boundary or on the fence of -			
(i) the site where the activity to which the application relates is to be undertaken; and	YES X	DEVIATED	
(ii) any alternative site mentioned in the application;	YES X	DEVIATED	
(b) giving written notice to -			
(i) the owner or person in control of that land if the applicant is not the owner or person in control of the land;	YES X	N/A	
(ii) the occupiers of the site where the activity is to be undertaken and to any alternative site where the activity is to be undertaken;	YES X	DEVIATED	
(iii) owners and occupiers of land adjacent to the site where the activity is to be undertaken and to any alternative site where the activity is to be undertaken;	YES X	DEVIATED	
(iv) the municipal councillor of the ward in which the site and alternative site is situated and any organisation of ratepayers that represent the community in the area;	YES X	DEVIATED	
(v) the municipality which has jurisdiction in the area;	YES X	DEVIATED	
(vi) any organ of state having jurisdiction in respect of any aspect of the activity; and	YES X	DEVIATED	
(vii) any other party as required by the competent authority;	YES X	DEVIATED	
I placing an advertisement in -			
(i) one* local newspaper; and	YES X	DEVIATED	
(ii) any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;	YES	DEVIATED	N/A X
(d) placing an advertisement in at least one* provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or local municipality in which it is or will be undertaken.	YES	DEVIATED	N/A X
2. Provide a list of all the state departments that were consulted:			
<ul style="list-style-type: none">- DEADP- DAFF- DEADP OCEANS AND COASTS- APPLICABLE ROADS AUTHORITY- HESSEQUA BAY MUNICIPALITY- EDEN DISTRICT MUNICIPALITY- HERITAGE WESTERN CAPE- GOVERNMENT OF ENVIRONMENTAL AFFAIRS AND DEVELOPMENT PLANNING : POLLUTION MANAGEMENT- GOVERNMENT OF ENVIRONMENTAL AFFAIRS AND DEVELOPMENT PLANNING : SPATIAL PLANNING AND COASTAL IMPACT MANAGEMENT- GOVERNMENT OF ENVIRONMENTAL AFFAIRS AND DEVELOPMENT PLANNING : TRANSPORT AND PUBLIC WORKS- CAPE NATURE- DOA- BGCMA			

<p>3. Please provide an overall summary of the Public Participation Process that was followed. (The detailed outcomes of this process must be included in a comments and response report to be attached to the final Basic Assessment Report (see note below) as Appendix F).</p> <p>THE DRAFT BAR WILL BE MADE AVAILABLE FOR A 30 DAY PERIOD FOR IAPS TO REGISTER AND COMMENT. NOTICEBOARDS WILL BE PLACED ON SITE, A NEWSPAPER ADVERTISEMENT WILL BE PLACED IN THE LOCAL NEWSPAPER, ALL LANDOWNERS ADJACENT TO THE SITE WILL BE NOTIFIED VIA REGISTERED MAIL AND ORGANS OF STATE WILL BE NOTIFIED AND PROVIDED WITH COPIES OF THE DOCUMENTS, ACCORDINGLY. THE APPLICATION WILL THEN BE SUBMITTED TO DEADP, AFTER WHICH THE FINAL BAR WILL BE CIRCULATED TO REGISTERED IAPS FOR A FURTHER 30 DAY PUBLIC PARTICIPATION PERIOD, BEFORE BEING SUBMITTED TO DEADP.</p> <p>THE CWDP WILL ALSO CIRCULATED TO ALL I&APS.</p>
--

7. CONCLUSION AND RECOMMENDATIONS

The proposed construction at the Gouritz Abalone Farm will result in sustainable development, local economic growth, job creation and skills transfer. There is a market demand for farmed abalone for export. Due to the high archaeological sensitivity of the area in which the farm is located, however, the proposed development is likely to impact on significant archaeological heritage resources.

Alternative 2 (preferred) has evolved with guidance from the specialist team and therefore includes 'no development areas', buffers, and test excavations for potential archaeological materials. This has resulted in a smaller alternative with fewer impacts than the previous alternative. The coastal waters discharge permit (CWDP) will ensure that effluent water quality is monitored and adheres to acceptable standards. Mitigatory measures have also been introduced to soften and break up the spatial layout, massing and architectural design in order to retain as much of the rural landscape character of the area.

The impacts of the proposed development of **Alternative 2** can be mitigated through the implementation of the recommendations below.

- Shovel testing must be undertaken to determine the significance of subsurface archaeological deposits. The focus of test excavations will be on the narrow dune cordon in the southwestern portion of the proposed development site. This will require the submission of a workplan to HWC for approval.
- The historic stone wall (SAHRIS Site ID: 99004) alongside the gravel road (inside the footprint area) must be protected and incorporated into the final development proposal. A 10m protective buffer is required.
- The possible grave/burial (SAHRIS Site ID: 99002) in the Eskom servitude must be avoided. The 'grave' must be demarcated (possibly enclosed inside a small fence).
- Bulk earthworks (i. e. excavations for building foundations, terracing cut backs, & services) must be monitored by a professional archaeologist. The site must be inspected once a week by the archaeologist during the construction phase of the project.
- It is not necessary for the archaeologist to monitor vegetation clearing operations, but the existing structures must not be impacted or altered as part of the proposed development.
- The Environmental Control Officer (ECO) must be briefed on site by the archaeologist prior to the commencement of site clearing. The site must also be inspected once vegetation clearing has been completed.
- If any unmarked human remains are exposed or uncovered during excavations and earthworks, these must immediately be reported to Heritage Western Cape (Att: Mr Andrew September), or the archaeologist (Jonathan Kaplan 082 321 0172).
- The HWC Fossil Finds Procedure must be implemented.
- The mitigation recommendations included in section 5 of the VIA Report (PHS Consulting, 2017, Annexure 4) must be implemented and adhered to.



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- The mitigation recommendations in Site and Landscape Development Plan by J.d.V Landscape Studio (Annexure 8) must be adhered to pertaining to the landscaping, massing and architectural design guidelines.
- The above recommendations must be incorporated into the Environmental Management Plan (EMP) for the proposed development.

Any additional excavation work that occurs after the completion of the proposed development that may not trigger a NEMA process is likely to impact on archaeological resources and will therefore require a permit in terms of section 35 of the National Heritage Resources Act (Act 25 of 1999).

Any proposed alterations to either existing structure within the development footprint during the Operational Phase will require an application to HWC in terms of section 34 of the National Heritage Resources Act (Act 25 of 1999).

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APPENDICES



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APPENDIX 1: Heritage Screener

HERITAGE SCREENER

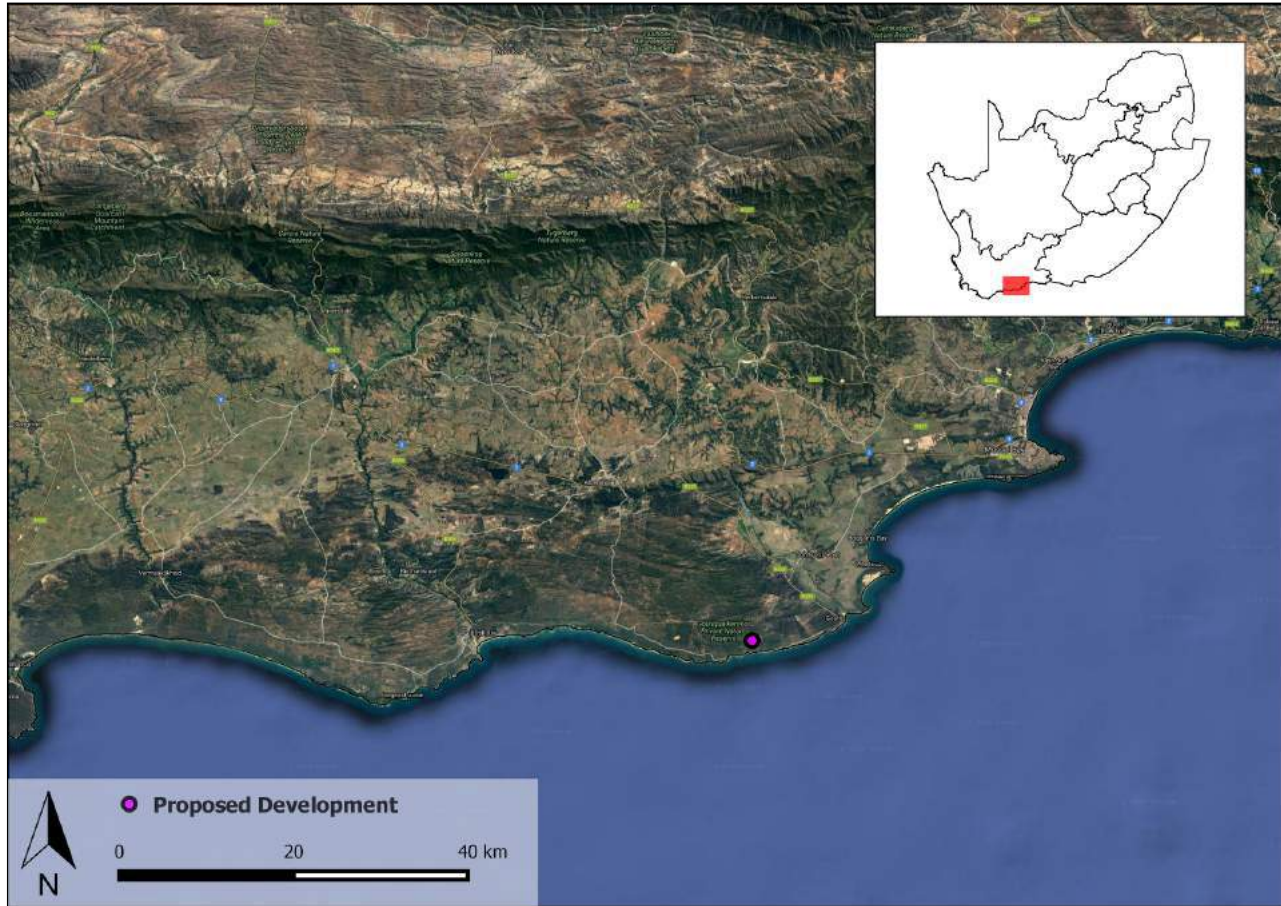
CTS Reference Number:	CTS16_050	
HWC Case Number:	16100429	
Client:	PHS Consulting	
Date:	04 October 2016	
Title:	Proposed Gouritz Abalone Farm On A Portion Of Portion 6 Of Farm 453 Lange Fontein, Hessequa Municipality, Western Cape	
Recommendation by CTS Heritage Specialists: (Type 3)	<p>RECOMMENDATION: The heritage resources in the area proposed for development have not been sufficiently recorded - The coastal area is highly sensitive for Stone Age archaeology and possible inland grave sites associated with ruins. A significant portion of the proposed development area has unknown palaeontological significance. It is therefore recommended that a Heritage Impact Assessment is required consisting of:</p> <ul style="list-style-type: none">- An assessment of impacts to archaeological heritage resources, focusing on Stone Age coastal archaeology and burial grounds or graves.- An assessment of impacts to palaeontological heritage resources, focusing on the areas of unknown fossil sensitivity.	

Figure 1a. Satellite Map indicating the location of the proposed development along the Southern Cape coast



1. Proposed Development Summary

An abalone farm and photo-voltaic facility are proposed on Portion 6 of Farm Langefontein 453, Hessequa

2. Application References

Name of relevant heritage authority(s)	Heritage Western Cape (HWC)
Name of decision making authority(s)	Department of Environmental Affairs and Development Planning (DEADP)

3. Property Information

Latitude / Longitude	-34.3723482166 S 21.7674173925 E
Erf number / Farm number	Lange Fontein 453, Portion 6
Local Municipality	Hessequa
District Municipality	Eden
Previous Magisterial District	Riversdal
Province	Western Cape
Current Use	Open veld, borders Gourikwa Private Nature Reserve
Current Zoning	Agricultural
Total Extent	1 407,704 ha

4. Nature of the Proposed Development

Surface area to be affected/destroyed	155,538 ha
Depth of excavation (m)	None anticipated
Height of development (m)	Approximately 2-3 m

Expected years of operation before decommission	Unknown
---	---------

5. Category of Development

Triggers: Section 38(8) of the National Heritage Resources Act	X
Triggers: Section 38(1) of the National Heritage Resources Act	
1. Construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier over 300m in length.	
2. Construction of a bridge or similar structure exceeding 50m in length.	
3. Any development or activity that will change the character of a site-	
a) exceeding 5 000m ² in extent	X
b) involving three or more existing erven or subdivisions thereof	
c) involving three or more erven or divisions thereof which have been consolidated within the past five years	
4. Rezoning of a site exceeding 10 000m ²	
5. Other (state):	

6. Additional Infrastructure Required for this Development

Access roads, electricity, freshwater supply.

7. Mapping (please see Appendix 3 and 4 for a full description of our methodology and map legends)

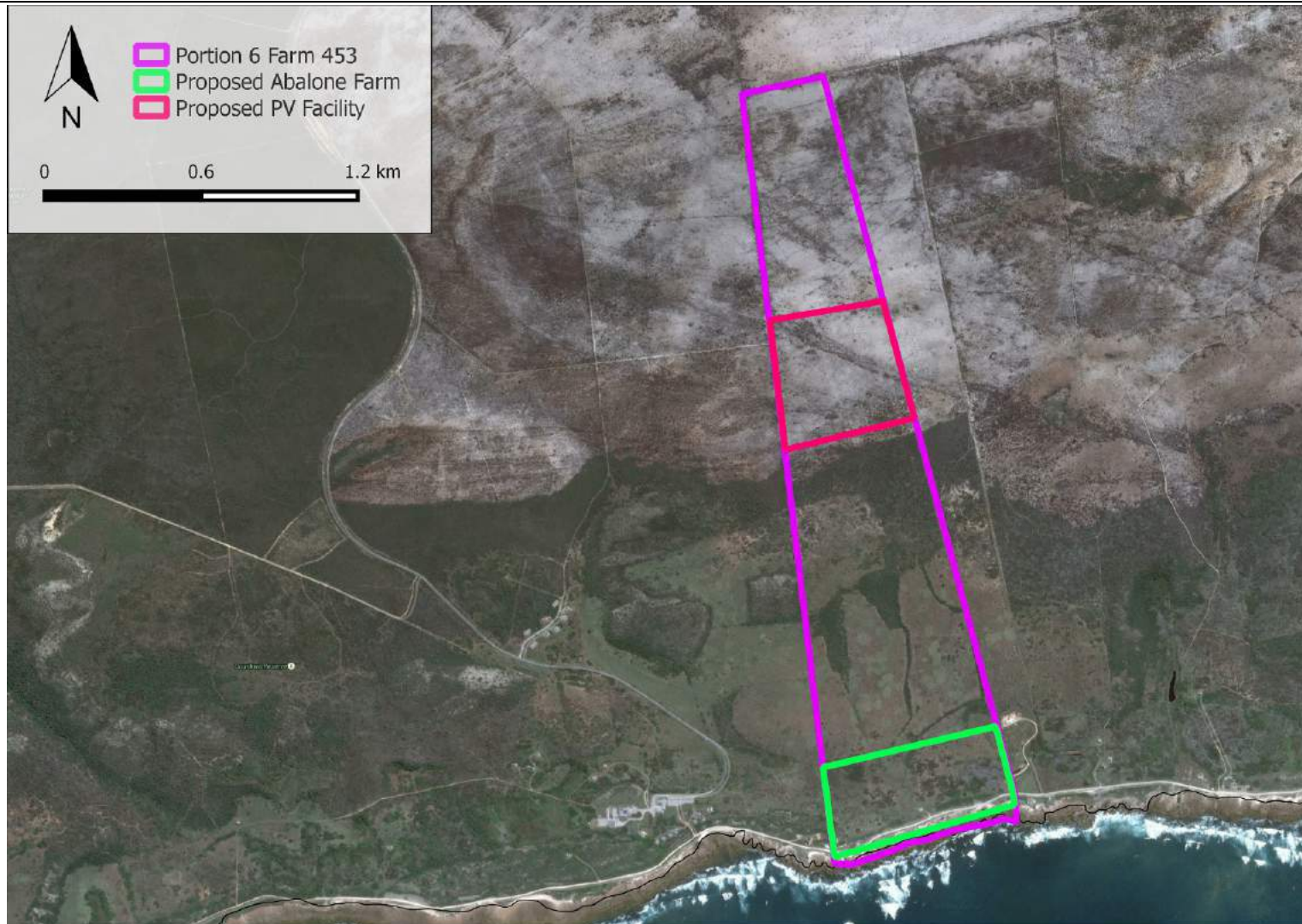


Figure 1b. Overview Map. Satellite image indicating the proposed development area at closer range.



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Figure 1c. Overview Map. Satellite image indicating the area proposed for the abalone farm at closer range.



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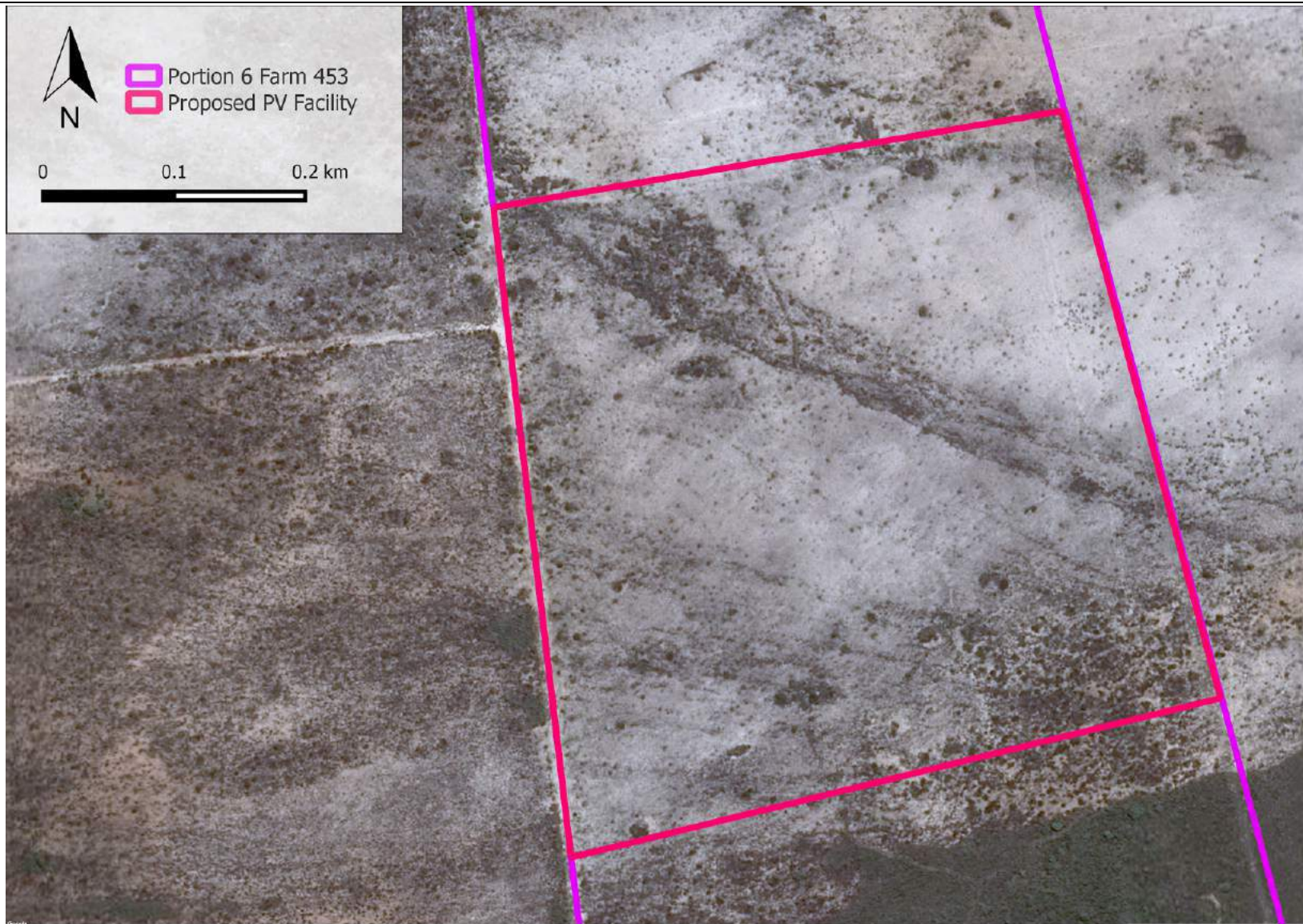


Figure 1d. Overview Map. Satellite image indicating the area proposed for the PV facility at closer range

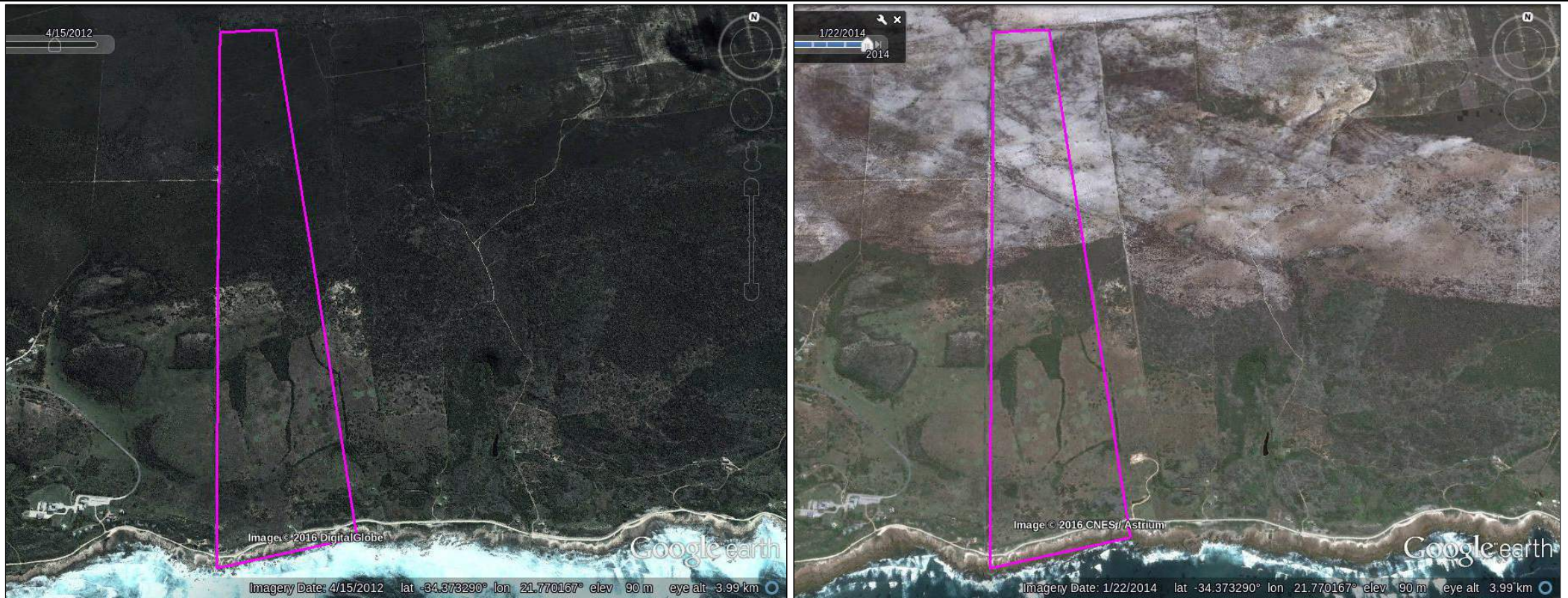


Figure 1e. Google Earth satellite images showing the proposed development area in 2012 (left) and in 2014 (right), before and after vegetation clearing and disturbance on site in the northern portion.



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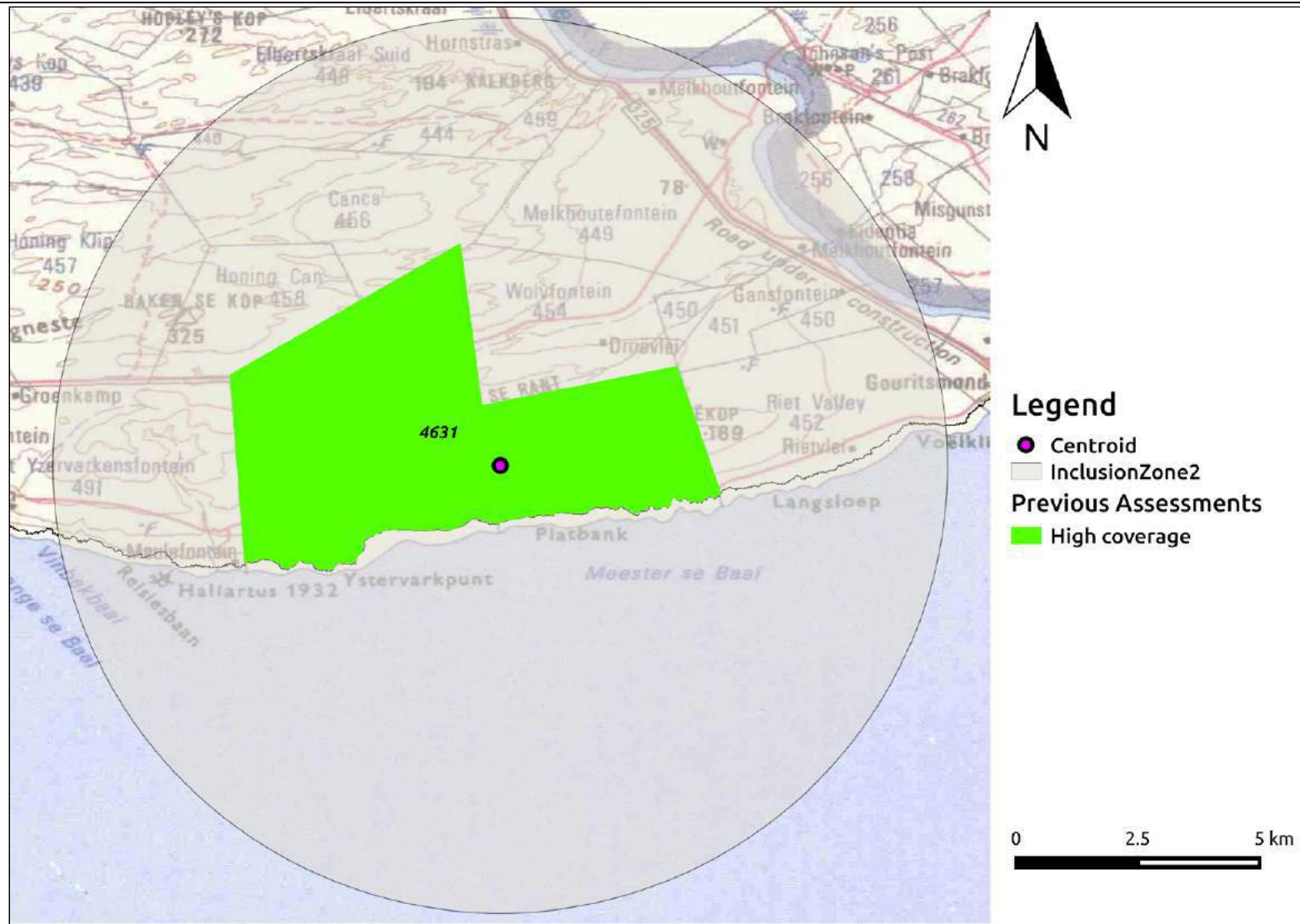


Figure 2. Previous surveys map. Previous Heritage Impact Assessments surrounding the proposed development area, with SAHRIS NIDS indicated (please see Appendix 2 for full reference list).



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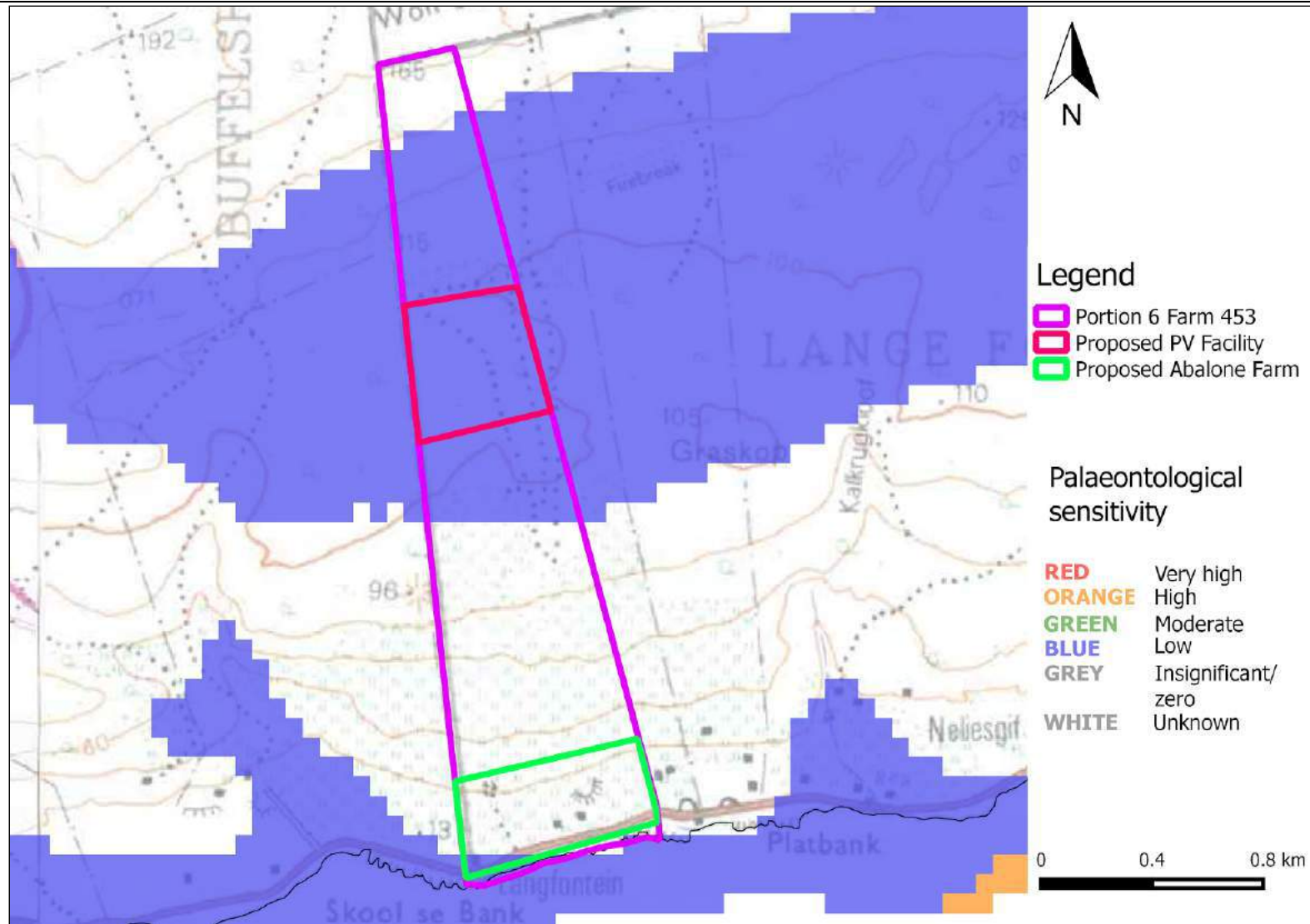


Figure 3a. Palaeosensitivity Map. Fossil sensitivity of the study area. See Appendix 3 for full guide to the legend.



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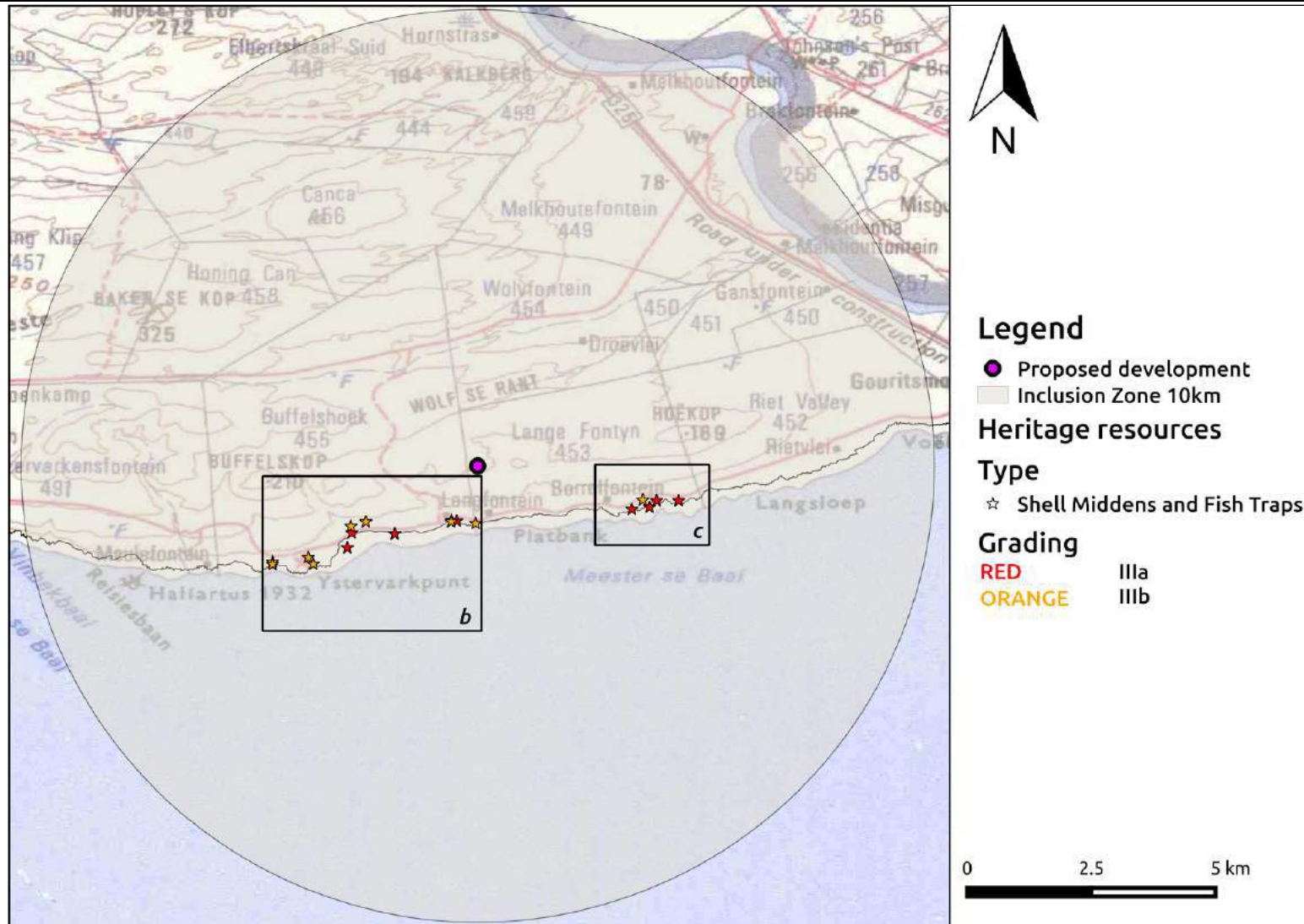


Figure 4a. Heritage Resources Map. Heritage resources previously identified in and near the study area, with SAHRIS Site IDs indicated (see Figures 4b - 4c for insets). See Appendix 4 for full description of heritage resource types.



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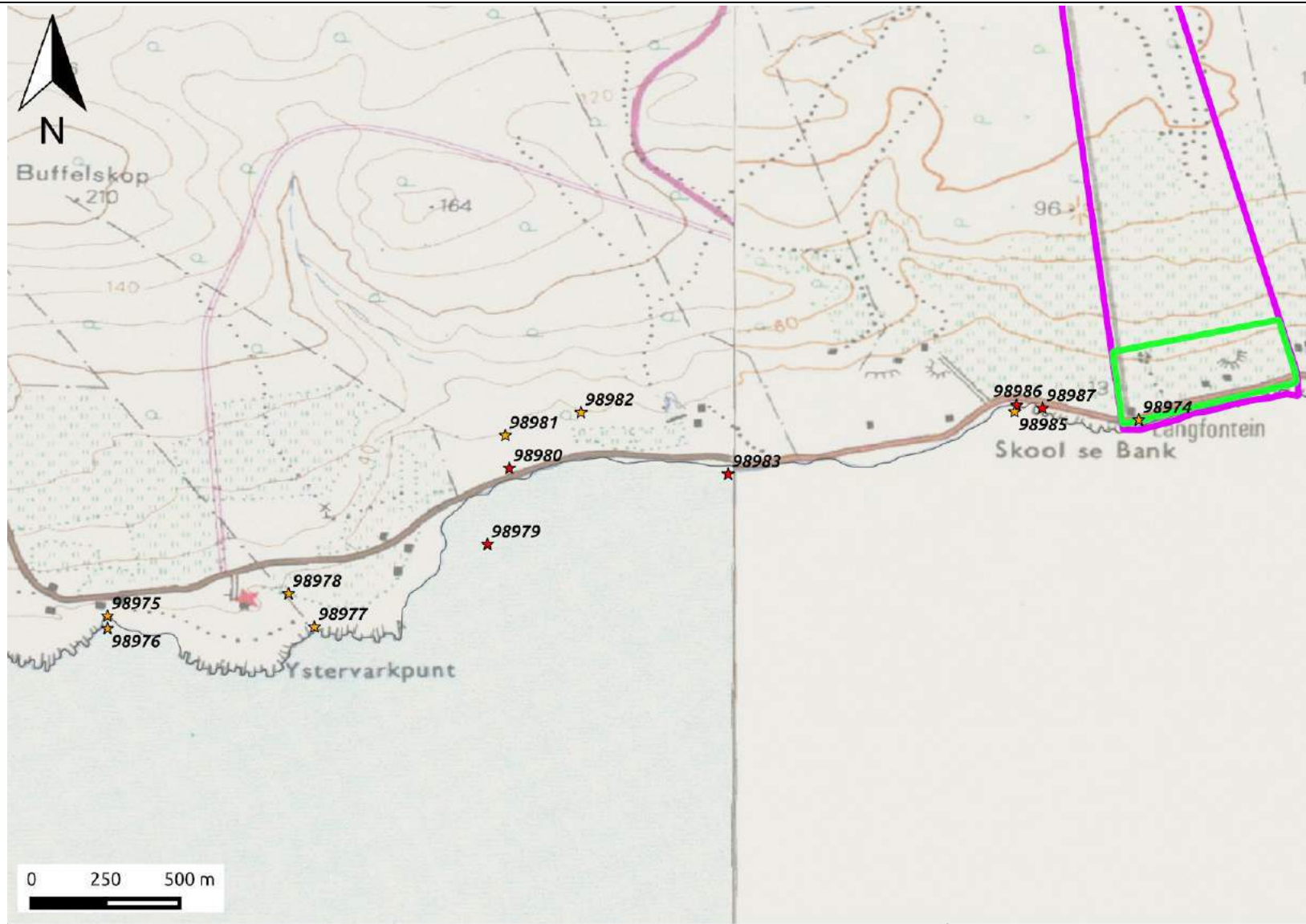


Figure 4b. Inset map. Note the position of site 98974 within the proposed development area.



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Figure 4c. Inset map.

8. Heritage statement and character of the area

It is proposed that an abalone farm and photo-voltaic facility be built on a portion of Portion 6 of Farm Langefontein 453 near Gouritz in the Hessequa Municipality. The proposed development area borders the Gourikwa Private Nature Reserve to the west, and along the coastline to the south.

One Archaeological Impact Assessment (AIA) has previously been undertaken in this area (Kaplan 1995, NID # 4631), and several coastal archaeological sites were recorded during this assessment (Figure 4a). These consisted of shell middens and fish traps of medium (Grade IIIb) and high (Grade IIIa) local significance respectively. One of these sites falls within the boundary of the proposed development area (Site ID 98974) and may possibly be impacted by the proposed development (Figure 4b). The exact locations of these sites may not be accurate, as precise mapping was unavailable from the report (Kaplan 1995) and as such, the location of Site ID 98974 must be verified. The report by Kaplan (1995) also discusses the presence of inland Stone Age artefact sites in deflation basins and exposed lower ridges, but does not record the position of these. It should therefore be taken into account that such sites are likely to exist within the proposed development area and may be impacted by the proposed development.

Two buildings appear on the satellite imagery of the proposed development area (Figure 1c), however it is believed that these are modern structures, possibly holiday homes, of low (or no) heritage significance. However Kaplan does discuss a series of ruins which are likely older than 60 years, although he determines that these sites “*are not of such historical significance as to warrant much further attention*” (1995, p10).

Although the northern portion of the proposed development area appears to have been cleared of vegetation and is thus likely highly disturbed (Figure 1e), the southern portion is located in a highly sensitive region for coastal archaeology. It is possible that grave sites associated with the above-mentioned ruins may exist, and that further Stone Age shell middens, fish traps and artefact sites may be impacted by the proposed development. It is therefore recommended that an assessment of impacts to archaeological resources be undertaken for the proposed project, with a focus on Stone Age coastal archaeology and the potential for inland graves and artefact sites.

No previous Palaeontological Impact Assessments (PIA) have been done in this area. However according to the SAHRIS Palaeosensitivity Map (Figure 3), the area is underlain by formations of low fossil sensitivity, as well as a significant portion of unknown fossil sensitivity in the Wankoe Formation. Considering the potential for fossils in this region, it is recommended that an assessment of likely impacts to significant palaeontological heritage be conducted with specific focus on the Wankoe Formation.

RECOMMENDATION:

The heritage resources in the area proposed for development have not been sufficiently recorded - The coastal area is highly sensitive for Stone Age archaeology and possible inland grave sites associated with ruins. A significant portion of the proposed development area has unknown palaeontological significance. It is therefore recommended that a Heritage Impact Assessment is required consisting of:

- An assessment of impacts to archaeological heritage resources, focusing on Stone Age coastal archaeology and burial grounds or graves.
- An assessment of impacts to palaeontological heritage resources, focusing on the areas of unknown fossil sensitivity.

APPENDIX 1

List of heritage resources within proposed development area

Site ID	Site no	Full Site Name	Site Type	Grading	GPS Coordinates
98974	RNR 1	Reins Nature Reserve Archaeological Site 1	Shell Midden	Grade IIIb	-34.384786478 S 21.7668731504 E

List of heritage resources within 30km inclusion zone

Site ID	Site no	Full Site Name	Site Type	Grading
98986	RNR12	Reins Nature Reserve Archaeological Site 12 Fish Trap	Intertidal	Grade IIIa
98987	RNR13	Reins Nature Reserve Archaeological Site 13 Fish Trap	Intertidal	Grade IIIa
98988	RNR14	Reins Nature Reserve Archaeological Site 14 Fish Trap	Intertidal	Grade IIIa
98989	RNR15	Reins Nature Reserve Archaeological Site 15 Fish Trap	Intertidal	Grade IIIa
98990	RNR16	Reins Nature Reserve Archaeological Site 16 Fish Trap	Intertidal	Grade IIIa
98991	RNR17	Reins Nature Reserve Archaeological Site 17 Fish Trap	Intertidal	Grade IIIa
98992	RNR18	Reins Nature Reserve Archaeological Site 18	Shell Midden	Grade IIIb
98983	RNR 10	Reins Nature Reserve Archaeological Site 10 Fish Trap	Intertidal	Grade IIIa
98985	RNR 11	Reins Nature Reserve Archaeological Site 11	Shell Midden	Grade IIIb
98975	RNR 2	Reins Nature Reserve Archaeological Site 2	Shell Midden	Grade IIIb
98976	RNR 3	Reins Nature Reserve Archaeological Site 3	Shell Midden	Grade IIIb
98977	RNR 4	Reins Nature Reserve Archaeological Site 4	Shell Midden	Grade IIIb
98978	RNR 5	Reins Nature Reserve Archaeological Site 5	Shell Midden	Grade IIIb
98979	RNR 6	Reins Nature Reserve Archaeological Site 6 Fish Trap	Intertidal	Grade IIIa
98980	RNR 7	Reins Nature Reserve Archaeological Site 7 Fish Trap	Partially submerged	Grade IIIa
98981	RNR 8	Reins Nature Reserve Archaeological Site 8	Shell Midden	Grade IIIb
98982	RNR 9	Reins Nature Reserve Archaeological Site 9	Shell Midden	Grade IIIb



APPENDIX 2

Reference List







Impact Assessment References				
Nid	Report Type	Author/s	Date	Title
4631	AIA	Jonathan Kaplan	01/02/1995	An Archaeological Survey of Rein's Nature Reserve, Southern Cape Coast

APPENDIX 3 - Keys/Guides

Key/Guide to Acronyms

AIA	Archaeological Impact Assessment
DARD	Department of Agriculture and Rural Development (KwaZulu-Natal)
DEA	Department of Environmental Affairs
DEADP	Department of Environmental Affairs and Development Planning (Western Cape)
DEDEAT	Department of Economic Development, Environmental Affairs and Tourism (Eastern Cape)
DEDECT	Department of Economic Development, Environment, Conservation and Tourism (North West)
DEDT	Department of Economic Development and Tourism (Mpumalanga)
DEDTEA	Department Of economic Development, Tourism And Environmental Affairs (free State)
Denc	Department Of Environment And Nature Conservation (northern Cape)
DMR	Department of Mineral Resources
Gdard	Gauteng Department Of Agriculture And Rural Development (gauteng)
HIA	Heritage Impact Assessment
Ledet	Department Of Economic Development, Environment and Tourism (Limpopo)
MPRDA	Mineral and Petroleum Resources Development Act, no 28 of 2002
NEMA	National Environmental Management Act, no 107 of 1998
NHRA	National Heritage Resources Act, no 25 of 1999
PIA	Palaeontological Impact Assessment
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
VIA	Visual Impact Assessment

Full guide to Palaeosensitivity Map legend

	RED:	VERY HIGH - field assessment and protocol for finds is required
	ORANGE/YELLOW:	HIGH - desktop study is required and based on the outcome of the desktop study, a field assessment is likely
	GREEN:	MODERATE - desktop study is required
	BLUE/PURPLE:	LOW - no palaeontological studies are required however a protocol for chance finds is required
	GREY:	INSIGNIFICANT/ZERO - no palaeontological studies are required
	WHITE/CLEAR:	UNKNOWN - these areas will require a minimum of a desktop study.



APPENDIX 4 - Methodology

The Heritage Screener summarises the heritage impact assessments and studies previously undertaken within the area of the proposed development and its surroundings. Heritage resources identified in these reports are assessed by our team during the screening process.

The heritage resources will be described both in terms of **type**:

- Group 1: Archaeological, Underwater, Palaeontological and Geological sites, Meteorites, and Battlefields
- Group 2: Structures, Monuments and Memorials
- Group 3: Burial Grounds and Graves, Living Heritage, Sacred and Natural sites
- Group 4: Cultural Landscapes, Conservation Areas and Scenic routes

and **significance** (Grade I, II, IIIa, b or c, ungraded), as determined by the author of the original heritage impact assessment report or by formal grading and/or protection by the heritage authorities.

Sites identified and mapped during research projects will also be considered.

DETERMINATION OF THE EXTENT OF THE INCLUSION ZONE TO BE TAKEN INTO CONSIDERATION

The extent of the inclusion zone to be considered for the Heritage Screener will be determined by CTS based on:

- the size of the development,
- the number and outcome of previous surveys existing in the area
- the potential cumulative impact of the application.

The inclusion zone will be considered as the region within a maximum distance of 50 km from the boundary of the proposed development.

DETERMINATION OF THE PALAEONTOLOGICAL SENSITIVITY

The possible impact of the proposed development on palaeontological resources is gauged by:

- reviewing the fossil sensitivity maps available on the South African Heritage Resources Information System (SAHRIS)
- considering the nature of the proposed development
- when available, taking information provided by the applicant related to the geological background of the area into account

DETERMINATION OF THE COVERAGE RATING ASCRIBED TO A REPORT POLYGON



Each report assessed for the compilation of the Heritage Screener is colour-coded according to the level of coverage accomplished. The extent of the surveyed coverage is labeled in three categories, namely low, medium and high. In most instances the extent of the map corresponds to the extent of the development for which the specific report was undertaken.

Low coverage will be used for:

- desktop studies where no field assessment of the area was undertaken;
- reports where the sites are listed and described but no GPS coordinates were provided.
- older reports with GPS coordinates with low accuracy ratings;
- reports where the entire property was mapped, but only a small/limited area was surveyed.
- uploads on the National Inventory which are not properly mapped.

Medium coverage will be used for

- reports for which a field survey was undertaken but the area was not extensively covered. This may apply to instances where some impediments did not allow for full coverage such as thick vegetation, etc.
- reports for which the entire property was mapped, but only a specific area was surveyed thoroughly. This is differentiated from low ratings listed above when these surveys cover up to around 50% of the property.

High coverage will be used for

- reports where the area highlighted in the map was extensively surveyed as shown by the GPS track coordinates. This category will also apply to permit reports.

RECOMMENDATION GUIDE

The Heritage Screener includes a set of recommendations to the applicant based on whether an impact on heritage resources is anticipated. One of three possible recommendations is formulated:

(1) The heritage resources in the area proposed for development are sufficiently recorded - The surveys undertaken in the area adequately captured the heritage resources. There are no known sites which require mitigation or management plans. No further heritage work is recommended for the proposed development.

This recommendation is made when:

- enough work has been undertaken in the area
- it is the professional opinion of CTS that the area has already been assessed adequately from a heritage perspective for the type of development proposed

(2) The heritage resources and the area proposed for development are only partially recorded - The surveys undertaken in the area have not adequately captured the heritage resources and/or there are sites which require mitigation or management plans. Further specific heritage work is recommended for the proposed development.



This recommendation is made in instances in which there are already some studies undertaken in the area and/or in the adjacent area for the proposed development. Further studies in a limited HIA may include:

- improvement on some components of the heritage assessments already undertaken, for instance with a renewed field survey and/or with a specific specialist for the type of heritage resources expected in the area
- compilation of a report for a component of a heritage impact assessment not already undertaken in the area
- undertaking mitigation measures requested in previous assessments/records of decision.

(3) The heritage resources within the area proposed for the development have not been adequately surveyed yet - Few or no surveys have been undertaken in the area proposed for development. A full Heritage Impact Assessment with a detailed field component is recommended for the proposed development.

Note:

The responsibility for generating a response detailing the requirements for the development lies with the heritage authority. However, since the methodology utilised for the compilation of the Heritage Screeners is thorough and consistent, contradictory outcomes to the recommendations made by CTS should rarely occur. Should a discrepancy arise, CTS will immediately take up the matter with the heritage authority to clarify the dispute.

The compilation of the Heritage Screener will not include any field assessment. The Heritage Screener will be submitted to the applicant within 24 hours from receipt of full payment. **If the 24-hour deadline is not met by CTS, the applicant will be refunded in full.**



CTS HERITAGE

APPENDIX 2: Archaeological Impact Assessment

AN ARCHAEOLOGICAL SURVEY OF
REIN'S NATURE RESERVE,
SOUTHERN CAPE COAST.

Prepared for

REIN'S NATURE RESERVE Pty, Ltd

by

AGENCY FOR CULTURAL RESOURCE MANAGEMENT

P.O. Box 159
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February
1995

1. EXECUTIVE SUMMARY

An archaeological survey of Rein's Nature Reserve on the southern Cape coast has found the area to be rich in archaeological sites. An extensive series of well preserved open station shell middens were found among the frontal dune system along almost the entire length of the 7.5 km sea frontage searched. A number of ancient stone-walled, tidal fishtraps (viswywers) associated with the pebble and cobble beach of the nature reserve, were also observed. Further inland from the coastline, an assemblage of much earlier stone implements within a disturbed deflation basin, as well as among the exposed lower ridges of Buffelskop overlooking Gouriqua, were also found.

The archaeological evidence at Rein's Nature Reserve can be traced back at least 400 000 years, until the more recent past about 350 years ago, when the stone walled fishtraps and rocky shoreline were still being utilised by the Bushman communities living there.

The archaeological survey also forms part of a much broader comprehensive environmental study commissioned by Rein's Nature Reserve. The results of these studies will be used to draft a Management Plan for the reserve. The approval of the proposed development plans for the nature reserve, which includes hiking trails, conference facilities, as well as an environmental/education centre, is subject to the approval of this Environment Management Plan by Cape Nature Conservation.

The proposed development plans, which also include the construction of chalets within the Main Complex area, the extension of the present clubhouse, and the development of Rest Camp C, will have a low level impact on some of the already disturbed shell midden deposits present there. No mitigation is therefore considered necessary, as the shell middens among the frontal dunes will be incorporated into the management plan implemented for the nature reserve.

It is recommended, however, that an archaeological component be included in the proposed environmental/education centre. This should take the form of one or two of the better preserved shell middens among the frontal dunes being excavated, and the artefacts excavated exhibited in the environmental/education centre.

The production of a pamphlet describing the early history of South Africa in general and of Rein's Nature Reserve in particular, as well as possibly the production of an audiovisual show, (eg video), of the excavation, is also envisaged.

In addition, sites of archaeological interest could be included into a hiking trail along the coastline, by way of information boards placed strategically close to some of the shell middens and fishtraps located along the coastline.

If these recommendations are accepted, it would be the first privately-owned nature reserve to adopt an archaeological protection plan in South Africa, thus ensuring the sustainable development of cultural resources as an integral part of environmental management.

2. INTRODUCTION AND BRIEF

The Agency for Cultural Resource Management has been commissioned by Rein's Nature Reserve Pty. Ltd., to undertake an archaeological survey of the proposed nature reserve.

The specific issues to be addressed include the following:

1. a systematic archaeological survey of the proposed nature reserve;
2. the identification of sites of archaeological interest that may exist, including their status and significance;
3. the proposal of measures to protect the archaeological integrity and sustainable development of archaeological sites in the proposed nature reserve; and
4. an assessment of the buildings described as "Ruins" in the proposed nature reserve.

3. LOCATION

The properties to be included in the proposed Rein's Nature Reserve comprise the portion of three farms known as Buffelshoek No. 455, Langefontein No. 453 and Viswatersplaas No. 536. The combined length of the sea frontage of the properties to be searched for archaeological sites is about 7.5 km, comprising a rocky shoreline interspersed with pebble and cobble beach, and a well vegetated frontal dune system. In addition, a number of inland locations on the Farm Buffelshoek (the originally owned Atomic Energy Corporation nuclear testing facility of Couriqua), were also searched for the presence of archaeological sites.

4 THE SURVEY

About 7.5 km of sea frontage of the proposed Rein's Nature Reserve was systematically foot searched for the presence of archaeological sites (Figure 1). All the sites located are described in detail and their locations marked. The description of the sites include the physical characteristic of the location of each site, the extent of the sites, and the nature of the archaeological remains present. A photographic record of the sites, including the stone walled tidal fishtraps, was also made.

5. RESULTS OF THE SURVEY

5.1 Shell middens

One of the best-known sites in the coastal zone of South Africa is the open station shell midden. These sites represent the accumulation of food debris from Bushman groups visiting or living close to the coast and exploiting the abundant marine resources, predominantly shellfish. Open station shell middens may also represent

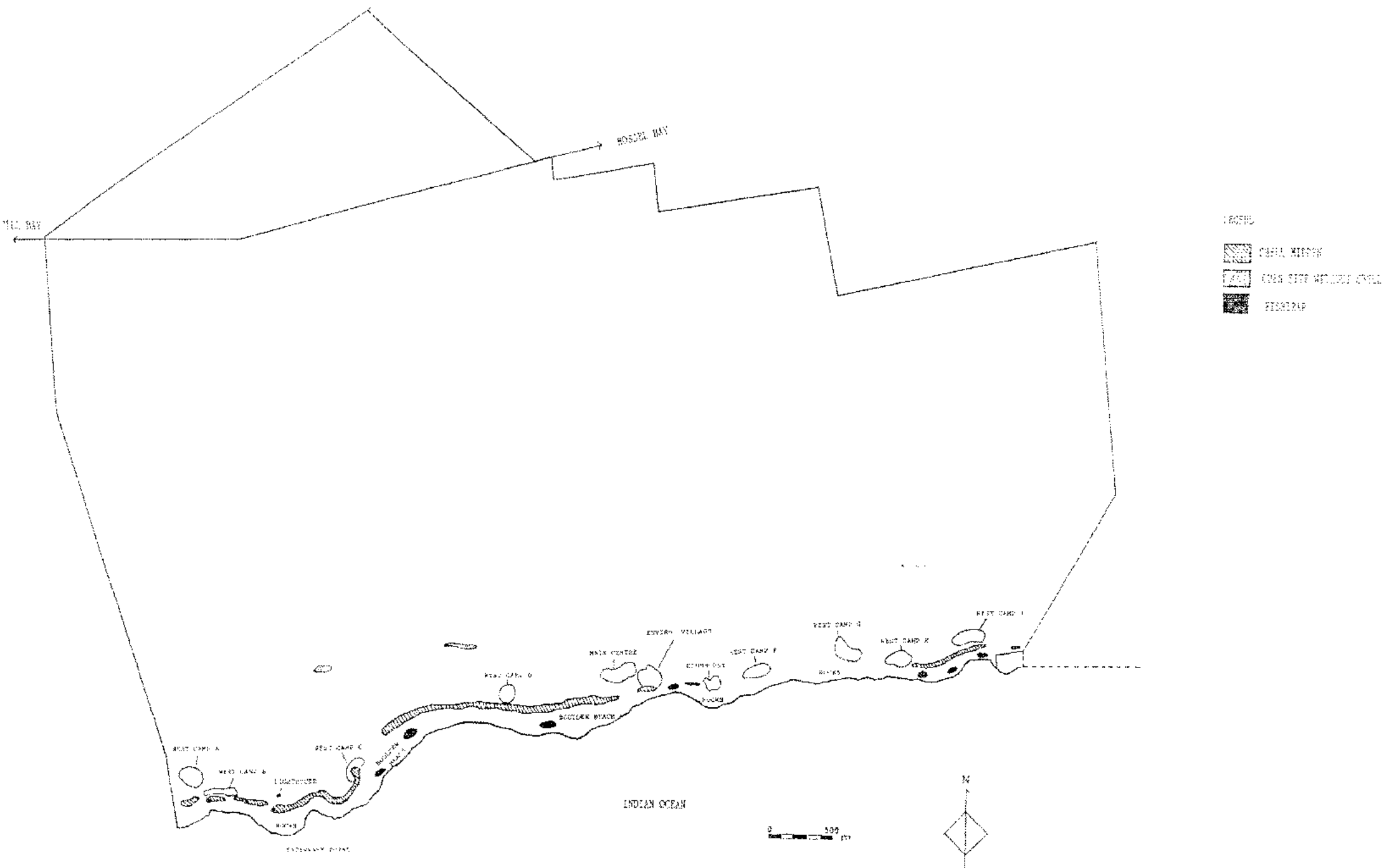


Figure 1. Reia's Nature Reserve: Concentration of archaeological sites.

short-term campsites and include remnants of structures, fire-places, etc. The remains of terrestrial animals including fishbones, crayfish, seal, birds, tortoise, and small antelope, are commonly found. Stone tools, pieces of ostrich eggshell, and pottery sherds also occur. Human burial remains are also occasionally found in shell midden deposits.

Open station shell middens can be found along the entire length of the South African coastline (Kaplan 1993). They are, however, predominantly located on or close to exposed rocky headlands or shorelines, and among vegetated and exposed dune systems. They vary considerably in size, from hundreds of square metres in extent and several metres deep, to a small pile of shell and one or two stone tools.

Many of the open station shell middens in South Africa dating to the last 2000 years contain fragments of clay pots. These findings mark the appearance of herders into the South African landscape. Archaeological evidence suggests that hunters and herders may have continued to live side by side after this time, but hunters were gradually assimilated by herders or moved further inland (Deacon 1985).

The Rein's Nature Reserve shell middens are predominantly concentrated in three areas (Figure 1).

Well preserved shell middens can be found along a stretch of coastline immediately south of the proposed environmental village (part of the main Conference Complex), till a sign marked 'Bosbokbos', at Gouriqua (Figure 2A-B). The middens are found among the vegetated frontal dunes which run parallel with the coastline, broken occasionally by road, path and stream cuttings. These middens are present in varying degrees of density and extent.

The exposed tops of the dune cordon contain abundant scatters of fragmented and crushed shell, numerous stone artefacts, pieces of ostrich eggshell, and pottery. The bones of seal, small antelope and bird (cormorant), were also found. Many more scatters of fragmented shell, both marginal and substantial, may also be found among the seaward-facing slopes of these frontal dunes. Fragmented scatters of shell and some stone implements may be found behind the barrier dunes where they have spilled over the back.

The stone tools on these middens are predominantly made of quartzite, and comprise unmodified and modified flakes (including both utilised and retouched pieces), large flake blades, split and unmodified cobbles, and chunks. Some partially ground pieces of stone, hammerstones, as well as one haematite (ochre) pencil, and several pieces of unmodified ochre were also found. Several stone tools, including flakes, small blades, utilised pieces and an adze, are made in silcrete. Pieces of ostrich eggshell

are present, as are several small pieces of red and black-burnished, grit tempered pottery.

A substantial scatter of fragmented and crushed shell, and stone implements, were found among lower frontal dunes in front of the proposed environmental village, as well as at the environmental village site identified for the construction of further accommodation units (Figure 1).

North of the proposed environmental village, toward the clubhouse and boundary fence of Gouriqua, the frontal dunes are low and thickly vegetated. Yet still marginal scatters of fragmented shell and some stone tools were found here, as well as behind the dunes (Figure 1).

An indication of the richness of the archaeology of Rein's Nature Reserve, is attested by the midden material which can be clearly seen eroding out of the (coastal) road cutting at Gouriqua. Stone implements were also found in the road.

Fragmented shell and some stone implements were found on the seaward side of the coastal road, but the bulk of the middens are located among the frontal dunes.

The shellfish species and the type of stone implements present on all the shell middens are consistent. Limpets are the dominant shellfish species, with small amounts of periwinkle and perlemoen. Mussels are conspicuous by their absence.

South of the sign "Bosbokbos", marginal scatters of fragmented and crushed shell, and fewer stone tools, are present among a low vegetated dune system. The shell thins out considerably beyond this point, almost disappearing, near a fairly large wetland system.

Numerous small marginal scatters of fragmented shell, and some stone tools can be found above a large sand dune close to and associated with the non habitable dwellings Nos. 59 and 60. Dune mole rat activity is extensive. The proposed development of Rest Camp C will have a low level impact on these largely disturbed shell middens present here. Midden material was also found scattered among the seaward facing slopes of this large dune, but none was found among the thickly vegetated coastal fynbos on the plain below.

A second, large concentration of both substantial and marginal shell middens, was located where the cobble beach bends around the coast toward Ystervarkpunt, extending beyond the lighthouse toward proposed Rest Camps B and A and the southern boundary fence of Gouriqua. Here the well vegetated frontal dunes are steeper and higher than the frontal dunes located parallel to the coastline. Numerous scatters of shell remains, both large and small, occur here.

Three large shell middens comprising fragmented and whole shell remains, stone tools, pottery and ostrich eggshell, are clearly visible from the coastal track, against the seaward facing slope of the steep frontal dunes. Midden material also occurs on top of the dunes (Figure 2C). These middens contain abundant concentrations of fragmented shell, dominated by limpet with some periwinkle and perlemoen. Stone artefacts made of quartzite are numerous, and include a range of unmodified and utilised flakes, flake blades, several retouched pieces, chunks, and whole unmodified as well as split cobbles. At least two upper grindstones, one lower grindstone and several single and double pecked hammerstones were found. Three silcrete adzes, one with end-scraper retouch, were also found. Ostrich eggshell and several sherds of black and red-burnished and plain unburnished, grit tempered pottery were present.

Yet more marginal and fairly extensive scatters of fragmented and crushed shell can be found among the steep frontal dunes above the coastal road, where they finally flatten out toward the lighthouse. Fewer quartzite stone tools including unmodified and modified flakes, split cobbles, some ostrich eggshell and a few pieces of grit tempered pottery occur.

A small site on the rocky coastline was found. This site is situated in the lee of some large quartzitic rocks about 20 metres south of the existing boat launch site. Remains of a modern fire, pieces of rusted metal and beer tops attest to a much more recent occupation. A large number of unmodified quartzite flakes and chunks, as well as a few large pieces of black burnished and plain, grit tempered pottery sherds, were found.

One of the most visible shell middens encountered during the survey is located alongside the coastal road leading down from the lighthouse (Figure 2D). The midden consists of a compacted and substantial accumulation of shell about one metre thick, located in a wind deflated gully. The midden unfortunately will over time become further eroded and damaged, and may eventually disappear altogether. A wide spread of fragmented shell covers the deflated slope, which is littered with stone artefacts. These include unmodified and modified quartzite flakes, large chunks, split and unmodified cobbles, and a hammerstone. Some ostrich eggshell and numerous pieces of red and black burnished grit tempered pottery sherds were also found.

An interesting feature on this midden, is the presence of a localised pile of quartzitic stone on the southern edge of the deflation basin, about 10 metres behind the main (compacted) shell concentration. Numerous unmodified flakes and pieces of flaking debris are associated with these stones, which may be the remains of a small knapping or workshop area.

South of the lighthouse toward the southern boundary fence of Gouriqua the frontal dunes are steep and well vegetated. A marginal but extensive scatter of fragmented shell can be found among these dunes. One such scatter, about 50 metres south of the lighthouse, is associated with a band of exposed calcrete. Fragmented shell is widespread. Nodules of calcrete, stone artefacts, including unmodified and modified quartzite flakes, a hammerstone, an upper grindstone, chunks, split and unmodified cobbles, some ostrich eggshell and a few pieces of pottery were found. A natural spring can be seen below this dune which probably acted as a focus of settlement at Ystervarkpunt.

Yet more marginal scatters of fragmented and crushed shell were located among the steep frontal dunes all the way till the southern boundary fence of Gouriqua. Small scatters of fragmented shell were also noted close to the non-habitable dwellings (proposed Rest Camp B), as well as above the dirt road among the vegetated coastal plateau. The impact of proposed Rest Camp B on these ephemeral scatters will, however, be low. No mitigation is therefore anticipated.

Marginal, but fairly extensive, scatters of fragmented shell were also discovered among the vegetated frontal dunes on the farm Langefontein No. 453 (Figure 1). These dunes are considerably flatter and more vegetated than the dune system at Gouriqua, making archaeological visibility low. This, and the fact that a number of holiday cottages, non-habitable dwellings, and structures are located here, as well as overgrazing, has meant that fewer and less well preserved midden occurrences were found.

Midden material can be found on the surface, as well as eroding from a small cutting, about a metre from the fence at the northern boundary of Langefontein. Stone flakes including unmodified flakes, some split cobbles and chunks were found. Fragmented and crushed limpets dominate the shellfish composition.

Several more thin scatters of fragmented shell can be found among these lower frontal dunes along this stretch of coastline. These scatters are located from the northern boundary fence of Langefontein until Neliesgif, where a cluster of non-habitable buildings and holiday cottages are located. Dune mole rat activity is quite extensive, especially in the vicinity of Neliesgif. Fragmented shell and stone tools including a broken upper grindstone, can be found among a raised pebble beach about 20 metres north of non-habitable dwelling No. 14. The impact of these clusters of cottages and dwellings on the scattered shell and stone remains is considered to be low. As a result no mitigation is considered necessary.

Midden material can also be seen in the sections of road cutting along this stretch of coastline. Beyond holiday cottage No. 22, the frontal dunes are heavily vegetated and no further midden occurrences were located.

5.2 Open-air sites without shell

Coastal open sites that are not shell midden dumps are generally interpreted as sites that are associated with one or other aspect of the Stone Age. These open air locations are usually found between dunes or behind frontal dunes and ridges (which afforded protection) - and often referred to as deflated sites. They are also found along exposed mountain ridges. They are usually fairly large in extent, with artefacts including stone, pottery and beads scattered widely. Coastal open sites without shell may also include quarry or manufacturing sites, where Stone Age people went to obtain raw materials for making stone tools.

Two such open-air sites were found at Gouriqua (Figure 1). A fairly large assemblage of stone implements was located on the coastal plateau, and within a wind deflated basin, about 500 metres inland from the coastline behind the lighthouse. A few stone implements were found scattered about the plateau on this disturbed site, while the bulk of stone is associated within the deflation basin among thatch and an outcropping of calcrete. The stone tools found are Middle Stone Age¹ and Early Stone Age² in character, and include both large and small unmodified flakes (some with faceted platforms), a few utilised implements, some cleavers, choppers and three crudely retouched handaxes all in quartzite. One possible upper grindstone was also found.

This site has been disturbed, however, attested by extensive dune-mole rate activity on the coastal plateau. There have also been attempts within the deflation basin to reduce wind erosion of the loose sandy soils by erecting shade cloth. This has caused further disturbance to this site.

The second open-air site was located among exposed quartzitic rocks on the mountain ridge overlooking Gouriqua (Figure 1). A few Early Stone Age implements were found, including some crudely struck flakes, and a large irregular core.

5.3 Fishtraps (visvywers)

Visvywers or tidal fishtraps typically consist of stone-walled enclosures built in either gullies or low-energy bays with an abundance of loose boulders. The dams range in size from a few metres in diameter to as much as 100 metres. The low piled stone walls are assembled with gently sloping seaward sides and almost vertical interior walls - thus entry of fish at high tide was facilitated while their exit at low tide was prevented. A number of south coast complexes comprise several tiers of enclosures extending from the high water mark to spring-low areas to ensure catches through a range of tidal situations.

1. A broad term referring to a period between 400 000 years and 20 000 years ago.

2. A broad term referring to a period between 2.5 million and 400 000 years ago.

Tidal fishtraps have been recorded on the south coast, for example at Still Bay and Cape Agulhas. Archaeologists have proposed that the concept of tidal fishtraps may have originated among Later Stone Age³ (LSA) people who lived at the coast some time after 2000 years ago (Avery 1975:). Archaeological deposits attributed to the LSA, like open station shell middens, contain far more fishbone than deposits of greater antiquity. Archaeologists have therefore concluded that LSA people invented a fishing method that enabled them to effectively exploit large quantities of vertebrate fish - mainly by means of fishtraps at suitable locations along the coast (Goodwin 1946). "Ownership" of some south coast fishtraps has continued through to the historic period with some families maintaining the devices and achieving catches to the present day.

At least nine tidal fishtraps were located along the 7,5 km stretch of coastline surveyed at Rein's Nature Reserve (Figure 1 and Figure 3A-D). They are all clearly associated with the pebble and cobble beach. Three were located within the farm Langefontein and six within Gouriqua. The walls of most of them have been washed flat by wave action, but generally they are in a fairly good condition. Three of the fishtraps at Gouriqua comprise several tiers of enclosures, similar to tidal fishtraps found to the south at Still Bay.

RUINS

All the buildings described as "Ruins" on the properties of the proposed Rein's Nature Reserve were provisionally assessed.

"Ruin" Nos. 57 and 58 on the farm Buffelshoek No. 455, are in a poor state of disrepair. Apart from the standing remains of a partial wall on "Ruin" No. 58, this building is completely destroyed, with only the foundation floor remaining. "Ruin" No. 57 is badly damaged; the roof has collapsed and only three incomplete walls remain. The thatch roof of "Ruin" No. 52 has collapsed, but the building is still standing, thus retaining its structure and architectural integrity.

The remaining "Ruins" are located on the Farm Langefontein No. 453. "Ruin" No. 10 has retained its architectural integrity. The use of modern building materials has however, reduced its historical value.

"Ruin" No. 11 has only three walls remaining and no roof. "Ruin" No. 13 is a more recent building. The roof has collapsed, but the walls are still standing. Modern cement building bricks have been used to construct this house.

3. A broad term referring to the last 20 000 years of early history

"Ruin" Nos. 57, 58, 11, 13, 25, 27 and 32 are not considered to be conservation worthy. These buildings are either completely destroyed, in a bad state of disrepair with roofs and walls collapsed, or fairly recently constructed with little architectural integrity.

"Ruins" Nos. 53 and 10 are the best examples of historical buildings on the respective farms. They retain a major part of their architectural integrity and should qualify for proposed conservation attention.

Although all buildings that are older than 50 years are protected by the National Monuments Act (Act No. 28 of 1969 as amended), the "Ruins" on Rein's Nature Reserve are not of such historical significance as to warrant much further attention. Most of them are badly damaged and do not retain much architectural integrity. Any proposed restoration of "Ruin" No. 52 on the farm Buffelshoek No. 455 and "Ruin" No. 10 on the farm Langefontein No. 453, however, should be surveyed and assessed by qualified specialists. In addition, a restoration permit will need to be obtained from the National Monuments Council before restoration be allowed to commence.

DISCUSSION

The archaeology of Rein's Nature Reserve can be traced back at least 400 000 years, until the more recent past about 350 years ago when Stone Age hunter-gatherer Bushman and KhoiKhoi herders inhabited the region.

The population density during the Early and Middle Stone Ages at Gouriqua was probably low. This is attested by the fact that only two sites dating to this period were located in the survey. Other early sites may however be buried by recent wind-blown sands. Caution should therefore be exercised when excavating building foundations and undertaking construction activities.

The shell middens located among the frontal dune system of the nature reserve, as well as the tidal fishtraps along the gently shelving rocky coastline, were probably formed sometime after 2000 years ago, when Later Stone Age Bushman hunter-gatherers inhabited the region. These shell middens likely represent a continuous series of midden formation reflecting sustained use of coastal resources after 2000 years ago. Population density after this time was probably quite high, resulting in the formation of the many shell middens, and the construction of a large number of tidal fishtraps in a relatively short stretch of coastline.

The range of stone implements, and cultural finds such as ostrich eggshell, and the remains of clay pots found on the shell middens, strongly point to a Later Stone Age presence at Gouriqua after 2000 years. Shellfish, particularly limpets, were predominantly exploited by the inhabitants, but fish, seal, small antelope, tortoise and

marine and terrestrial birds were also consumed. Activities such as gathering, grinding and preparing of plant foods, fishing, and snaring of animals, were practiced.

The manufacture of stone tools, and possibly of wooden artefacts as well, were some of the daily tasks performed. This is clear from the range of stone implements and flaking debris present on the shell midden sites, which reflect plant food processing, meat processing, and wood working activities. Pieces of ostrich eggshell may be parts of broken water containers, or raw material for making beads. Pots were used to store water, food, and for cooking. Thatch, and reed from the wetlands, may have been used to construct huts and windbreaks. Abundant fresh water was available to the Gouriqua hunter-gatherers from a number of springs and freshwater streams in the area, and from the wetlands.

RECOMMENDATIONS

A management plan will be implemented at Rein's Nature Reserve which will include measures to protect and sustain the archaeological resources present there. The development of an environmental/educational centre at Gouriqua is envisaged. The aim of the centre will be to promote environmental awareness among visitors and school groups to the nature reserve. It is in this context that the following recommendations are made.

It is recommended that:

1. One or two of the shell middens at Gouriqua be excavated, and the excavated artefacts, along with photographs, drawings, and maps of the excavation, be exhibited in glass-covered display cabinets in the environmental/educational centre.

The excavation of stratified midden deposits in such close association with tidal fishtraps has not been undertaken in South Africa. Thus the visywers of the southern Cape coast have not been directly or securely dated. The excavation of one or two of the Gouriqua shell middens may hold clues as to why and when these structures were built.

2. A pamphlet be produced describing the archaeology of South Africa in general, and of Rein's Nature Reserve in particular, focussing on the early history of Gouriqua and the hunter-gatherers of the area.

3. An audiovisual, (eg video or slide-tape show) of the excavation be made, to be used in the environmental/educational centre.

4. Archaeological sites of interest be included in a hiking trail along the coast and that information boards be placed strategically close to fishtraps and middens along this route. This will further ensure the protection of the shell middens and fishtraps.

5. The Figure 2D shell midden be preserved and protected as part of an open-air exhibit, and included in the hiking trail.

6. Activities such as the proposed development of the environmental village, the proposed extension of the clubhouse and the proposed development of Rest Camp C, may impact on human burials buried beneath the surface. If burials are uncovered, a professional archaeologist must be called onto site to intervene where necessary.

7. Long-term proposed development plans (not included in the present study Terms of Reference) should be subjected to an archaeological impact assessment. The anticipated impacts of these plans on archaeological deposits, which include the proposed Rest Camps for example, are however, considered to be low.

8. All Rein's Nature Reserve personnel be informed of the presence of archaeological sites in the area, and the importance of protecting them.

9. "Ruin" No. 52 on the farm Buffelshoek No. 455 and "Ruin" No. 10 on the farm Langefontein No.453, should be surveyed and assessed by National Monuments Council personnel, should plans to restore these buildings be proposed.

10. Finally, it should be acknowledged in the environmental management plan that archaeological sites are protected by the National Monuments Council (Act No. 28 of 1969, as amended) (Appendix 1).

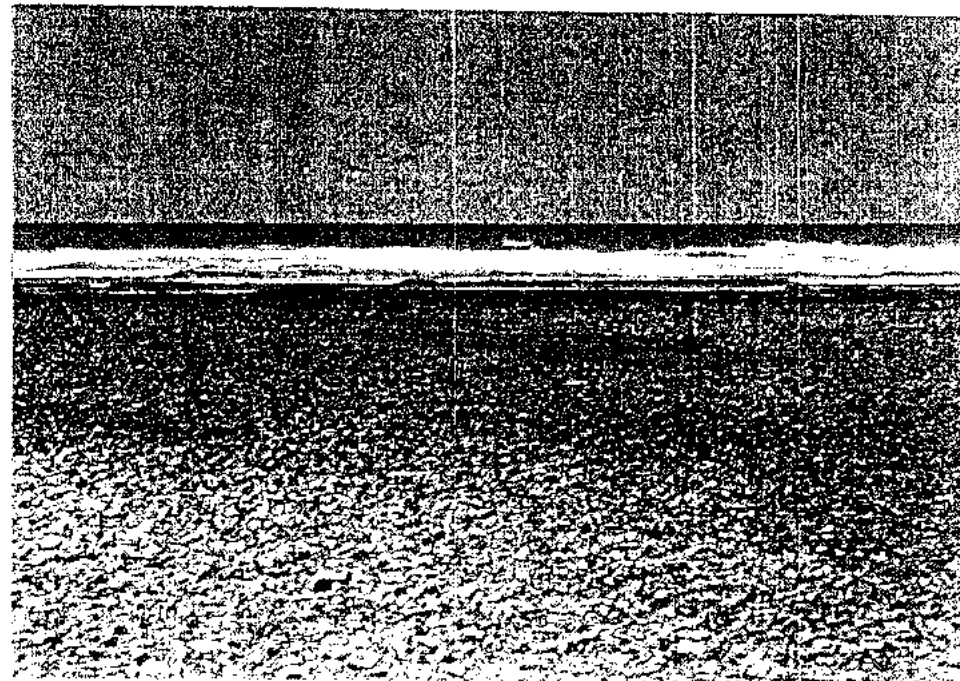
CONCLUSION

The excavation and display of excavated artefacts in an environmental/educational centre at Rein's Nature Reserve offers a unique opportunity to make archaeological information accessible to large numbers of people. Coupled with environmental education, an appreciation of the rich cultural history of the area will ensure the protection of archaeological sites in Rein's Nature Reserve.

If the recommendations proposed are accepted, it would be the first privately-owned nature reserve to adopt an archaeological protection plan in South Africa, thus ensuring the sustainable development of cultural resources as an integral part of environmental management.



A



B

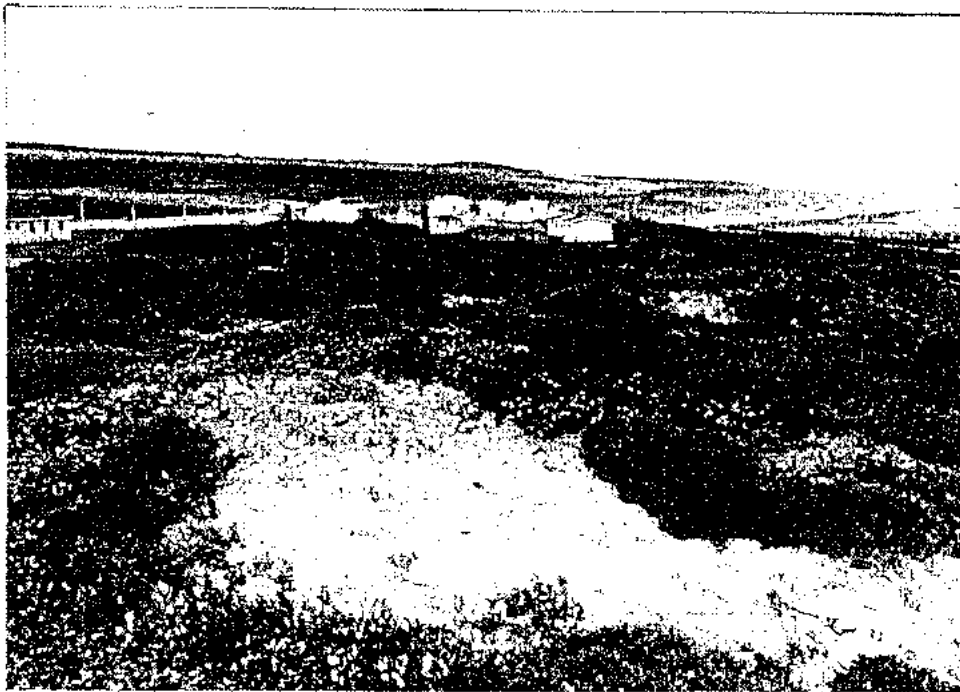


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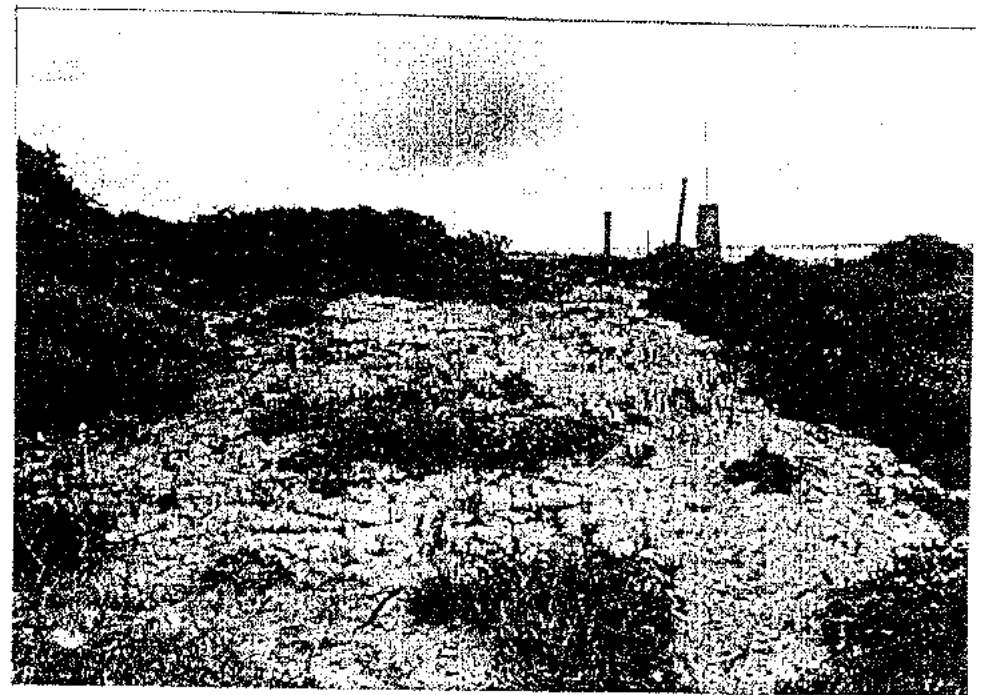


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Figure 2A-D. Pointe Nature Reserve, Fishtraps



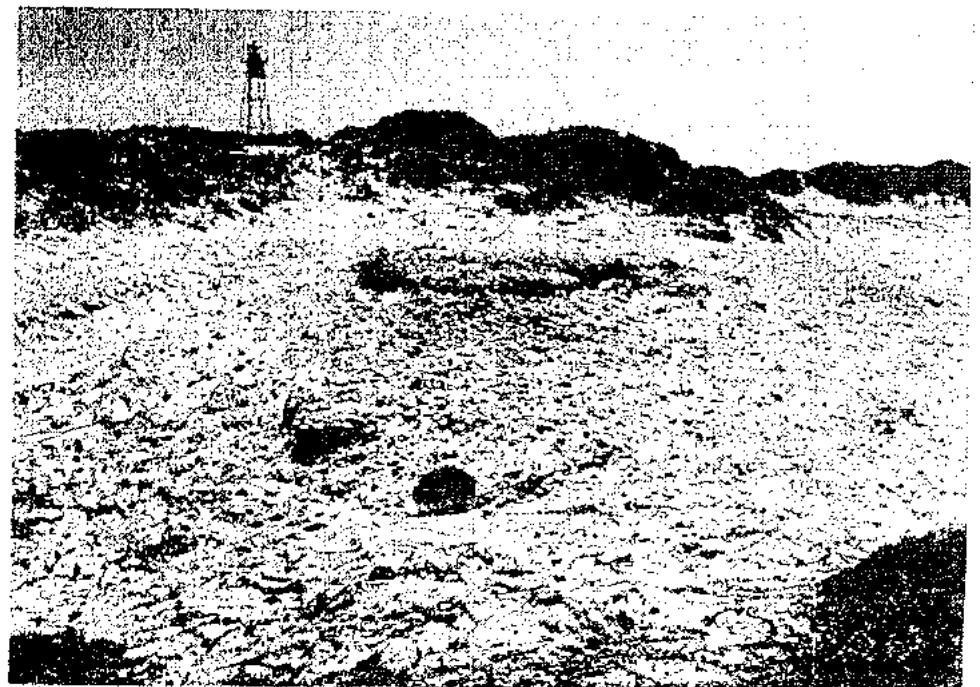
A



B



C



D

Figure 2A-D. Rein's Nature Reserve: Shell middens

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ARCHAEOLOGICAL IMPACT ASSESSMENT

PROPOSED GOURITZ ABALONE FARM ON A PORTION OF PORTION 6 OF FARM 453 LANGE FONTEIN, HASSEQUA MUNICIPALITY WESTERN CAPE

Assessment conducted under Section 38 (3) of the National Heritage
Resource Act (No. 25 of 1999)

Prepared for

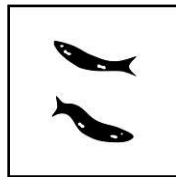
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**JUNE
2016**

EXECUTIVE SUMMARY

Introduction

ACRM was appointed by PHS Consulting to conduct an Archaeological Impact Assessment (AIA) for a proposed abalone farm on a portion of Farm 453/6 Lange Fontein, about 10kms south of Gouritzriver on the Southern Cape coast.

The AIA forms part of a wider Heritage Impact Assessment (HIA) that is being done by PHS Consulting, which also includes a desk top Palaeontological Impact Assessment (John Pether). A HIA was requested by Heritage Western Cape following submission of a Notice of Intent to Develop (NID).

The footprint area for the proposed development is about 20 ha in extent. Almost full coverage of the proposed site is envisaged, although the final layout of the farm is subject to a biophysical and heritage constraints study.

The development proposal

Grow-out abalone tanks occupy the bulk of the proposed site, while a 2.5 MW solar array will be located on the upper hill slopes of the property. Seawater will be pumped from an intake, distributed through the grow-out tanks and returned to the sea via an effluent channel. Other infrastructure involves a hatchery, buildings for processing the grown abalone, administration offices, canteen, stores, parking and a workshop.

The stretch of coastline (between Gouritzriver and Stillbaai) where the abalone farm is planned is a known sensitive archaeological landscape. The most commonly occurring heritage resources are Later Stone Age shell middens, and late 18th/early 19th Century tidal fishtraps/visvywers.

Aim of the AIA

The overall purpose of the AIA is to assess the sensitivity of archaeological resources in the affected area, to determine the potential impacts on such resources, and to avoid and/or minimise such impacts by means of management and/or mitigation measures.

Results of the study

A site assessment was undertaken in May 2016, in which the following observations were made:

- Shell midden deposits are concentrated on the narrow dune cordon in the south western portion of the proposed development site. The shellfish is dominated by intertidal *Turbo Sarmaticus*, with modest amounts of limpets occurring. Stone tool frequencies are very low, limited to a few quartzite chunks, smashed cobbles and flakes. No organic remains such as pottery, bone or ostrich eggshell was found.
- Archaeological traces occur over the remainder of the property, but are very thinly and unevenly distributed over the surrounding landscape, limited to a few isolated stone tools (quartzite chunks & flakes) and some fragments of shellfish (*T. Sarmaticus*), associated with dune mole rat dumps, and recent mechanical surface disturbance.

- Stone walling alongside the coastal road (inside the footprint area) may be the remains of an early, farm boundary wall.
- A possible burial/grave (a small pile of stone) was located in the Eskom servitude near the entrance to the farm. It is unclear whether this is an indigenous (Khoisan) grave, or one associated with the historical development of the farm.
- The remains of a small fishtrap in the intertidal zone may be contemporaneous with the above farm, boundary wall and ownership history of the farm.

Anticipated impacts

- Construction activities, for example foundation excavations for buildings, offices, stores, etc, terracing cut backs for the grow-out tanks, installation of services for water & cabling for the solar array, will likely impact negatively on fragile archaeological deposits.
- Unmarked Khoisan burials, and buried shell middens may be exposed or uncovered during project-related earthworks and excavations.

Conclusions

There are no fatal flaws or major constraints, and as long as the recommendations made in the report are adhered to, there are no objections to the authorization of the proposed activities (i. e. development of an abalone farm, solar array & associated activities) proceeding.

Recommendations

1. Shovel testing must be undertaken to determine the significance of sub surface archaeological deposits. The focus of test excavations will be on the narrow dune cordon in the south western portion of the proposed development site.
2. The historic stone wall / farm boundary alongside the gravel road (inside the footprint area) must be protected and incorporated into the final development proposal. A 10m protective buffer is recommended
3. A possible grave/burial (in the Eskom servitude) must be avoided. The 'grave' must be demarcated (possibly enclosed by a small fence), or simply left alone.
4. Bulk earthworks (i. e. excavations for building foundations, terracing cut backs, & services) must be monitored by a professional archaeological. The site must be inspected once a week by the archaeologist during the construction phase of the project.
5. It is not necessary for the archaeologist to monitor vegetation clearing operations, but the Environmental Control Officer (ECO) must be briefed on site, prior to the commencement of site clearing. The site must also be inspected once vegetation clearing has been completed.

6. If any unmarked human remains are exposed or uncovered during excavations and earthworks, these must immediately be reported to Heritage Western Cape (Att: Mr Guy Thomas), or the archaeologist (Jonathan Kaplan 082 321 0172).

7. The above recommendations must be incorporated into the Environmental Management Plan (EMP) for the proposed development.

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Declaration:

I confirm that the above bio sketch is an accurate description of my qualifications.



Signature

Date: 01 July, 2016

Declaration of independence

I, **Jonathan Kaplan** (MA in archaeology, University of Cape Town, 1989), hereby confirm that I am a professional member, in good standing, of the Association of South African Professional Archaeologists (ASAPA membership # 253).

I am an accredited Principal Investigator for coastal shell middens and Stone Age archaeology, and Field Director for Rock Art.

As the appointed independent specialist archaeologist for this project, I hereby declare that I:

- Act as an independent specialist in this application;
- Regard the information contained in this report as it relates to my specialist input to be true and correct;
- Do not have any financial interest in the undertaking of the activity, other than remuneration for work performed.



Signature of the specialist:

Name of company: **Agency for Cultural Resource Management**

Date: **01 July, 2016**

1. INTRODUCTION

ACRM was appointed by PHS Consulting, on behalf of Aquunion, to conduct an Archaeological Impact Assessment (AIA) for a proposed abalone/perlemoen farm on a portion of Farm 453/6 Lange Fontein (Hassequa Municipality), near Gouritz River on the Southern Cape coast (Figures 1 & 2).

The AIA forms part of a Heritage Impact Assessment (HIA) that is being undertaken by PHS Consulting, which also includes a desk top Palaeontological Impact Assessment (Pether 2016). A HIA was requested by Heritage Western Cape following the submission of a Notice of Intent to Develop (NID).

The overall purpose of the AIA is to assess the sensitivity of archaeological resources in the affected area, to determine the potential impacts on such resources, and to avoid and/or minimise such impacts by means of management and/or mitigation measures.

2. THE DEVELOPMENT PROPOSAL

The proposed development entails the following activities;

- Tanks for the grow out phase of the abalone (2 development phases are envisaged),
- 2.5 mva solar array including inverter rooms, solar control & grid tie in rooms,
- Intake area, including sump (blasted into the rocky shore) / or intakes pipes extending into the sea,
- Pump house,
- Reservoir / header tank for seawater,
- Channels/effluent area for water movement across the site (may be open or closed)
- Administration areas including offices, processing area, canteen, workshop area, diesel storage areas, parking, blower and generator rooms etc, and
- Associated infrastructure including access roads, electricity, freshwater supply, etc

The footprint area for the proposed facility is about 20 ha in extent. Almost full coverage of the proposed site is envisaged. A preliminary Site Development Plan (Figure 3) illustrates the envisaged infrastructure. The final layout of the proposed abalone farm is, however, subject to an environmental and heritage constraints study.

The grow-out tanks will occupy the bulk of the site, while the 2.5 mva solar array will be located on the upper hill slopes. Seawater will be pumped from an intake, distributed through the tanks and returned to the sea via an effluent channel. Other infrastructure involves a hatchery to produce spat and buildings for processing the grown abalone, administration offices, canteens and a workshop.

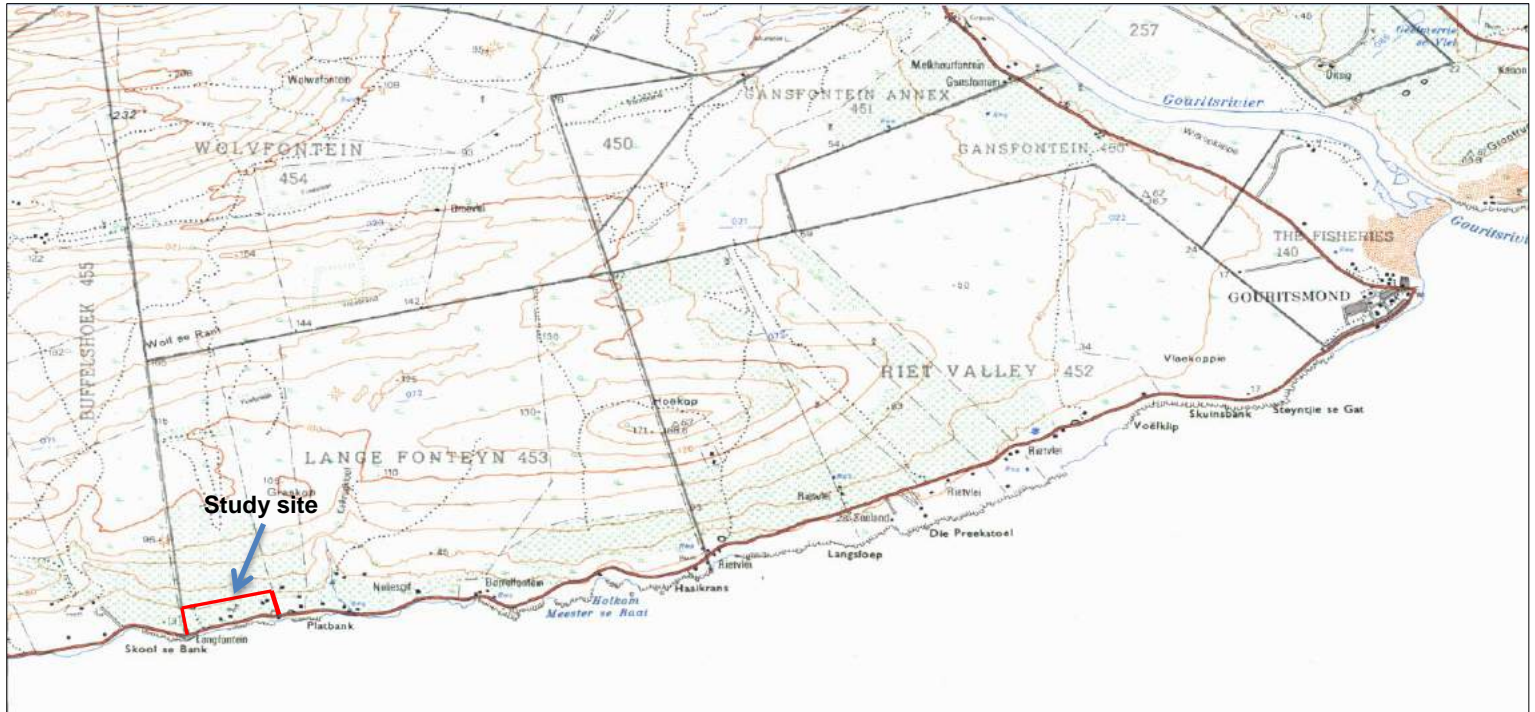


Figure 1. 1:50 000 locality map (3421BD Gouritsmond). Red polygon illustrates the location of the proposed abalone farm

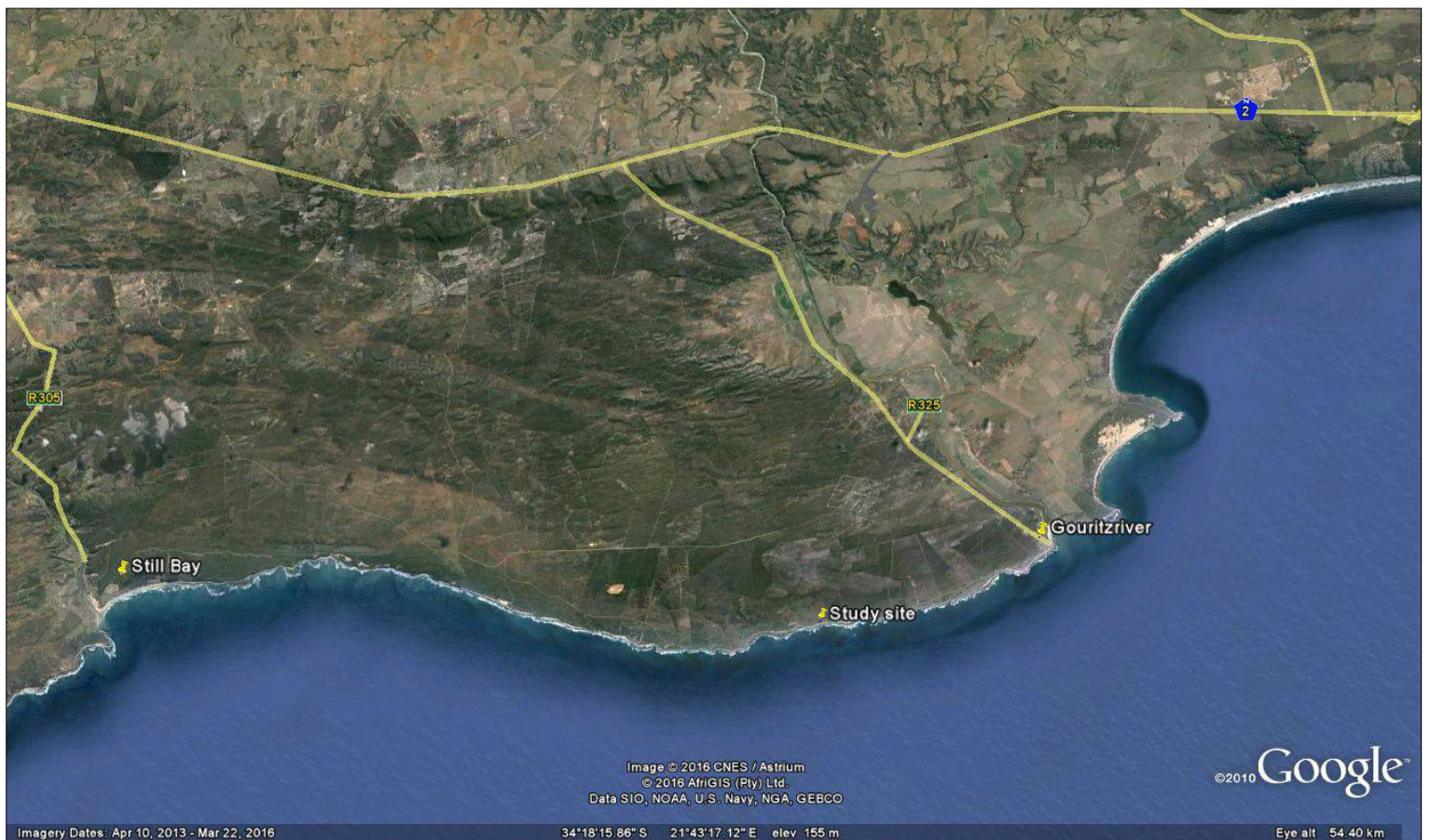


Figure 2. Google satellite map indicating the location of the study site in relation to Still Bay & Gouritzriver

Archaeological Impact Assessment, proposed abalone farm on portion of Farm 453/6 Riversdale

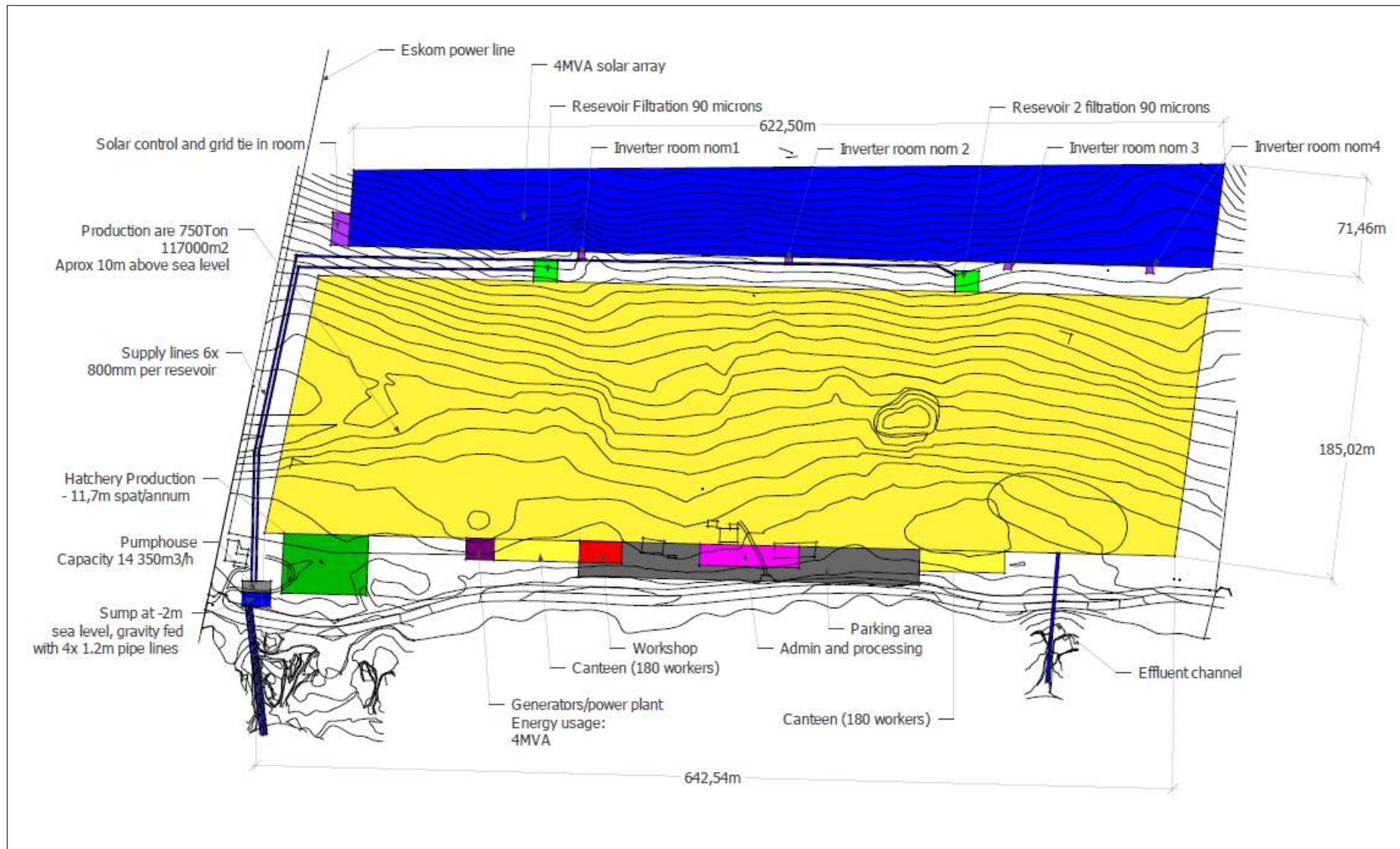


Figure 3. Gouritz Abalone Farm: Proposed site layout plan (Alternative 1)

3. HERITAGE LEGISLATION

The National Heritage Resources Act (Act No. 25 of 1999) makes provision for a compulsory Heritage Impact Assessment (HIA) when an area exceeding 5000 m² is being developed. This is to determine if the area contains heritage sites and to take the necessary steps to ensure that they are not damaged or destroyed during development.

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)).

4. TERMS OF REFERENCE

The terms of reference for the archaeological study were to:

- Determine whether there are likely to be any important archaeological resources that may be impacted by the proposed development;
- Indicate any constraints that would need to be taken into account in considering the development proposal;
- Identify possible `No-Go` areas, and
- Recommend any mitigation action

5. DESCRIPTION OF THE RECEIVING ENVIRONMENT

The seafront property is situated on vegetated windblown cover sands and low dunes backing a rocky intertidal shoreline, about 10kms south of the mouth of the Gouritz River (Figures 4-8). The fairly gently sloping site borders the Gourikwa Private Nature Reserve, previously Rheins Nature Reserve, in the south and a smallholding development in the east. Existing infrastructure comprises two holiday cottages, some old farming infrastructure (concrete drinking trough), a barely visible demolished building, fencing, informal roads/tracks, and an, Eskom servitude. A small dam/old excavation pit occurs in the north east, on the lower slopes of the proposed development site.

The majority of the site is covered in very dense vegetation on a substrate of dark brown cover sands. Informal access roads have recently been constructed (mostly bush cut/tractor trampled) to facilitate planning and access. Protected Milkwood trees cover the upper slopes of the property.



Figure 4. Google satellite map of the proposed development site. Purple polygon illustrates the 20ha footprint area



Figure 5. View of the proposed development site taken from the northern boundary. The house is inside the property



Figure 6. View of the proposed development site taken from the northern boundary. The house is inside the property



Figure 7. View of the proposed development site facing west. The house in the background is inside the property



Figure 8. View of the proposed development site facing west. The house in the background is inside the footprint area

6. STUDY APPROACH

6.1 Method

The overall purpose of the study is to assess the sensitivity of archaeological resources in the affected area, and to determine potential impacts on such resources.

The significance of archaeological resources was assessed in terms of their content and context. Attributes considered in determining significance include artefact and/or ecofact types, rarity of finds, exceptional items, organic preservation, potential for future research, density of finds and the context in which archaeological traces occur.

Heritage Western Cape (2012) uses a system in which archaeological resources of local significance are divided into Grade 3A, 3B and 3C. These equate to *high*, *medium* and *low* local significance. This grading system is employed in the present report.

The position of identified archaeological occurrences, were plotted using a hand held GPS unit set on the map datum wgs 84.

The field assessment was undertaken by J. Kaplan of ACRM on 27th May, 2016. A track path of the survey was also captured.

A desk top study was carried out to assess the heritage context surrounding the proposed development site.

6.2 Limitations

The proposed development site is covered in extremely dense vegetation, resulting in very poor archaeological visibility and limiting access to much of the site.

6.3 Identification of potential risks/development constraints

Based on the results of the study, the following risk sources have been identified:

- Development of an abalone farm will impact negatively on potentially important archaeological deposits on the narrow dune cordon in the south western portion of the proposed site
- Buried shell middens and unmarked Khoisan human remains may be uncovered during bulk earthworks and excavation for services
- Isolated Middle Stone Age implements, including mineralized bone and fossil shell may be intercepted if excavations extend into underlying semi consolidated aeolianites of the Waenhuiskrans Formation (Pether 2016)

6.4 Heritage context

Later Stone Age (LSA) shell middens are ubiquitous on the coastline between Gouritz River and Stillbaai (Hart 1991; Kaplan 1993, 2007; Orton 2005; Rudner 1968; Kaplan personal observation). The rocky shoreline is rich in marine resources, particularly shellfish, and acted as foci that attracted LSA hunter-gatherers in the past.

The region, however, is probably best known for the large number of fish traps / viswywers that occur in the intertidal zone, which are clearly visible at low tide, and on Google Earth images. Large, well preserved fishtraps have been recorded at Gourikwa Private Nature Reserve (previously Rheins Nature Reserve) on the western boundary of the proposed development site (Kaplan 2007).

For many years archaeologists have assumed that these stone walled 'dams' built in either gullies or low energy bays originated among LSA hunter-gatherers who lived on the coast after 3000 years ago (Avery 1975; Goodwin 1946; Gribble 2005). But recent work (comprising a combination of archaeological excavations & archival research) by the archaeologist Philip Hine (2008), has shown that most, if not all of these traps, were constructed by poor whites (*bywoners*) in the late 1800s and early 1900s, who rented properties from absent farmers at the time. The romantic notion of fishtraps constructed by ancient Stone Age people is still popularized in modern literature and this myth needs to be more vigorously challenged.

7. FINDINGS

In discussing the findings, we have focussed on the distribution of archaeological resources/residues across the proposed development site, rather than on individual sites or occurrences. For a more detailed description of each captured 'site', refer to Table 1.

Figure 9 illustrates the distribution of archaeological resources across the affected property. It is clear that most of the remains are concentrated on the narrow, frontal dune cordon in the south western portion of the proposed development site, alongside the coastal road (i.e. Sites 445-477). Shellfish deposits are visible on patches of soft brown sands inside the fence line, and alongside the coastal track (Figures 10-13), while an extensive, albeit patchy, scatter of fragmented shellfish is visible on the flat top of the dune cordon itself (Figures 14 & 15).

Most of the shellfish on the dune cordon appears to be *in-situ*, while some compacted shell also appears in places. In contrast, much of the shellfish on the loose brown sands below the dune cordon is associated with burrowing, and dune mole rat activity indicating that shell midden deposits occur below the surface sands, extending into the dune slack area as well.

As with most of the shell midden deposits recorded so far in the southern Cape, the Farm 453/6 shellfish is dominated by *Turbo Sarmaticus* (round turban shell) whose habitat is intertidal, while some limpets such as *Scutellastra longicosta* and *S. cochlear* (both low – mid & infratidal species), were also recorded. Operculum (the hard knobby foot bone of *T. Sarmaticus*) is not surprisingly present, while a few fragments of perlemoen (*Haliotis*), and some whelk and low spring tide periwinkle (*Diloma sinensis*) were also recorded.

The frequency of stone implements on the dune cordon is very low; limited to a few quartzite stone flakes, chunks, and smashed beach cobbles. No formal tools or organic remains such as pottery, bone or ostrich were found.

Grading of the archaeological resources

The archaeological resources across the dune cordon in the south western portion of the property have been rated as having *low-medium* (Grade 3C) significance, subject to test excavations to determine the depth and extent of sub-surface deposits.

Archaeological resources were also encountered over the remainder of the site, but the remains are spread very thinly and unevenly over the surrounding landscape, limited to small patches/fragments of shellfish (*T. Sarmaticus*, limpet & *Haliotis*) and a few isolated quartzite stone flakes and chunks (Figure 16). Most of the remains are associated with burrowing and dune mole rat activity, or have been exposed during bush cutting, or driving heavy plant machinery (tractor) to access portions of the site. While these surface residues constitute low density scatters, it does indicate that sub-surface archaeological deposits occur over much of the proposed development site, even on the upper slopes.

Grading of the archaeological resources

The archaeological resources across the eastern portion of the development site have been rated as having *low* (Grade 3C) significance.



Figure 9. Google satellite map of the proposed development site. Track paths (red) and waypoints of archaeological finds



Figure 10. Site 427



Figure 11. Site 449



Figure 12. Site 452



Figure 13. Site 451



Figure 14. Shell midden deposits are concentrated on the dune cordon in the south western portion of the proposed development site



Figure 15. Shell midden deposits are concentrated on the dune cordon in the south western portion of the portion of the proposed development site. Note the dense vegetation cover



Figure 16. Collection of quartzite stone flakes and chunks. Scale is in cm

7.1. Burials/graves

A possible grave (Site 423) was found in the Eskom servitude near the entrance to the farm (Figure 17). Comprising several round quartzite boulders, no grave goods such as glass jars were found, and no head or foot stone indicating a Christian burial is visible, suggesting that the feature might hint at a pre-colonial Khoisan burial. Some shellfish fragments (Site 424) were recorded a few meters from the stones.

Grading of the archaeological resources

All burials are rated as having *high* (Grade 3A) significance

7.2 Fishtraps

The remains of a fishtrap (Site 444) were found in the intertidal zone. The walls have mostly collapsed, but some form still exists (Figure 18). Research by Hine (2008) has shown that fishtraps on the southern Cape coastline were constructed by poor whites (bywoners) in the late 1800s and early 1900s, who rented properties from absent farmers at the time.

Grading of the archaeological resource

The collapsed remains have been rated as having *low* (Grade 3C) significance



Figure 17. Site 424 (possible grave). Note the shell fragments lying alongside



Figure 18. Site 444 (tidal fish trap). Arrow indicates packed stone boulders which have partially collapsed

7.3. Structures/features

A dry packed, partially collapsed, cobble stone wall was recorded 20m from the property fence alongside the coastal road (Figures 19 & 20). The standing wall is about 1m high and approximately 30m long. Assuming the feature is a boundary wall; it most likely dates to the late 1800s / early 1900s and may be contemporaneous with the tidal fishtrap (Site 444) – constructed with the same round beach cobbles. The surrounding wind shorn vegetation is extremely dense.

Grading of the archaeological resource

The feature has been rated as having as *Medium* (Grade 3B) significance



Figure 19. Site 443 (possible farm boundary wall). View facing north from the coast road



Figure 20. Site 443 (possible farm boundary wall). View facing south west

Archaeological Impact Assessment, proposed abalone farm on portion of Farm 453/6 Riversdale

Site	Name of farm	Lat/Long	Description of finds	Grading	Proposed mitigation
	Portion of Farm 453/6, Riversdale				
416		S34° 22.990' E21° 46.190'	Fragments of <i>Turbo Sarmaticus</i> , <i>Scutellastra argenvillei</i> and a few quartzite stone flakes associated with dune mole rat activity	3C	None required
417		S34° 22.940' E21° 46.193'	Quartzite flake in 2-track road	3C	None required
418		S34° 22.884' E21° 46.304'	Fragment of perlemoen (<i>Haliotis</i>) on dune mole rat dump	3C	None required
419		S34° 22.832' E21° 46.366'	Whole <i>T. Sarmaticus</i> & fragments – dune mole rate dump	3C	None required
420		S34° 22.825' E21° 46.207'	Large quartzite flake outside footprint area	3C	None required
421		S34° 22.901' E21° 46.128'	Possible MSA quartzite flake – dune mole rate dump	3C	None required
422		S34° 22.972' E21° 46.120'	2 quartzite flakes – dune mole rat dump	3C	None required
423		S34° 22.992' E21° 46.176'	Fragments of <i>T. Sarmaticus</i> shellfish, inc. large whole shell and <i>Operculum</i> – dune mole rat alongside house	3C	None required
424		S34°22'595' E21° 46.105'	Possible burial in Eskom servitude right alongside 423	Potential 3A	Note and avoid
425		S34°23.003' E21° 46.172'	Fragments of <i>T. Sarmaticus</i> – dune mole rat		None required
426		S34° 23.017' E21° 46.175'	Concrete drinking trough 15m x 1.5m wide	3C	None required
427		S34° 23.011' E21° 46.194'	Fragments of <i>T. Sarmaticus</i> , <i>S. longicosta</i> , <i>S. cochlear</i> , <i>Operculum</i> , whelk frags, a few quartzite chunks – soft brown sands/dune mole – in front of house alongside fence	3C	Test excavations to determine significance of sub-surface archaeological deposits.
429		S34° 22.988' E21° 46.232'	Quartzite chunk – dune mole rat	3C	None required
430		S34° 22.967' E21° 46.244'	Quartzite chunk and	3C	None required

Archaeological Impact Assessment, proposed abalone farm on portion of Farm 453/6 Riversdale

			shell fragment – dune mole rat		
432		S34° 22.927' E21° 46.264'	Fragment of <i>T. Sarmaticus</i>	3C	None required
434		S34° 22.896' E21° 46.288'	Shell fragment – dune mole rate	3C	None required
435		S34° 22.864' E21° 46.306'	Shell frags on brown sands in bush cut track	3C	None required
436		S34° 22.867' E21° 46.297'	Quartzite chunk in bush cut road	3C	None required
438		S34° 22.867' E21° 46.229'	Quartzite flake in bush cut road	3C	None required
441		S34° 22.876' E21° 46.191'	Fragments of <i>T. Sarmaticus</i> – dune mole rat dump in bush cut road	3C	None required
443		S34° 22.992' E21° 46.308'	Collapsed cobble stone (farm boundary) wall about 10m from coastal road. Wall is about 1m high x 30m long.	3B	Protect and incorporate into development proposal
444		S34° 23.062' E21° 46.225'	Collapsed fishtrap	3C	None required
445		S34° 23.051' E21° 46.089'	Patches of fragmented shellfish inside fence line alongside coastal road. Shellfish inc. <i>T. operculum</i> and <i>S. longicosta</i> . A few quartzite flakes and chunks	3C	None required
446		S34° 23.032' E21° 46.082'	Patches of fragmented shellfish on soft sands on dune cordon	3C	Shovel testing to determine significance of archaeological deposits
447		S34° 23.027' E21° 46.094'	Same as above, inc. <i>S. longicosta</i> , <i>S. cochlear</i> , <i>turbo Sarmaticus</i> and occasional and isolated quartzite flake and chunk on dune cordon	3C	Shovel testing to determine significance of archaeological deposits
448		S34° 23.027' E21° 46.100'	Same as above	3C	Shovel testing to determine significance of archaeological deposits
449		S34° 23.030' E21° 46.109'	Same as above	3C	Shovel testing to determine significance of archaeological deposits
450		S34° 23.024' E21° 46.124'	Patches of shellfish	3C	Shovel testing to

Archaeological Impact Assessment, proposed abalone farm on portion of Farm 453/6 Riversdale

			associated with dune mole rat activity		determine significance of archaeological deposits
451		S34° 23.021' E21° 46.134'	Fairly substantial shellfish fragments and some whole shell (<i>T. Sarmaticus</i>) associated with dune mole rat activity	3C	Shovel testing to determine significance of archaeological deposits
452		S34° 23.018' E21° 46.141'	Fairly substantial shellfish fragments, including <i>T. Sarmaticus</i> , <i>operculum</i> , limpet and <i>Diloma sinensis</i> associated with burrowing and dune mole rat. Several quartzite chunks	3C	Shovel testing to determine significance of archaeological deposits
453		S34° 23.019' E21° 46.148'	Demolished modern building	3C	None required
454		S34° 23.023' E21° 46.096'	Shell fragments – dune mole rat activity	3C	Shovel testing to determine significance of archaeological deposits
455		S34° 23.019' E21° 46.092'	Shell fragments – dune mole rat activity	3C	Shovel testing to determine significance of archaeological deposits
456		S34° 23.022' E21° 46.074'	Shell fragments – dune mole rat activity	3C	Shovel testing to determine significance of archaeological deposits
458		S34° 23.035' E21° 46.072'	Shell fragments on dune cordon	3C	Shovel testing to determine significance of archaeological deposits
459		S34° 23.028' E21° 46.066'	Shell fragments on dune cordon	3C	Shovel testing to determine significance of archaeological deposits
460		S34° 23.020' E21° 46.061'	Shell fragments on dune cordon	3C	Shovel testing to determine significance of archaeological deposits
461		S34° 23.025' E21° 46.057'	Shell fragments on dune cordon	3C	Shovel testing to determine significance of

Archaeological Impact Assessment, proposed abalone farm on portion of Farm 453/6 Riversdale

					archaeological deposits
462		S34° 23.026' E21° 46.039'	Shell fragments on dune cordon	3C	Shovel testing to determine significance of archaeological deposits
463		S34° 23.028' E21° 46.028'	Shell fragments on dune cordon	3C	Shovel testing to determine significance of archaeological deposits
464		S34° 23.004' E21° 46.023'	A few fragments of shell and quartzite stone in back dune area, behind dune cordon	3C	Shovel testing to determine significance of archaeological deposits
465		S34° 23.033' E21° 46.016'	Shell fragments and scattered bit of shellfish on dune cordon	3C	Shovel testing to determine significance of archaeological deposits
466		S34° 23.039' E21° 46.023'	Shell fragments and scattered bit of shellfish on dune cordon	3C	Shovel testing to determine significance of archaeological deposits
467		S34° 23.045' E21° 46.024'	Shell fragments and scattered bits of shell on dune cordon	3C	Shovel testing to determine significance of archaeological deposits
468		S34° 23.041' E21° 46.048'	Fairly extensive scatter of shellfish on frontal dune cordon including <i>S. cochlear</i> , <i>S. argenvillei operculum</i> , <i>T. Sarmaticus</i> , & <i>D. sinensis</i> . Quartzite chunks	3C	Shovel testing to determine significance of archaeological deposits
469		S34° 23.055' E21° 46.051'	Shell fragments and scattered bits of shell on dune cordon	3C	Shovel testing to determine significance of archaeological deposits
470		S34° 23.055' E21° 46.033'	Shell fragments and scattered bits of shell on dune cordon	3C	Shovel testing to determine significance of archaeological deposits
471		S34° 23.041' E21° 46.034'	Shell fragments and scattered bits of shell on dune cordon	3C	Shovel testing to determine significance of archaeological deposits

Archaeological Impact Assessment, proposed abalone farm on portion of Farm 453/6 Riversdale

472		S34° 23.037' E21° 46.032'	Shell fragments and scattered bits of shell on dune cordon	3C	Shovel testing to determine significance of archaeological deposits
473		S34° 23.030' E21° 46.024'	Shell fragments and scattered bits of shell on dune cordon	3C	Shovel testing to determine significance of archaeological deposits
474		S34° 23.024' E21° 45.987'	Scattered fragments of shellfish on soft sands on higher back dune	3C	Shovel testing to determine significance of archaeological deposits
475		S34° 23.032' E21° 45.995'	Shell fragments and scattered bits of shell	3C	Shovel testing to determine significance of archaeological deposits
476		S34° 23.039' E21° 45.988'	Shell fragments and scattered bits of shell	3C	Shovel testing to determine significance of archaeological deposits
477		S34° 23.056' E21° 46.054'	Shell fragments and scattered bits of shell	3C	Shovel testing to determine significance of archaeological deposits
478		S34° 23.051' E21° 46.076'	Holocene High raised beach deposits with round beach cobbles and dispersed shellfish (refer to Pether 2016)	Ungraded	

Table1. Spreadsheet of waypoints and description of archaeological resources

8. DESCRIPTION OF POTENTIAL IMPACTS

Tables 2 and 3, assesses the overall impacts to archaeological resources.

The impact of the proposed development will be limited, and will most likely occur during the Construction Phase of the project (i. e. excavations for building foundations, terracing cutback, installation of services, etc).

8.1 Summary of assessment of potential impact of the proposed activities

Potential impact on archaeological resources	
Nature of impact	Damage to, or destruction of archaeological resources
Extent and duration of impact	Localized short term
Intensity of impact	Potentially high – particularly raised dune cordon
Probability of occurrence	Probable
Degree to which impact can be reversed	Reversible
Irreplaceability of resources	Low
Cumulative impact prior to mitigation	High
Significance of impact pre-mitigation	Potentially High
Degree of mitigation possible	High
Proposed mitigation	Test excavations to be carried out to determine significance of sub surface archaeological deposits. If exposed, burials must be removed/left alone Bulk earthworks to be monitored by a professional archaeologist
Cumulative impact post mitigation	Low
Significance after mitigation	Insignificant

Table 2. Assessment of archaeological impacts: Construction Phase

Potential impact on archaeological resources	
Nature of impact	Damage to or destruction of archaeological resources
Extent and duration of impact	Insignificant
Intensity of impact	Very Low
Probability of occurrence	Very Low
Degree to which impact can be reversed	Very Low
Irreplaceability of resources	Very Low
Cumulative impact prior to mitigation	Very Low
Significance of impact pre-mitigation	Very Low
Degree of mitigation possible	Very Low
Proposed mitigation	None required
Cumulative impact post mitigation	Low
Significance after mitigation	Insignificant

Table 3. Assessment of archaeological impacts: Operational Phase

9. CONCLUSION

Archaeological resources (i. e. shell midden deposits) are concentrated on the narrow dune cordon in the south western portion of the proposed development site, and are unevenly distributed over the remainder of the property (refer to Figure 9). Shellfish frequencies, while relatively low, are dominated by *T. Sarmaticus*, with modest amounts of limpet, perlemoen, whelk and periwinkle. Stone tool frequencies are very low, limited to a few crude quartzite flakes, chunks and broken/smashed cobbles. No pottery, bone or ostrich eggshell was found, suggesting the sites are older than 2000 years.

Construction activities, including bulk earthworks (for example foundation excavations for buildings, terrace cuttings etc), and excavations for services (water pipelines & installation of cables for the solar array), will likely impact on fragile heritage resources (refer to impact assessment table 1).

Unmarked (Khoisan) human remains may also be uncovered.

There are, however, no fatal flaws, and as long as the recommendation made in the report, are adhered too, there are no objections to the authorization of the proposed development proceeding.

10. RECOMMENDATIONS

1. Shovel testing must be undertaken to determine the significance of sub surface archaeological deposits. The focus of test excavations will be on the narrow dune cordon in the south western portion of the proposed development site.
2. The historic stone wall alongside the gravel road (inside the footprint area) must be protected and incorporated into the final development proposal. A 10m protective buffer is recommended
3. A possible grave/burial (in the Eskom servitude) must be avoided. The 'grave' must be demarcated (possibly enclosed inside a small fence), or simply left alone.
4. Bulk earthworks (i. e. excavations for building foundations, terracing cut backs, & services) must be monitored by a professional archaeological. The site must be inspected once a week by the archaeologist during the construction phase of the project.
5. It is not necessary for the archaeologist to monitor vegetation clearing operations, but the Environmental Control Officer (ECO) must be briefed on site, prior to the commencement of site clearing. The site must also be inspected once vegetation clearing has been completed.
6. If any unmarked human remains are exposed or uncovered during excavations and earthworks, these must immediately be reported to Heritage Western Cape (Att: Mr Guy Thomas), or the archaeologist (Jonathan Kaplan 082 321 0172).
7. The above recommendations must be incorporated into the Environmental Management Plan (EMP) for the proposed development.

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23 October, 2016

Att: Paul Slabber
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7200

**ARCHAEOLOGICAL IMPACT ASSESSMENT, PROPOSED GOURITZ ABALONE FARM
ON A PORTION OF PORTION 6 OF FARM 453 LANGE FONTEIN, WESTERN CAPE:**

PROPOSED RELOCATION OF THE 2.5MW SOLAR ARRAY

1. Introduction

ACRM was instructed to undertake an archaeological impact assessment of a new site for the 2.5MW solar array that is intended for the proposed Gouritz Abalone Farm on Portion of Portion 6 of Farm 453 Langefontein (Hassequa Municipality), near Gouritzriver (Figures 1 & 2) in the Western Cape.

An Archaeological Impact Assessment (or AIA) of the proposed development has already been done by ACRM (Kaplan 2016)¹.

The original site for the solar array, including inverter rooms, solar control and grid tie in rooms was on the upper, south hill facing slopes immediately behind the proposed grow out tanks, with a clear view of the ocean.

The proposed new site for the solar array is positioned on a gentler, north facing slope at the back of the upper hill slopes of the property, about 1.2kms inland from the coast, outside the view shed of the coastline.

The proposed ± 5ha site is covered in pristine natural veld (Restio, grassland, groundcover, Proteas & Fynbos) on a fairly soft sandy substrate (Figures 3-6). There are no rocky outcrops or any other significant landscape features on the proposed site. There are no springs, streams or any other natural source of water on the subject property. Surrounding land use is the Gourikwa Private Nature Reserve on the western boundary, agriculture, small holdings and Wilderness.

2. Approach to the study

A field assessment of the proposed new location site was undertaken on the 19th October, 2016.

A track path of the survey was created (Figure 7).

The study was constrained by extremely dense vegetation, resulting in low archaeological visibility.

¹ Kaplan, J. 2016. Archaeological Impact Assessment, proposed Gouritz Abalone Farm on Portion of Portion 6 of Farm 453 Lange Fontein, Hassequa Municipality, Western Cape. Report prepared for PHS Consulting. ACRM, Cape Town



Agency for Cultural Resource Management

Specialists in Archaeological Studies and Heritage Resource Management

3. Potential risks

The results of the study indicate there are no archaeological risks in re-locating the proposed solar array from its original site behind the grow out tanks, to a new site at the back of the upper hill slopes.

4. Findings

No pre-colonial archaeological remains were encountered during the field assessment.

No graves or typical grave markers were located during the study

5. Other finds

A patch of quartzite pebbles, a small quartzite chunk, and a few tiny pieces of adiaagnostic marine shellfish (Site 1009) was found on soft loose sands in the fire break directly alongside the fence line of the Gourikwa Private Nature Reserve (refer to Figure 7).

6. Conclusion

The proposed new site for the 2.5MW solar array is not a sensitive archaeological landscape.

7. Recommendations

With regard to the re-location of the 2.5MW solar array for the proposed Gouritz Abalone Farm on Portion of Portion 6 of Farm 453, Lange Fontein, the following recommendations are made:

1. No archaeological mitigation is required.
2. No archaeological monitoring is required during construction operations for the new solar array.



Figure 1. Proposed Gouritz Abalone Farm on Portion of Portion 6 of Farm 453. Location site of proposed 2.5MW solar array on the upper hill slopes



Figure 2. Google satellite map of the site for the proposed Gouritz Abalone Farm (red polygon). Yellow polygon indicates the proposed location site for the new 2.5MW solar array.

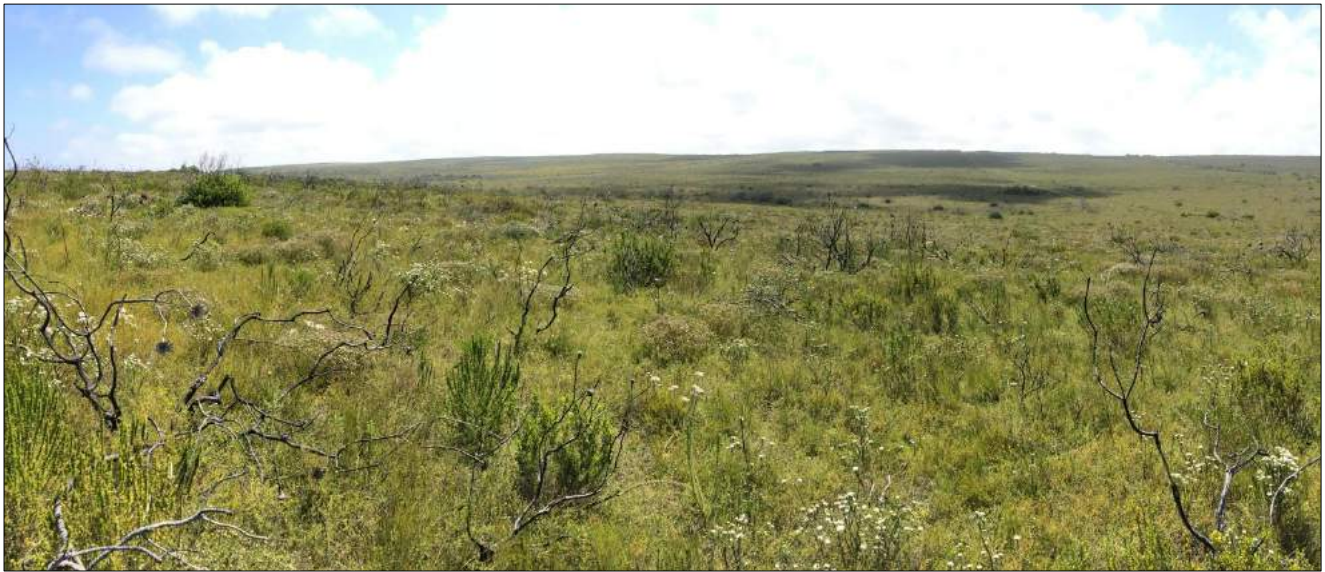


Figure 3. Proposed location site for the new solar array. View facing north east



Figure 4. Proposed location site for the new solar array. View facing north east



Figure 5. Proposed location site for the new solar array. View facing north



Figure 6. Proposed location site for the new solar array. View facing north east



Figure 7. Proposed Gouritz Abalone Farm on Portion 6 of Farm 453: Location of archaeological remains documented during the study. Red lines are track paths



CTS HERITAGE

APPENDIX 3: Palaeontological Impact Assessment

**PALAEONTOLOGICAL IMPACT ASSESSMENT
DESKTOP STUDY**

**PROPOSED GOURITZ ABALONE FARM, FARM 6 OF 453, RIVERSDALE
HESSEQUA MUNICIPALITY, WESTERN CAPE**

By

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REVISED 2ND DRAFT

20 September 2016

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EXECUTIVE SUMMARY

1. SITE NAME

Proposed Gouritz Abalone Farm.

2. LOCATION

Portion 6 of Farm 453 (Lange Fontein), near Riversdale. Figure 1.

3. LOCALITY PLAN

See Figures 2 and 6.

4. PROPOSED DEVELOPMENT

Site Alternative 1 (revised). Figure 2 and detail in Appendix 1.

An abalone farm is proposed for a 20 ha seafront area on a portion of Farm 6/453 (Lange Fontein), near Riversdale. A ~5 ha solar photo-voltaic array to provide power is proposed for a site on the crest of the coastal slope above the abalone farm. PHS Consulting has been appointed to undertake a Basic Environmental Assessment as required by the National Environmental Management Act (NEMA) EIA Regulations. The precise layout of the proposed abalone farm is still under consideration. The preliminary Site Development Plan (Appendix 1) illustrates the envisaged infrastructure of the abalone farm.

This report outlines the nature of palaeontological/fossil heritage resources in the subsurface of the affected area and suggests mitigatory actions to be taken in the event of the discovery of fossils during earth works, for inclusion in the Environmental Management Plan for the Construction Phases. The operational and decommissioning phases do not involve adverse impacts on palaeontological heritage.

5. PALAEOLOGICAL HERITAGE RESOURCES IDENTIFIED

The abalone farm site (Figures 2, 6) is situated on vegetated windblown coversands and low dunes backing a rocky sandstone intertidal shoreline, on the foot of the gentle concave coastal slope of a broad rounded ridge comprised of ancient dune sands which rises to above 100 m asl. Pale **Qg** aeolian coversands extend from the edge of the shoreline rock and lap onto old **Wankoe Formation** aeolianites. Beneath the Qg coversand are raised beach deposits of the **Klein Brak Formation** which may be present in the form of terraces, beach ridges and gravel beds extending down from ~15 m asl. and overlying the eroded Wankoe aeolianites and the sandstone bedrock.

The new site for the solar PV array on the crest of the Wankoe Formation salient (Figures 2, 6) is mantled by thin Qg coversands derived from weathering of the underlying Wankoe Formation aeolianites.

6. ANTICIPATED IMPACTS

The footprint of abalone farm is mainly on the Qg coversands (Figure 2). As the grow-out tanks must be situated on level areas, it is assumed they are to be arranged on a series of terraces descending to the shoreline, with access lanes and runoff drainage control. The construction of level platforms involves cutbacks. Specifications are not yet available, but presumably will attempt to minimize the volume of bulk earth works to limit costs. Nevertheless, exposures of a few metres in vertical extent may be expected along the inner edge of terrace cutbacks.

Terracing cutbacks in the upslope area of the tank sites will intersect the Wankoe Formation. The Qg coversands and underlying palaeosols are likely thickest in the mid-slope zone and the underlying Klein Brak Formation raised beaches may be too deep for intersection. Along the outer, lower zone these raised beach deposits will be intersected in cutbacks, foundation excavations and trenches.

The solar array on the hilltop is assumed to be a typical installation, with the photo-voltaic panels mounted on frameworks which will be supported on posts. In addition to numerous post holes, disturbance involves the making of access tracks, drainage for runoff control, possibly shallow burial of cables and a small number of areas for platforms to support power management equipment.

The thickness of the Qg sands at the PV array site is not accurately known, but the lineations seen in aerial images evidently reflect outcropping strata of the underlying Wankoe Formation. Although the construction of the solar panel array does not involve a large volume of deep earthworks, it is likely that the potentially fossil-bearing palaeosurface formed on calcrete beneath the loose Qg sands will be intersected. The post holes, likely ~1 m deep, constitute an array of “probes” across the area, a few of which may fortuitously intersect fossil bones.

This impact assessment refers to the occurrence of sparse, high value vertebrate fossil bone material in the Wankoe and Qg coversand formations. The fossil bones are sparse, but those that have been found in the coastal aeolianites are of profound scientific value and of international interest. However, in consideration of the relatively limited depth of bulk earthworks (*cf.* quarrying/mining) and that a major fossil find of international significance is not usually expected nor can be predicted, the palaeontological sensitivity is rated as MODERATE, with a magnitude of MEDIUM. For the purposes of this report it is assumed that the vertebrate fossils (bones) that may be destroyed/lost (or found) are likely to be additions to the mid to late Quaternary fauna of the region.

The marine fossil shell content of the raised beaches of the Klein Brak Formation is of LOW palaeontological sensitivity. Due to the exposed coast setting the shell assemblages expected are those composed of modern species, the fossils are abundant, easily sampled and natural exposures occur in places along the coast.

7. RECOMMENDATIONS

A practical monitoring and mitigation programme must be implemented during the Construction Phases of the proposed abalone farm. Strategies for palaeontological mitigation must dovetail with those for archaeological mitigation. The details of the programme must await the finalization of the proposals for the study area w.r.t. the extent of bulk earthworks, when the contracted palaeontologist will liaise with PHS Consulting, the developer, the contracted archaeologist and earthworks contractors about the specifics of setting up a monitoring and inspection programme.

**DECLARATION BY THE INDEPENDENT PERSON WHO COMPILED A
SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS**

**PALAEONTOLOGICAL IMPACT ASSESSMENT
DESKTOP STUDY**

**PROPOSED GOURITZ ABALONE FARM, FARM 6 OF 453, RIVERSDALE
HESSEQUA MUNICIPALITY, WESTERN CAPE**

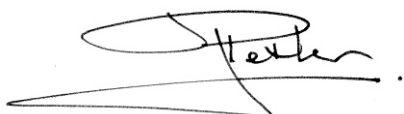
Terms of Reference

This assessment forms part of the Heritage Impact Assessment in the EIA process and it assesses the probability of palaeontological materials (fossils) being uncovered in the subsurface and being disturbed or destroyed in the process of bulk earth works. Mitigatory actions to be taken with respect to the occurrence of fossils during bulk earth works are proposed.

Declaration

I ...**John Pether**....., as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in the compilation of the above report;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- 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, 2010 and any specific environmental management Act;
- have and will not have any vested interest in the proposed activity proceeding;
- have disclosed to the EAP any material information that has 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, 2010 and any specific environmental management act;
- have provided the EAP with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 71 of GN No. R. 543, 2010.



Signature of the specialist

Date: 20 September 2016

The author is an independent consultant/researcher and is a recognized authority in the field of coastal-plain and continental-shelf palaeoenvironments and is consulted by exploration and mining companies, by the Council for Geoscience, the Geological Survey of Namibia and by colleagues/students in academia pursuing coastal-plain/shelf projects.

Expertise

- Shallow marine sedimentology.
- Coastal plain and shelf stratigraphy (interpretation of open-pit exposures and on/offshore cores).
- Marine macrofossil taxonomy (molluscs, barnacles, brachiopods).
- Marine macrofossil taphonomy.
- Sedimentological and palaeontological field techniques in open-cast mines (including finding and excavation of vertebrate fossils (bones)).

Membership of Professional Bodies

- South African Council of Natural Scientific Professions. Earth Science. Reg. No. 400094/95.
- Geological Society of South Africa.
- Palaeontological Society of Southern Africa.
- Southern African Society for Quaternary Research.
- Accredited member, Association of Professional Heritage Practitioners, Western Cape.

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An abalone farm is proposed for a 20 ha seafront area on a portion of Farm 6/453 (Lange Fontein), near Riversdale (Figure 1). PHS Consulting has been appointed to undertake a Basic Environmental Assessment as required by the National Environmental Management Act (NEMA) EIA Regulations.

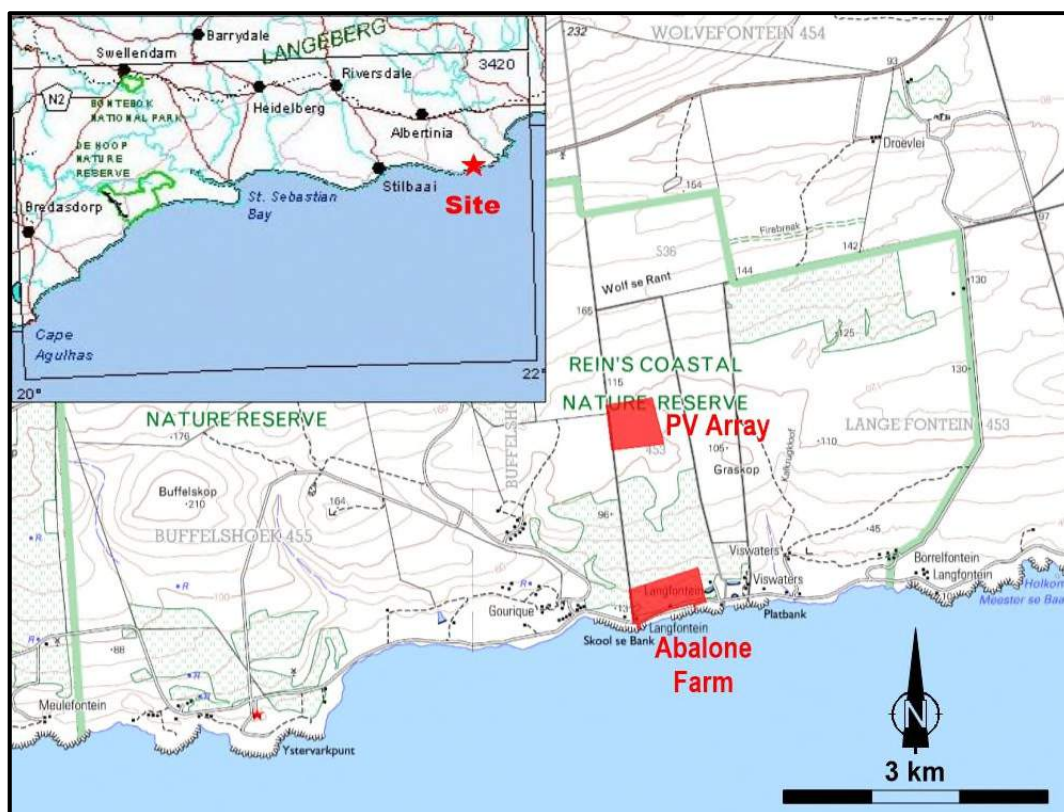


Figure 1. Location of the proposed Gouritz Abalone Farm and solar PV power supply array (Alt. 2). Extract from 1:50000 topo-cadastral maps 3421BC_ and 3421BD_1999_ED3_GEO.TIF. Chief Directorate National Geo-spatial Information of South Africa.

The proposed Gouritz Abalone Farm project area is situated on vegetated windblown coversands and low dunes backing a rocky intertidal shoreline, on the foot of the gentle concave coastal slope of a broad rounded ridge comprised of ancient dune sands which rises to above 100 m asl. (Figure 2).

The precise layout of the proposed abalone farm is still under consideration. A preliminary Site Development Plan (SDP Alternative 1) illustrates the envisaged infrastructure (Figure 2 and detail in Appendix 1). This SDP succeeds an earlier one wherein the solar Photo-Voltaic (PV) array was placed on the slope immediately above the abalone farm. Its revised site is now on the crest of the ancient coastal dune ridge (Figures 2, 6). It will link into the existing ESKOM overhead powerline that runs along the western boundary of the property down to the coast.

The grow-out tanks, in which the abalone are reared to commercial size, occupy most of the site (Figure 2) and are designed for production of up to ~750 tons of abalone per annum. Seawater is to be pumped from an intake at 10 000 m³/hour, distributed through the tanks and returned to the sea via an effluent channel. Other infrastructure involves a Hatchery to produce spat and buildings for processing the grown abalone, administration offices, canteens and a workshop.

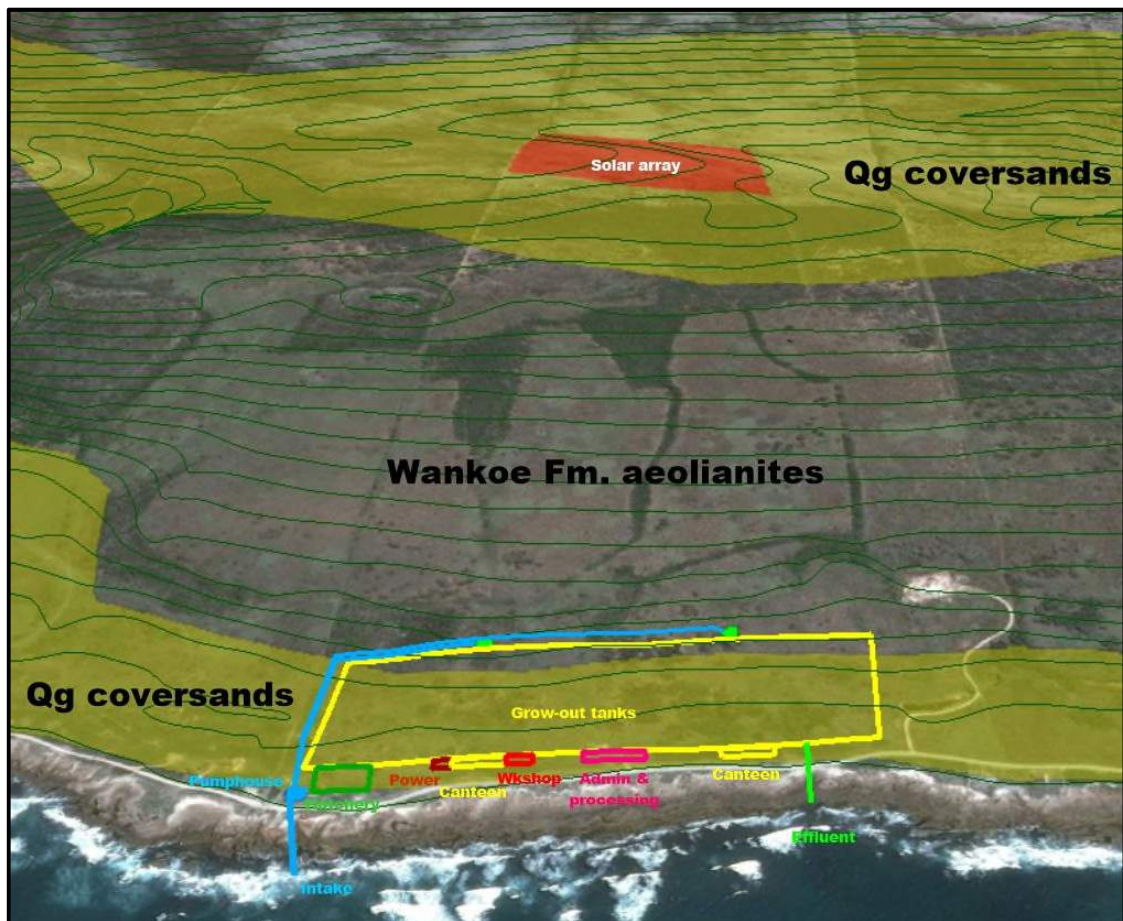


Figure 2. Main elements of proposed (revised) Site Development Plan Alternative 1. Simulated aerial view looking north. See Appendix 1 for detail. Contours at 5 m intervals.

This report assesses the probability of palaeontological materials (fossils) being uncovered in the subsurface and being disturbed or destroyed in the process of earth works associated with the construction of the proposed abalone farm. The main purposes are to:

- Outline the nature of palaeontological/fossil heritage resources in the subsurface of the affected area.
- Suggest the mitigatory actions to be taken with respect to the occurrence of fossils during earth works.

Palaeontological interventions mainly happen once fossil material is exposed at depth, i.e. once the EIA process is done and construction commences. The action plans and protocols for palaeontological mitigation must therefore be included in the Environmental Management Plan (EMP) for the project. Included herein is a general fossil-finds procedure for the appropriate responses to the discovery of paleontological materials during construction of the proposed abalone farm.

2 APPROACH AND METHODOLOGY

2.1 AVAILABLE INFORMATION

The relevant geological map is 1:250 000 Geological Series sheet 3420 Riversdale (extract shown in Figure 3), together with the explanation (Malan *et al.*, 1994).

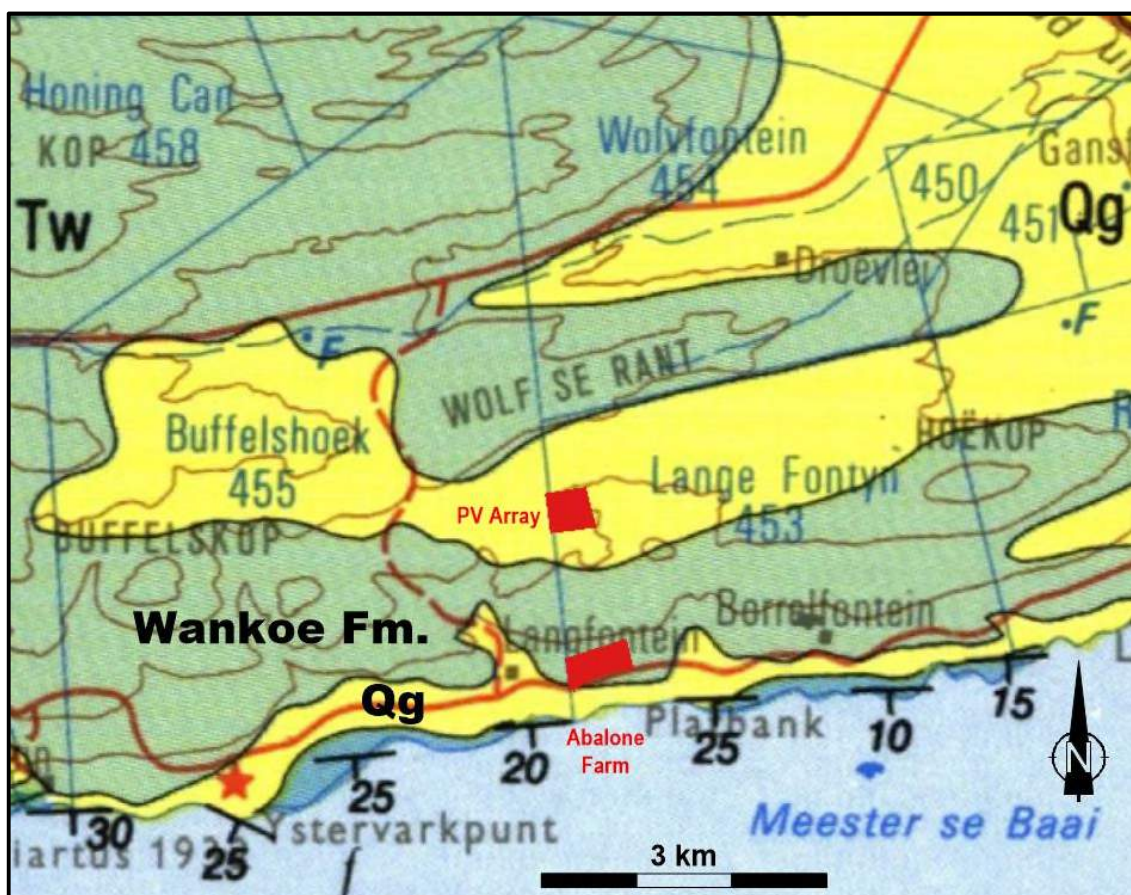


Figure 3. Geology surrounding the Project Area. From 1:250 000 Geological Series sheet 3420 Riversdale. Council for Geoscience, 1993.

The younger geological record, that overlies the bedrock of folded and deformed Cape Supergroup quartzites and shales, is of concern here. During the last decade or so, the application of new dating techniques (OSL dating) has greatly

improved our understanding of the history of the younger dune formations of the coastal plain. The relevant articles will be cited in the normal manner in the text and included in the References section.

2.2 *ASSUMPTIONS AND LIMITATIONS*

It is not possible to predict the buried fossil content of an area other than in general terms, based on the depositional environments of the formations and the fossils that have been found. In particular, the important fossil bone material is generally sparsely scattered in most deposits and much depends on spotting this material as it is uncovered during digging *i.e.* by monitoring excavations.

3 *GEOLOGICAL AND PALAEOONTOLOGICAL SETTING*

3.1 *THE BEDROCK GEOLOGY*

The coastal platforms in this region are cut across **Cape Supergroup** bedrock of the upper **Table Mountain Group** (TMG) and the lower **Bokkeveld Group** which span the period 430-380 Ma (Silurian and Devonian periods) (Ma = millions of years ago). The rocks exposed along the intertidal zone of the study area comprise TMG quartzitic sandstones of the Silurian **Skurweberg Formation**, deposited in a fluvial braid plain setting. Sparse trace fossils are found in finer-grained, marine-influenced sections, but the palaeontological sensitivity is low and this bedrock is not considered further.

3.2 *THE MIO-PLIOCENE MARINE DEPOSITS*

After the breakup of Gondwana and the formation of the coast, marine erosion beveled the coastal edge. Along the southern Cape coast, the combination of marine platform formation and uplift has produced a large-scale stepped profile. A “High Coastal Platform” forms the higher, older part of the coastal plain where it is now uplifted up to its present altitude of between ~200-260 m asl. (Marker & Holmes, 2002). Definite marine deposits have not been found on the “High Coastal Platform” and have evidently been eroded away, but it is likely that it was last occupied by the sea during Eocene times, between 55-34 Ma.

In contrast, shallow marine deposits mantle the bedrock of the “Lower Coastal Platform” below ~120 m asl. and these shelly calcareous sands and conglomerates comprise the **De Hoopvlei Formation** (Malan, 1991a) which is the basal formation of the **Bredasdorp Group**, the latter encompassing the Cenozoic deposits of the southern Cape coast (Malan, 1989a) (Figure 4).

In the Mossel Bay area the De Hoopvlei Formation shelly conglomerates on the platform crop out between elevations of 60 to 120 m asl. (Viljoen & Malan, 1993). In the Knysna region, Marker (1987) has recorded marine benches below the “High Coastal Platform”, eroded at 120-140, 90, 60 and 30 m asl.

Marine deposits have been recognized in similar topography in the Plettenberg Bay area, relating to sea levels reaching ~100, ~60 and ~30 m asl. (Butzer & Helgren, 1972). In the region of the study area, the De Hoopvlei Formation marine deposits are exposed on the valley flanks of the Goukou (Kafferkuils) and Gouritz rivers, extending continuously from ~120 m asl. across the seaward-sloping platformed area up to the coast.

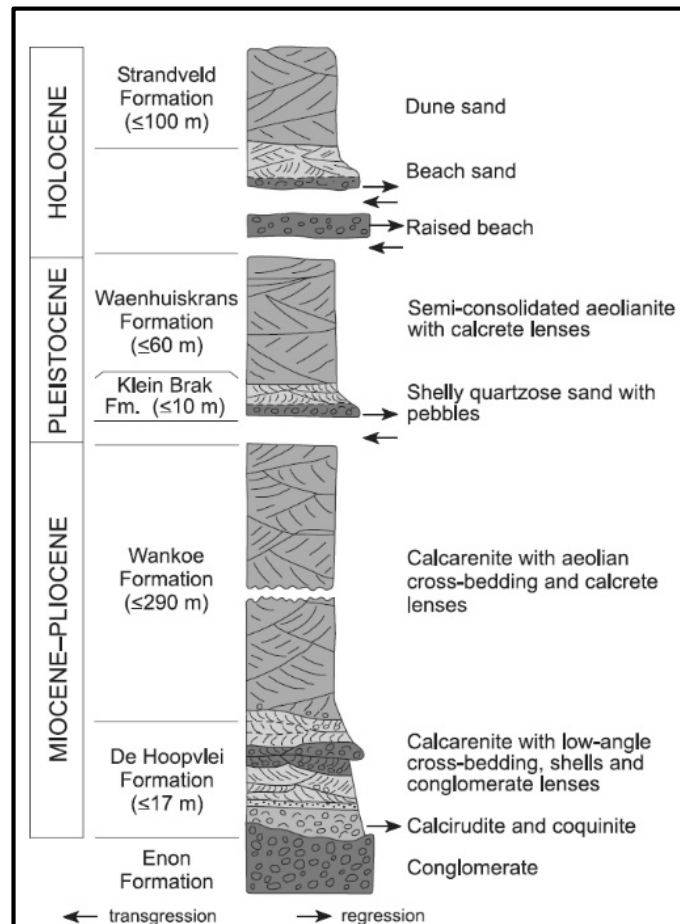


Figure 4. Schematic geological section of the Bredasdorp Group. From Roberts et al., 2006.

The sea level elevations mentioned above are very similar to those determined on the West Coast, where three major marine formations are preserved (Pether *et al.*, 2000), each emplaced during sea level regressions (fall) from successive highstands at ~90, ~50 and ~30 m asl. Respectively, these formations are dated to ~16-15 Ma (middle Miocene), ~5-4 Ma (early Pliocene) and ~3.0 Ma (late Pliocene), respectively. This is in accord with the broad sea level and palaeoclimatic history as preserved in marine and continental records and these high sea levels correlate with periods of global warming referred to as the Mid-Miocene Climatic Optimum, the Early Pliocene Warm Period and the ^{*}Mid-Pliocene Warm Period. The De Hoopvlei Formation is similarly considered to be a composite “formation” made up of these subset formations of different ages. (^{*}-see Glossary.)

Exposures of the De Hoopvlei Formation along the coastline at low elevations (<30 m asl.) are expected to be of the youngest, ~3 Ma late Pliocene subset formation, but this is not exposed along the coast in the vicinity of the study area, being buried beneath aeolianites of the Wankoe Formation.

3.3 **THE MIO-PLIOCENE AEOLIANITES**

Subsequent to the marine inundations a huge pile of ancient dune sand has accumulated episodically on the coastal platforms, blown inland from the ancient sandy shorelines. These variously-cemented dunes (aeolianites) are much evident in the regional landscape as old, calcrete-capped, rounded dune ridges (“Wankoe se Rante” or “Die Harde Duine”) and are particularly well displayed where erosion, road cuttings and limestone quarries reveal their internal, large-scale dune-slipface crossbedding. The older aeolianites that cover the Mio-Pliocene De Hoopvlei Formation marine deposits are consigned to the **Wankoe Formation** (Figure 3, Tw; Figure 4) (Malan, 1989b).

Beneath the capping calcrete crust the Wankoe Formation aeolianites include further calcretes and leached *terra rosa* (reddish) soils at depth, attesting to episodes of sand accumulation during windy/dry periods, separated by less windy/wetter periods of reduced sand accumulation, with the calcrete and soil formation showing the surface stability. Runoff during wetter intervals induces colluviation of steeper dune slopes, rounding off the dune crests and ridges and infilling lower interdune areas. The buried soil profiles often occur within such colluviated sand intervals.

The maximum ages of these old aeolianites is the age of the marine formations that underlie them and thus the Wankoe Formation aeolianites must also become younger towards the coast. However, age gap varies considerably and the time of dune deposition may be significantly younger than the eroded marine formation finally being covered up. The oldest Wankoe aeolianites at high elevation could be of later Miocene age, similar to the Prospect Hill Formation aeolianites on the West Coast which are dated to 12-9 Ma on the basis of finds of fossil eggshell of an extinct ostrich. The youngest Wankoe Formation aeolianites postdate the younger ~3 Ma old part of the underlying De Hoopvlei Formation and could be latest Pliocene or early Quaternary in age.

3.4 **THE QUATERNARY RECORD**

Since ~2.6 Ma the Earth has been in the Quaternary Period, when there was a major expansion of the polar ice caps, mainly in the Northern Hemisphere. This was the onset of more marked, repetitive Ice Ages (glacials) when the expanded ice on continents subtracted water from the oceans and sea level rose and fell repeatedly. Sea levels fluctuated at positions mainly below the present level and down as much as ~130 m bsl. during glacial maxima, exposing much of the continental shelves (e.g. the Agulhas Bank) and increasing the width of the coastal plains, albeit temporarily. The generally colder palaeoclimates were interrupted by brief intervals of rapid global warming, called interglacials, of which the present time is an example, when sea levels were similar to the present level or just several metres above or below present level. Figure 5

shows the sawtooth pattern of sea-level and glacial/interglacial cycles of the last 800 ka.

During interglacial to intermediate shoreline levels dune plumes migrated onto the present-day coastal plain, sourced from now-submerged beaches. These younger aeolianites comprise the **Waenhuiskrans Formation** (Figure 4), so named after this place near Arniston where they form the low seacliffs at the coast (Malan, 1989c). Similar to the Wankoe Fm. aeolianites there is a calcrete-capped relict dune-ridge topography and “packages” of dune accumulation defined by palaeosols.

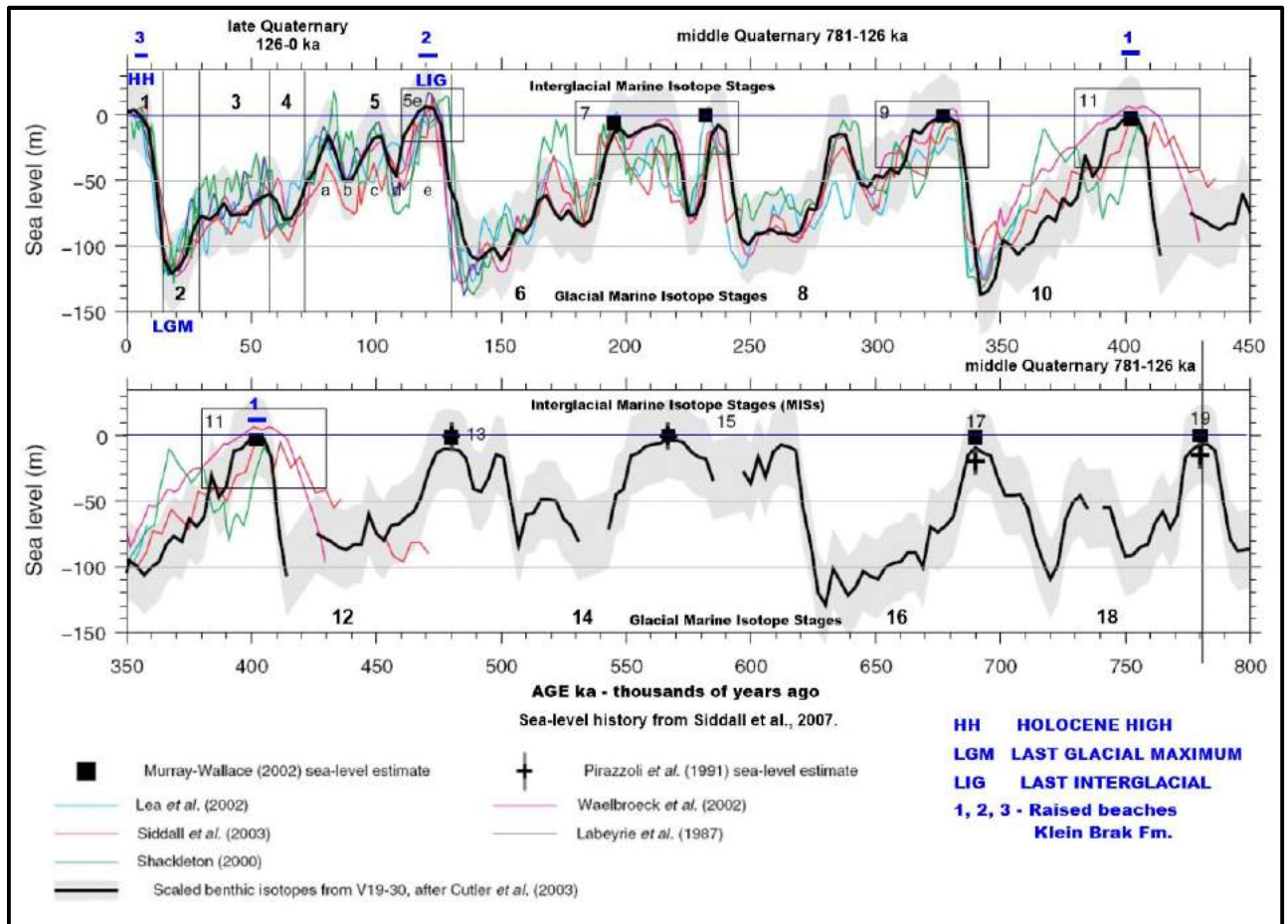


Figure 5. Sea-level history of the last 800 ka, during the middle and late Quaternary.

These younger aeolianites can be dated by the OSL method (see glossary) and this has now shown that Waenhuiskrans Formation aeolianite deposition has occurred on the southern Cape coast since the later part of the mid Quaternary, at >200 ka and 189-160, 128-104, 90-88 and 80-67 ka, during interglacial and intermediate sea-level high stands (Bateman *et al.*, 2004) (ka = thousands of years ago). In the Wilderness embayment the successive dune cordons are dated to 241-221 ka, 159-143 ka, 130-120 ka and 92-87 ka (Bateman *et al.*, 2011). The cliffed Waenhuiskrans Formation aeolianites east of Stilbaai produced dates of 140-90 ka that indicate deposition mainly during MIS 5 (Roberts *et al.*, 2008) (Figure 5).

During some of the previous warm interglacials sea level was higher than present and lapped onto the coast, depositing “raised beaches” around the coast, mostly on the bedrock platform and also onto notches eroded into older Waenhuiskrans or Wankoe formation aeolianites. These “raised beaches” are found below ~15 m asl. and constitute the **Klein Brak Formation** which is defined to include the Quaternary raised beaches fringing the coast (Malan, 1991b).

The older raised beach deposits in the Klein Brak River type area, Dana Bay and Hartenbos have been OSL-dated to an older interglacial high sea level around 400 ka (MIS 11, Figure 5) and record a sea level highstand of ~13 m asl. (Roberts *et al.*, 2012). Present sea level was evidently not exceeded during the MIS 9 and MIS 7 interglacials (Figure 5). However, deposits relating to the MIS 7 interglacial about 200 ka are often found interbedded in the bases of the aeolianite seacliffs, exposed in the intertidal zone and below sea level (e.g. at Waenhuiskrans and False Bay). These include estuarine/lagoonal and coastal vlei deposits, the latter reflecting high water tables associated with the nearby high sea level. The vlei deposits include organic-rich and peaty beds with terrestrial fossil bones.

Present sea level was exceeded again by about 6 m during the Last Interglacial interval of global warmth (LIG or MIS 5e, Figure 5, ~125 ka). This is the most prominent raised beach noticeable around the coast and it is often overlain by younger Waenhuiskrans Formation aeolianites.

During the recent past, only 7-4 ka (early to mid-Holocene), sea level was again higher than present by 2-3 m. This is the mid-Holocene highstand (“Holocene High”) raised beach. It is preserved beneath Holocene dunes on sandy coastal stretches or as a small terrace on rocky coasts which are less exposed due to a wide intertidal platform.

Coversand unit **Qg** comprises poor soils in pale sands that have accumulated in the broader coastal landscape (Figure 6), where for the most part the sand has been derived by weathering of the old Wankoe aeolianites. On the West Coast, similar sands have been dated by the OSL technique which indicates several periods of deposition during the last 80 ka (Chase & Thomas, 2007).

The latest addition of dunes to the coastal plain is the **Strandveld Formation (Qs)**. These are sands blown from the beaches in the last several thousand years, during the Holocene, and accumulated in the form of a narrow dune cordon or “sand wall” parallel to the coast, often overlying the aforementioned Holocene High raised beach, or transgressing a few kilometres inland as dune plumes.

3.5 **LOCAL GEOLOGICAL SETTING**

The abalone farm project area extends from the edge of the shoreline rock platform across pale **Qg** coversands which lap onto old **Wankoe Formation** aeolianites that form the coastal salient. There is a slight increase in the slope 15-20 m asl. where the Qg coversands thin out. Figures 2 and 6 more

accurately depict the surface geology boundaries compared to the Figure 3 geological map extract which is distorted along the coast. Coversand Qg mantles deposits of the **Klein Brak Formation** raised beaches which may be present in the form of terraces, beach ridges and gravel beds extending down from ~15 m asl. and overlying the eroded Wankoe aeolianites and the TMG sandstone bedrock.

The Qg shoreline sands have been derived from washing down of eroded Wankoe sands and reworking of sands of the raised beaches. Mid to late Quaternary Waenhuiskrans Formation aeolianites and Holocene Strandveld Formation dunes have not accumulated on this broad cape between Ystervarkpunt and the Gouritz River, but are extensive along the shoreline of the bight to the west between Stilbaai and Ystervarkpunt (Figure 1, inset). The volume of these two formations decreases eastward from the Goukou River (Stilbaai) and peters out near Meulefontein (Figure 1), reflecting the eastward diminishment of sand delivery by longshore drift due to dune formation fed from the beaches updrift.

The new site for the solar PV array on the crest of the Wankoe Formation salient (Figures 2, 6) is mantled by Qg coversands derived from weathering of the underlying Wankoe Formation aeolianites.

This assessment therefore entails the degree of subsurface disturbance and the palaeontological sensitivities of the fossil content of the Wankoe Formation aeolianites, the Klein Brak Formation raised beaches and the Qg coversands.

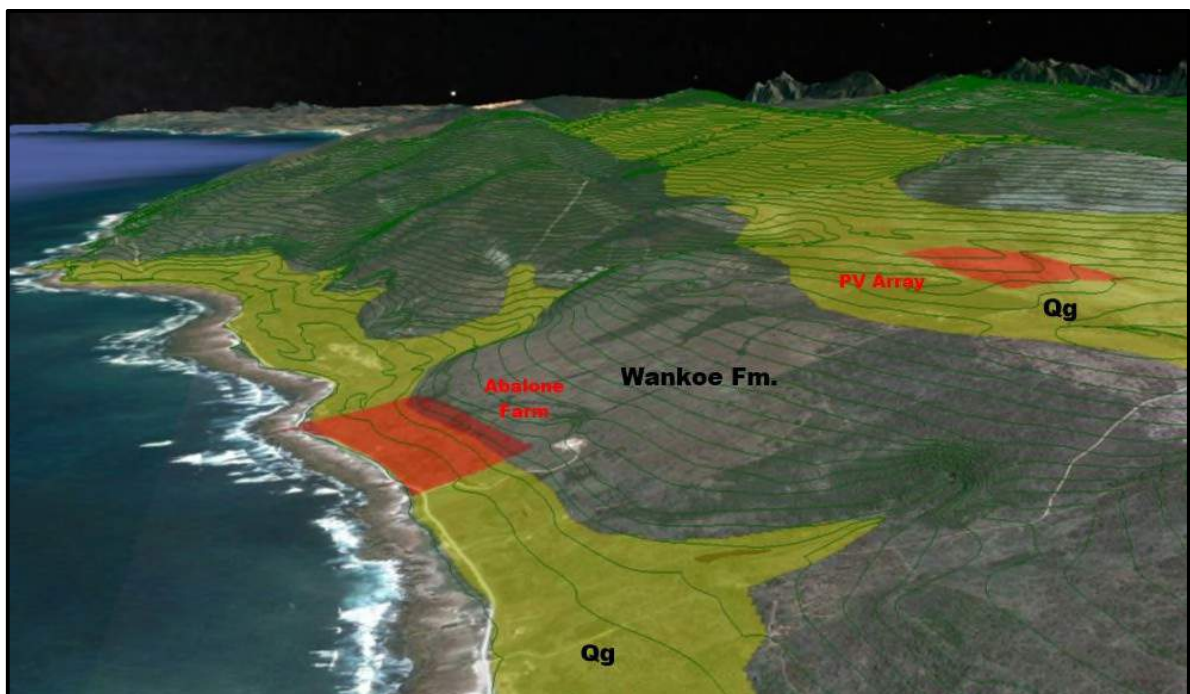


Figure 6. Simulated aerial view of the Project Area looking west.

The footprint of abalone grow-out tanks and infrastructure is mainly on the Qg coversands (Figure 2). As the tanks and buildings must be situated on level areas, it is assumed they are to be arranged on a series of terraces descending to the shoreline, with access lanes and runoff drainage. The scale of the levelled areas will determine the extent of cutbacks into the slope and hence the degree of subsurface disturbance. Given the moderate gradient, narrow steps entail more shallow cutbacks into the slope and less exposure of the underlying layers. These construction specifications are not yet available, but presumably will attempt to minimize the volume of bulk earth works to limit costs. Nevertheless, exposures of a few metres in vertical extent may be expected along the inner edge of terrace cutbacks.

The coastal slope of Wankoe Formation aeolianite and calcrete is an old feature, evidently pre-dating the mid-Quaternary MIS 11 highstand. As such, it constitutes a long-lived palaeosurface upon which there has been ample time for the fossil bones of animals to accumulate. The slope was likely the habitat of brown hyaenas when the shoreline was nearby, but for much of the post-Wankoe time the site would have been remote from the shoreline and the habitat of faunas more typical of inland environments. In counteraction, many bones would have remained unburied and subject to destruction during prolonged exposure. Notwithstanding, a portion is likely sequestered in surficial slope wash and colluvial deposits and flushed into irregularities such as gullies and fissures, or may be in shallow burrows.

Terracing cutbacks in the upslope area of the tank sites will intersect the Wankoe Formation. The Qg coversands and underlying palaeosols are likely thickest in the mid-slope zone and the underlying Klein Brak Formation raised beaches may be too deep for intersection. Along the outer, lower zone these raised beach deposits will be intersected in cutbacks, foundation excavations and trenches.

The solar array is situated on the Qg coversands (Figures 2, 6). It is assumed that the installation will be typical, with the photo-voltaic panels mounted on frameworks which will be supported on posts. In addition to numerous post holes, disturbance involves the making of access tracks, drainage for runoff control, possibly shallow burial of cables and a small number of areas for platforms to support power management equipment.

The thickness of the Qg sands at the PV array site is not accurately known, but the lineations seen in aerial images evidently reflect outcropping strata of the underlying Wankoe Formation. Although the construction of the solar panel array does not involve a large volume of deep earthworks, it is likely that the potentially fossil-bearing palaeosurface formed on calcrete beneath the loose Qg sands will be intersected. The post holes, likely ~1 m deep, constitute an array of “probes” across the area, a few of which may fortuitously intersect fossil bones.

Very few fossils have been recovered from the **Wankoe Formation** and these have been terrestrial snails. However, this not only reflects the sporadic fossil content of these aeolianites, but also a lack of collecting/searching effort. The Wankoe Formation is expected to have a fossil background typical of aeolianites, viz. various land snails, tortoise, rodent and mole bones and ostrich eggshell are fairly common. As is the case with older aeolianites on the West Coast, these fossils may include extinct forms. Small land snails and tiny rodent fossils also reflect the palaeoenvironments such as the vegetation type and distinguish wetland and vlei deposits.

Larger animal bones (antelopes, zebra, rhino, elephant, pigs, ostrich etc.) are sparsely scattered on palaeosurfaces. Deposits associated with vleis, pans and springs are very rich, but these are rare exposures. In an aeolian accumulation, the lowermost parts tend to contain more fossil bones; on the eroded palaeosurface formed on the marine deposits and in the initial aeolianites where there are more likely to be low-lying palaeoenvironments such as interdune vleis and blowouts.

Where aeolianites have a calcrete capping, the eroded hillslopes often manifest harder overhangs and ledges separated by hollowed-out softer intervals. The latter are further exploited by burrowing, making small caves, particularly by hyaenas that make dens in them. Bone-collecting behaviour results in concentrations of bones of antelopes and carnivores in the lairs of the hyaenas. Several important fossil fauna assemblages have been found in this context of ancient dens that were later abandoned and filled in with slopewash and windblown sand. Although obviously post-dating the deposition of the aeolianites, these not-uncommon occurrences are fossil bonanzas. On bare hill slopes, these bone accumulations can be signalled by the occurrence of scattered bone fragments washed out downhill.

Fossil ostrich eggshell fragments have become important fossils in aeolianites found across southwestern Africa, East Africa and Arabia. These differ from modern ostrich eggs by having the pores concentrated in clumps or pore complexes, rather than evenly distributed. Different pore arrangements occur in eggshells from formations of different ages, forming a sequence of changes in patterns through time. So far there are eight eggshell types spanning the last 20 million years. For example, diligent searching by Dave Roberts has resulted in the discovery of fossil eggshell fragments of the extinct ostrich (*Diamantornis wardi*) (Roberts & Brink, 2002). *Diamantornis wardi* is dated as Miocene 12-10 Ma in the Namib Desert (Senut & Pickford, 1995) and, based on dated occurrences in East Africa and Arabia, an age of 12-9 Ma is indicated for those aeolianites. Such fossil-based age control is still lacking for the Wankoe aeolianites.

Dissolution hollows and pipes formed by water locally ponding and plant root action in dissolving the calcareous deposits are another site of local fossil trapping. Usually filled with soft reddened sediment, such dissolution pipes can

accumulate fossils and can also be exploited for burrows. Fossil roots (rhizoliths) formed in palaeosols are a related phenomenon and some are sufficiently distinct to identify the plant type.

A multiplicity of trace fossils (ichnofossils) occur in aeolianites such as the burrows of insects, spiders, lizards, rodents and moles. Termite burrow systems and chambers are particularly common, in a variety of architectures. The trackways of animals that traversed the dunes are often preserved along bedding planes and include those of birds, antelopes, zebra, hyaenas, carnivores, rhino and prehistoric humans. Tracks of elephants are preserved in Last Interglacial Waenhuiskrans Formation aeolianites east of Stilbaai (Roberts *et al.*, 2008).

3.8

PALAEONTOLOGY OF THE KLEIN BRAK FORMATION

The fossil shell fauna of the Klein Brak Formation is predominantly composed of “modern” or living species, but not all of them live along the coast today. The shell beds are famous for exotic, warm-water species that today live further north in tropical latitudes. These “thermally anomalous” or “extralimital” molluscs involve West African taxa that today live along the Angolan coast and farther northwards and Indo-Pacific taxa that occur along the Natal coast and in the tropical Indian Ocean. However, they populated embayment and estuarine settings that were greatly expanded and more numerous during the LIG and MIS 11 highstands and provided warmer-water sheltered habitats. These sheltered, shallow-water habitats are much less extensive at present sea level. The LIG and MIS 11 interglacials were apparently “super-interglacials” for a time, with warmer climate and changed coastal oceanography that facilitated dispersal of mollusc larvae southwards past biogeographic barriers. A few extinct species have been discovered, but there are usually few examples and some are known from one locality only (Kilburn & Tankard, 1975).

In contrast, the fossil shelly fauna of raised beaches deposited along exposed, high wave energy parts of the coasts includes the same species found today. However, the proportions of species in the assemblages is often different to the assemblage found adjacent on the seashore, as a function of different ecological factors (such as intertidal area/slope, sediment supply, presence/absence of kelp beds, predator-prey population dynamics etc.). These differences are of interest in the field of comparative palaeoecology. Fossil bones are sparsely present in the raised beach deposits and include seabirds, seals, dolphins and whales.

3.9

PALAEONTOLOGY OF THE COVERSANDS

Shell and bone material in the pale Qg coversands close to the coast is usually in an archaeological context, such as Late Stone Age middens. The loose sands adjacent to the coast are usually regarded as a thin equivalent of the Holocene Strandveld Formation.

Based on the authors’ experience these loose coversands seldom directly overlie the raised beach deposits, but are underlain by a thin unit of older,

compact coversands in which palaeosols have developed. These are broadly equivalent to the Waenhuiskrans Formation aeolianites, having accumulated after the ~400 ka MIS 11 highstand and after the ~125 ka LIG highstand. Buried shell and bone in these palaeosols are also often in an archaeological, Middle Stone Age context, as evident by the presence of stone tools, but “primary” fossil bones do occur sparsely. Fossil bones in the coversands and underlying palaeosols are typically exposed during construction of coastal developments where the finds are large bones that get noticed, such as bigger antelopes and buffalo, rhino, bushpigs and elephants. A nearby example is the fossil elephant in the Stilbaai Museum.

At the PV array site, the relatively thin sands may similarly include archaeological material in places and fossil bones may be scattered on the underlying palaeosurface, as well as older bones eroded from the calcrete palaeosol capping the Wankoe Formation.

4 *NATURE OF THE IMPACT OF BULK EARTH WORKS ON FOSSILS*

Fossils are rare objects, often preserved due to unusual circumstances. This is particularly applicable to vertebrate fossils (bones), which tend to be sporadically preserved and have high value w.r.t. palaeoecological and biostratigraphic (dating) information. Such fossils are non-renewable resources. Provided that no subsurface disturbance occurs, the fossils remain sequestered there.

When excavations are made they furnish the “windows” into the coastal plain depository that would not otherwise exist and thereby provide access to the hidden fossils. The impact is positive for palaeontology, provided that efforts are made to watch out for and rescue the fossils. Fossils and significant observations will be lost in the absence of management actions to mitigate such loss. This loss of the opportunity to recover them and their contexts when exposed at a particular site is irreversible.

Although coastal aeolianites are not generally very fossiliferous, it is quite possible that fossiliferous material could occur. The very scarcity of fossils makes for the added importance of watching for them.

There remains a medium to high risk of valuable fossils being lost in spite of management actions to mitigate such loss. Machinery involved in excavation may damage or destroy fossils, or they may be hidden in “spoil” of excavated material.

The fossil bones that have been found in the coastal aeolianites are of profound scientific value, raising international interest in the region. The aeolianites have been a prime source of information on Quaternary faunas and archaeology of southern Africa.

This impact assessment refers to the occurrence of sparse, high value vertebrate fossil bone material in the affected formations (Wankoe, Klein Brak & Qg coversand formations) and pertains to the construction phases. The operational and decommissioning phases do not involve adverse impacts on palaeontological heritage.

At the coast, the marine fossil shell content of the raised beaches of the Klein Brak Formation is of LOW palaeontological sensitivity. Due to the exposed coast setting the shell assemblages expected are those composed of modern species, the fossils are abundant, easily sampled and natural exposures occur in places along the coast.

As the same formations are involved, this impact assessment refers to both the abalone farm site and the PV array site.

5.1 FATAL FLAWS

There are no fatal flaws or predetermined NO-GO areas. The palaeontological heritage resources in the project area are in the subsurface where their locations, nature and size cannot be determined beforehand. Thus pre-construction fatal flaws predicated on fossil content are not a consideration. Although generally unlikely, it could be that a major find is uncovered during construction. It should then be evaluated as to an appropriate mitigation strategy.

5.2 EXTENTS

The physical extent of impacts on potential palaeontological resources relates directly to the extents of subsurface disturbance, *i.e.* SITE-SPECIFIC or LOCAL. However, unlike an impact that has a defined spatial extent (*e.g.* loss of a portion of a habitat), the consequences of an important fossil find are of international scientific significance.

5.3 DURATION

The initial duration of the impact is shorter term and primarily related to the period over which infrastructural excavations are made. This is the “time window” for mitigation.

The impact of both the finding or the loss of fossils is permanent. The found fossils must be preserved “for posterity”; the lost, overlooked or destroyed fossils are lost to posterity. The duration of impact is this LONG TERM.

5.4 *MAGNITUDE*

Magnitude of impact relates to the palaeontological sensitivities of the formations (Appendix 2). Overall the palaeontological sensitivity of coastal deposits is HIGH (Almond & Pether, 2008) due to previous fossil bone finds of high scientific importance. However, in consideration of the relatively limited depth of bulk earthworks and that a major fossil find of international significance is not usually expected nor can be predicted, the palaeontological sensitivity is rated as MODERATE, with a magnitude of MEDIUM. For the purposes of this report it is assumed that the vertebrate fossils (bones) that may be destroyed/lost (or found) are likely to be additions to the mid to late Quaternary fauna of the region.

5.4.1 *Magnitude of Negative Impact*

The construction of the proposed abalone farm will result in a negative impact. In the absence of effective mitigation, scientifically significant material will quite probably be destroyed or highly disturbed. It is quite likely that scientifically valuable fossils will be lost in spite of mitigation. The negative impact is rated MEDIUM. Should a major fossil occurrence be destroyed/ignored, the magnitude potentially becomes HIGH-negative.

5.4.2 *Magnitude of Positive Impact*

With successful mitigation the impact should be positive. However, mitigation can only strive to obtain a sample or portion of the potential fossil content of the disturbed subsurface. This positive impact is also rated as MEDIUM. If a significant find of fossils is made, such as a large assemblage of bones or some hominid remains, the impact may translate to HIGH-positive.

5.5 *PROBABILITY*

The likelihood of impact is PROBABLE, *i.e.* it is likely to occur under most circumstances.

5.6 *REVERSIBILITY*

The loss of fossil material such as rare fossil bone is irreversible.

5.7 *IRREPLACEABILITY*

The loss of fossil material such as rare fossil bones is irreplaceable.

5.8 *CONFIDENCE*

The level of confidence in the magnitudes and probability of impacts is SURE.

5.9 *STATUS OF THE IMPACT*

Negative without mitigation, positive with mitigation.

5.10 CUMULATIVE IMPACT

The cumulative result of coastal developments is the inevitable permanent loss of fossils. Conversely, with due attention to mitigation and the successful rescue of fossils, there is an accumulation of scientific evidence and knowledge about the evolution of the southern African fauna, the past palaeoenvironments and the contexts of our prehistoric ancestors.

5.11 SUMMARY RATINGS TABLE

Impact rating - fossil bones in all formations						
Mitigation	Extent	Magnitude	Duration	Probability	Confidence	Significance
Without	SS	M-ve	L	PR	S	M
With	SS	M+ve	L	PR	S	M

6 RECOMMENDATIONS

A practical monitoring and mitigation programme must be implemented during the Construction Phases of the proposed abalone farm. Buried archaeological material beneath coversands is common in coastal settings. Recommendations for palaeontological mitigation are affected by those for archaeological mitigation. In most cases, when monitoring and inspection of excavations is recommended in the Archaeological Impact Assessment, separate monitoring for fossil occurrences is not necessary.

The details of the programme must await the finalization of the proposals for the study area w.r.t. the extent of bulk earthworks, when the contracted palaeontologist will liaise with PHS Consulting, the developer, the contracted archaeologist and earthworks contractors about the specifics of setting up a monitoring and inspection programme.

6.1 MONITORING

Interventions are particularly required if fossil bones are turned up during earth works. These are rare and valuable and every effort should be made to spot them and effect rescue of them. However, it is not usually practical for a specialist or a designated monitor to be continuously present during the Construction Phase.

It is therefore proposed that personnel involved in the making of excavations keep a lookout for fossil material during digging. The field supervisor/foreman and workers involved in digging excavations must be informed of the need to watch for fossil bones and buried potential archaeological material. Workers seeing potential objects are to report to the field supervisor who, in turn, will

report to the ECO. The ECO will inform the developer/owner who will contact the palaeontologist contracted to be on standby in the case of fossil finds.

Appendix 3 outlines monitoring by construction personnel and general Fossil Find Procedures for various scenarios. In the event of possible fossil and/or archaeological finds, the contracted archaeologist or palaeontologist must be contacted. For possible fossil finds, the palaeontologist will assess the information and liaise with the developer and the ECO and a suitable response will be established.

6.2

MITIGATION SUMMARY FOR THE CONSTRUCTION PHASE EMP

OBJECTIVE: To see and rescue fossil material that may be exposed in the excavations made for installation of the abalone farm infrastructure.		
Project components	Level terrace cutbacks, foundation excavations, trenches for drainage, pipes and cables, spoil from excavations.	
Potential impact	Loss of fossils by their being unnoticed and/ or destroyed.	
Activity/ risk source	All bulk earthworks.	
Mitigation: target/ objective	To facilitate the likelihood of noticing fossils and ensure appropriate actions in terms of the relevant legislation.	
Mitigation: Action/ control	Responsibility	Timeframe
Inform staff of the need to watch for potential fossil bone occurrences.	The Client, PHS, the ECO & contractors.	Pre-construction.
Inform staff of the procedures to be followed in the event of fossil bone occurrences.	ECO/specialist.	Pre-construction.
Monitor for presence of fossil bones	Contracted personnel and ECO, monitoring archaeologist.	Construction.
Liaise on nature of potential finds and appropriate responses.	ECO and specialist.	Construction.
Liaise on progress of earthworks and suitable exposures for inspection.	ECO and specialist.	Construction.
Excavate main finds, inspect pits & record and sample excavations.	Specialist.	Construction.

Obtain permit from HWC for bone finds and shell samples.	Specialist.	Construction
Performance Indicator	Reporting of and liaison about possible fossil finds. Fossils noticed and rescued. Scientific record of fossil contexts and temporary exposures in earthworks.	

7 **APPLICATION FOR A PALAEOLOGICAL PERMIT**

A permit from Heritage Western Cape (HWC) is required to excavate fossils. The applicant should be the qualified specialist responsible for assessment, collection and reporting (palaeontologist). Should fossils be found that require rapid collecting, application for a palaeontological permit will be made to HWC immediately. The application requires details of the registered owner/s of the property, their permission and a site-plan map.

All fossils found and samples of must be deposited at a SAHRA-approved institution, e.g. the IZIKO S. A. Museum. Thereafter it should be feasible for the display of selected fossils and geoheritage information at a local, secure educational/interpretational centre.

8 **REPORTING**

Should fossils be found a detailed report on the occurrence/s must be submitted. This report is in the public domain and copies of the report must be deposited at the IZIKO S.A. Museum and Heritage Resources Western Cape. It must fulfil the reporting standards and data requirements of these bodies.

The report will be in standard scientific format, basically:

- A summary/abstract.
- Introduction.
- Previous work/context.
- Observations (incl. graphic sections, images).
- Palaeontology.
- Interpretation.
- Concluding summary.
- References.
- Appendices

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~ (tilde): Used herein as “approximately” or “about”.

Aeolian: Pertaining to the wind. Refers to erosion, transport and deposition of sedimentary particles by wind. A rock formed by the solidification of aeolian sediments is an aeolianite.

AIA: Archaeological Impact Assessment.

Alluvium: Sediments deposited by a river or other running water.

Archaeology: Remains resulting from human activity which are 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.

asl.: above (mean) sea level.

Bedrock: Hard rock formations underlying much younger sedimentary deposits.

Calcareous: sediment, sedimentary rock, or soil type which is formed from or contains a high proportion of calcium carbonate in the form of calcite or aragonite.

Calcrete: An indurated deposit (duricrust) mainly consisting of Ca and Mg carbonates. The term includes both pedogenic types formed in the near-surface soil context and non-pedogenic or groundwater calcretes related to water tables at depth.

Clast: Fragments of pre-existing rocks, e.g. sand grains, pebbles, boulders, produced by weathering and erosion. Clastic – composed of clasts.

Colluvium: Hillwash deposits formed by gravity transport downhill. Includes soil creep, sheetwash, small-scale rainfall rivulets and gullyng, slumping and sliding processes that move and deposit material towards the foot of the slopes.

Coversands: Aeolian blanket deposits of sandsheets and dunes.

Duricrust: A general term for a zone of chemical precipitation and hardening formed at or near the surface of sedimentary bodies through pedogenic and (or) non-pedogenic processes. It is formed by the accumulation of soluble minerals deposited by mineral-bearing waters that move upward, downward, or laterally by capillary action, commonly assisted in arid settings by evaporation. Classified into calcrete, ferricrete, silcrete.

ESA: Early Stone Age. The archaeology of the Stone Age between 2 000 000 and 250 000 years ago.

EIA: Environmental Impact Assessment.

EMP: Environmental Management Plan.

Ferricrete: Indurated deposit (duricrust) consisting predominantly of accumulations of iron sesquioxides, with various dark-brown to yellow-brown hues. It may form by deposition from solution or as a residue after

removal of silica and alkalis. Like calcrete it has pedogenic and groundwater forms. Synonyms are laterite, iron pan or “koffieklip”.

Fluvial deposits: Sedimentary deposits consisting of material transported by, suspended in and laid down by a river or stream.

Fm.: Formation.

Fossil: The remains of parts of animals and plants found in sedimentary deposits. Most commonly hard parts such as bones, teeth and shells which in lithified sedimentary rocks are usually altered by petrification (mineralization). Also impressions and mineral films in fine-grained sediments that preserve indications of soft parts. Fossils plants include coals, petrified wood and leaf impressions, as well as microscopic pollen and spores. Marine sediments contain a host of microfossils that reflect the plankton of the past and provide records of ocean changes. Nowadays also includes molecular fossils such as DNA and biogeochemicals such as oils and waxes. 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).

HIA: Heritage Impact Assessment.

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

LIG: Last Interglacial. Warm period 128-118 ka BP. Relative sea-levels higher than present by 4-6 m. Also referred to as Marine Isotope Stage 5e or “the Eemian”.

Midden: A pile of debris, normally shellfish and bone that have accumulated as a result of human activity.

Mid Pliocene Warm Period (MPWP): An interval of warm climate and high sea level around ~3 Ma. When this interval was referred to as “mid-Pliocene” the boundary between the Pliocene and Quaternary was set younger, at 1.8 Ma at the beginning of the Calabrian (see Quaternary definition below). Now that the Pliocene/Quaternary boundary is set further back in time by international agreement to the beginning of the Gelasian at ~2.6 Ma, the MPWP at ~3 Ma is no longer “mid”, but is in the late Pliocene. However, for continuity it is still being referred to as the MPWP.

MSA: Middle Stone Age. The archaeology of the Stone Age between 20-300 000 years ago associated with early modern humans.

OSL: Optically stimulated luminescence. One of the radiation exposure dating methods based on the measurement of trapped electronic charges that accumulate in crystalline materials as a result of low-level natural radioactivity from U, Th and K. In OSL dating of aeolian quartz and feldspar sand grains, the trapped charges are zeroed by exposure to daylight at the time of deposition. Once buried, the charges accumulate and the total radiation exposure (total dose) received by the sample is estimated by laboratory measurements. The level of radioactivity (annual doses) to

which the sample grains have been exposed is measured in the field or from the separated minerals containing radioactive elements in the sample. Ages are obtained as the ratio of total dose to annual dose, where the annual dose is assumed to have been similar in the past.

Palaeontology: The study of any fossilised remains or fossil traces of animals or plants which lived in the geological past and any site which contains such fossilised remains or traces.

Palaeosol: An ancient, buried soil formed on a palaeosurface. The soil composition may reflect a climate significantly different from the climate now prevalent in the area where the soil is found. Burial reflects the subsequent environmental change.

Palaeosurface: An ancient land surface, usually buried and marked by a palaeosol or pedocrete, but may be exhumed by erosion (e.g. wind erosion/deflation) or by bulk earth works.

Peat: partially decomposed mass of semi-carbonized vegetation which has grown under waterlogged, anaerobic conditions, usually in bogs or swamps.

Pedogenesis/pedogenic: The process of turning sediment into soil by chemical weathering and the activity of organisms (plants growing in it, burrowing animals such as worms, the addition of humus etc.).

Pedocrete: A duricrust formed by pedogenic processes.

PIA: Palaeontological Impact Assessment.

Rhizolith: Fossil root. Most commonly formed by pedogenic carbonate deposition around the root and developed in palaeosols.

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

Stone Age: The earliest technological period in human culture when tools were made of stone, wood, bone or horn. Metal was unknown.

Trace fossil: A structure or impression in sediments that preserves the behaviour of an organism, such as burrows, borings and nests, feeding traces (sediment processing), farming structures for bacteria and fungi, locomotion burrows and trackways and traces of predation on hard parts (tooth marks on bones, borings into shells by predatory gastropods and octopuses).

10.1

GEOLOGICAL TIME SCALE TERMS (YOUNGEST TO OLDEST).

ka: Thousand years or kilo-annum (10^3 years). Implicitly means “ka ago” *i.e.* duration from the present, but “ago” is omitted. The “Present” refers to 1950 AD. Not used for durations not extending from the Present. For a duration only “kyr” is used.

Ma: Millions years, mega-annum (10^6 years). Implicitly means “Ma ago” *i.e.* duration from the present, but “ago” is omitted. The “Present” refers to

1950 AD. Not used for durations not extending from the Present. For a duration only “Myr” is used.

Holocene: The most recent geological epoch commencing 11.7 ka till the present.

Pleistocene: Epoch from 2.6 Ma to 11.7 ka. Late Pleistocene 11.7–126 ka. Middle Pleistocene 135–781 ka. Early Pleistocene 781–2588 ka (0.78–2.6.Ma).

**ICS-approved 2009 Quaternary
(SQS/INQUA) proposal**

C

ERA	PERIOD	EPOCH & SUBEPOCH	AGE	AGE (Ma)	GSSP
CENOZOIC	QUATERNARY	HOLOCENE			
		PLEISTOCENE	Late	0.012	Vrica, Calabria Monte San Nicola, Sicily
				0.126	
			M	0.781	
			Early	1.806	
	Ng	PLIOCENE		2.588	
				3.600	Monte San Nicola, Sicily
			Piacenzian		
			Zanclean		
				5.332	

Quaternary: The current Period, from 2.6 Ma to the present, in the Cenozoic Era. The Quaternary includes both the Pleistocene and Holocene epochs. As used herein, early and middle Quaternary correspond with the Pleistocene divisions, but late Quaternary includes the Late Pleistocene and the Holocene.

Pliocene: Epoch from 5.3–2.6 Ma.

Miocene: Epoch from 23–5 Ma.

Oligocene: Epoch from 34–23 Ma.

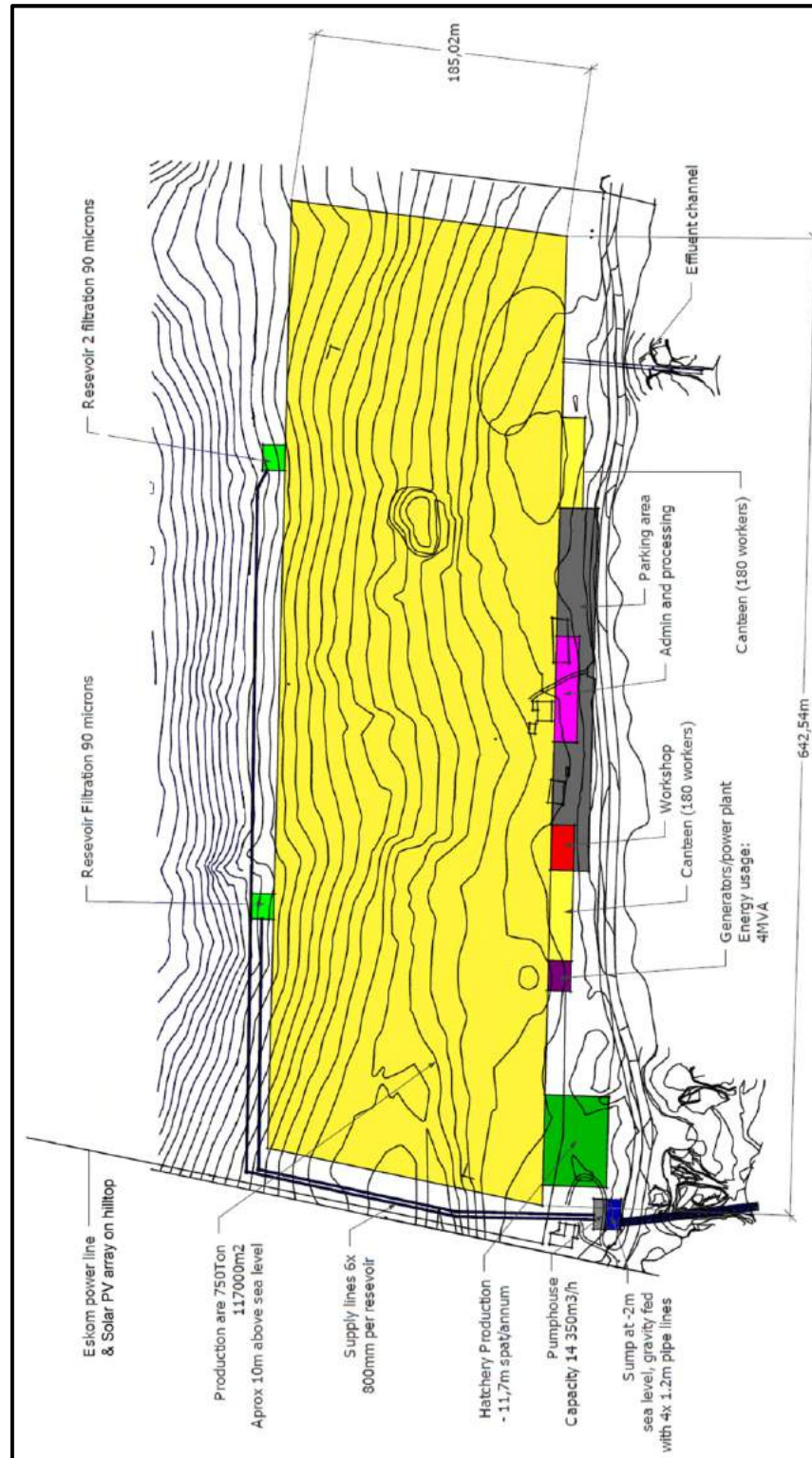
Eocene: Epoch from 56–34 Ma.

Paleocene: Epoch from 65–56 Ma.

Cenozoic: Era from 65 Ma to the present. Includes Paleocene to Holocene epochs.

Cretaceous: Period in the Mesozoic Era, 145–65 Ma.

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Palaeontological Sensitivity refers to the likelihood of finding significant fossils within a geologic unit.

HIGH: Assigned to geological formations known to contain palaeontological resources that include rare, well-preserved fossil materials important to on-going palaeoclimatic, palaeobiological and/or evolutionary studies. Fossils of land-dwelling vertebrates are typically considered significant. Such formations have the potential to produce, or have produced, vertebrate remains that are the particular research focus of palaeontologists and can represent important educational resources as well.

MODERATE: Formations known to contain palaeontological localities and that have yielded fossils that are common elsewhere, and/or that are stratigraphically long-ranging, would be assigned a moderate rating. This evaluation can also be applied to strata that have an unproven, but strong potential to yield fossil remains based on its stratigraphy and/or geomorphologic setting.

LOW: Formations that are relatively recent or that represent a high-energy subaerial depositional environment where fossils are unlikely to be preserved, or are judged unlikely to produce unique fossil remains. A low abundance of invertebrate fossil remains can occur, but the palaeontological sensitivity would remain low due to their being relatively common and their lack of potential to serve as significant scientific resources. However, when fossils are found in these formations, they are often very significant additions to our geologic understanding of the area. Other examples include decalcified marine deposits that preserve casts of shells and marine trace fossils, and fossil soils with terrestrial trace fossils and plant remains (burrows and root fossils)

MARGINAL: Formations that are composed either of volcanoclastic or metasedimentary rocks, but that nevertheless have a limited probability for producing fossils from certain contexts at localized outcrops. Volcanoclastic rock can contain organisms that were fossilized by being covered by ash, dust, mud, or other debris from volcanoes. Sedimentary rocks that have been metamorphosed by the heat and pressure of deep burial are called metasedimentary. If the meta sedimentary rocks had fossils within them, they may have survived the metamorphism and still be identifiable. However, since the probability of this occurring is limited, these formations are considered marginally sensitive.

NO POTENTIAL: Assigned to geologic formations that are composed entirely of volcanic or plutonic igneous rock, such as basalt or granite, and therefore do not have any potential for producing fossil remains. These formations have no palaeontological resource potential.

Adapted from Society of Vertebrate Paleontology. 1995. Assessment and Mitigation of Adverse Impacts to Nonrenewable Paleontologic Resources - Standard Guidelines. News Bulletin, Vol. 163, p. 22-27.

In the context under consideration, it is improbable that fossil finds will require declarations of permanent “no go” zones. At most a temporary pause in activity at a limited locale may be required. The strategy is to rescue the material as quickly as possible.

The procedures suggested below are in general terms, to be adapted as befits a context. They are couched in terms of finds of fossil bones that usually occur sparsely, such as in the aeolian deposits. However, they may also serve as a guideline for other fossil material that may occur.

In contrast, fossil shell layers are usually fairly extensive and can be easily documented and sampled (See section 13.5).

Bone finds can be classified as two types: isolated bone finds and bone cluster finds.

13.1

ISOLATED BONE FINDS

In the process of digging the excavations, isolated bones may be spotted in the hole sides or bottom, or as they appear on the spoil heap. By this is meant bones that occur singly, in different parts of the excavation. If the number of distinct bones exceeds 6 pieces, the finds must be treated as a bone cluster (below).

Response by personnel in the event of isolated bone finds

- **Action 1:** An isolated bone exposed in an excavation or spoil heap must be retrieved before it is covered by further spoil from the excavation and set aside.
- **Action 2:** The site foreman and ECO must be informed.
- **Action 3:** The responsible field person (site foreman or ECO) must take custody of the fossil. The following information to be recorded:
 - Position (excavation position).
 - Depth of find in hole.
 - Digital image of hole showing vertical section (side).
 - Digital image of fossil.
- **Action 4:** The fossil should be placed in a bag (e.g. a Ziplock bag), along with any detached fragments. A label must be included with the date of the find, position info., depth.
- **Action 5:** ECO contacts the standby archaeologist and/or palaeontologist. ECO to describe the occurrence and provide images asap. by email.

Response by Palaeontologist in the event of isolated bone finds

The palaeontologist will assess the information and liaise with the developer, the environmental consultant and the ECO and a suitable response will be established.

13.2

BONE CLUSTER FINDS

A bone cluster is a major find of bones, *i.e.* several bones in close proximity or bones resembling part of a skeleton. These bones will likely be seen in broken sections of the sides of the hole and as bones appearing in the bottom of the hole and on the spoil heap.

Response by personnel in the event of a bone cluster find

- **Action 1:** Immediately stop excavation in the vicinity of the potential material. Mark (flag) the position and also spoil that may contain fossils.
- **Action 2:** Inform the site foreman and the ECO.
- **Action 3:** ECO contacts the standby archaeologist and/or palaeontologist. ECO to describe the occurrence and provide images asap. by email.

Response by Palaeontologist in the event of a bone cluster find

The palaeontologist will assess the information and liaise with the developer and the environmental consultant and a suitable response will be established. It is likely that a Field Assessment by the palaeontologist will be carried out asap.

It will probably be feasible to “leapfrog” the find and continue the excavation farther along, or proceed to the next excavation, so that the work schedule is minimally disrupted. The response time/scheduling of the Field Assessment is to be decided in consultation with developer/owner and the environmental consultant.

The field assessment could have the following outcomes:

- If a human burial, the appropriate authority is to be contacted. The find must be evaluated by a human burial specialist to decide if Rescue Excavation is feasible, or if it is a Major Find.
- If the fossils are in an archaeological context, an archaeologist must be contacted to evaluate the site and decide if Rescue Excavation is feasible, or if it is a Major Find.
- If the fossils are in a palaeontological context, the palaeontologist must evaluate the site and decide if Rescue Excavation is feasible, or if it is a Major Find.

13.3

RESCUE EXCAVATION

Rescue Excavation refers to the removal of the material from the “design” excavation. This would apply if the amount or significance of the exposed material appears to be relatively circumscribed and it is feasible to remove it without compromising contextual data. The time span for Rescue Excavation should be reasonably rapid to avoid any or undue delays, *e.g.* 1-3 days and definitely less than 1 week.

In principle, the strategy during mitigation is to “rescue” the fossil material as quickly as possible. The strategy to be adopted depends on the nature of the

occurrence, particularly the density of the fossils. The methods of collection would depend on the preservation or fragility of the fossils and whether in loose or in lithified sediment. These could include:

- On-site selection and sieving in the case of robust material in sand.
- Fragile material in loose/crumblly sediment would be encased in blocks using Plaster-of Paris or reinforced mortar.

If the fossil occurrence is dense and is assessed to be a “Major Find”, then carefully controlled excavation is required.

13.4

MAJOR FINDS

A Major Find is the occurrence of material that, by virtue of quantity, importance and time constraints, cannot be feasibly rescued without compromise of detailed material recovery and contextual observations.

A Major Find is not expected.

Management Options for Major Finds

In consultation with the developer and the environmental consultant, the following options should be considered when deciding on how to proceed in the event of a Major Find.

Option 1: Avoidance

Avoidance of the major find through project redesign or relocation. This ensures minimal impact to the site and is the preferred option from a heritage resource management perspective. When feasible, it can also be the least expensive option from a construction perspective.

The find site will require site protection measures, such as erecting fencing or barricades. Alternatively, the exposed finds can be stabilized and the site refilled or capped. The latter is preferred if excavation of the find will be delayed substantially or indefinitely. Appropriate protection measures should be identified on a site-specific basis and in wider consultation with the heritage and scientific communities.

This option is preferred as it will allow the later excavation of the finds with due scientific care and diligence.

Option 2: Emergency Excavation

Emergency excavation refers to the “no option” situation wherein avoidance is not feasible due to design, financial and time constraints. It can delay construction and emergency excavation itself will take place under tight time constraints, with the potential for irrevocable compromise of scientific quality. It could involve the removal of a large, disturbed sample by excavator and conveying this by truck from the immediate site to a suitable place for “stockpiling”. This material could then be processed later.

Consequently, emergency excavation is not a preferred option for a Major Find.

13.5

EXPOSURE OF FOSSIL SHELL BEDS

Response by personnel in the event of intersection of fossil shell beds

- **Action 1:** The site foreman and ECO must be informed.
- **Action 2:** The responsible field person (site foreman or ECO) must record the following information:
 - Position (excavation position).
 - Depth of find in hole.
 - Digital image of hole showing vertical section (side).
 - Digital images of the fossiliferous material.
- **Action 3:** A generous quantity of the excavated material containing the fossils should be stockpiled near the site, for later examination and sampling.
- **Action 4:** ECO contacts the standby archaeologist and/or palaeontologist. ECO to describe the occurrence and provide images asap. by email.

Response by Palaeontologist in the event of fossil shell bed finds

The palaeontologist will assess the information and liaise with the developer and the environmental consultant and a suitable response will be established. This will most likely be a site visit to document and sample the exposure in detail, before it is covered up.

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CTS HERITAGE

APPENDIX 4: Visual Impact Assessment

VISUAL IMPACT ASSESSMENT

PROPOSED ESTABLISHMENT OF AN ABALONE FARM TO
BE LOCATED ON THE FARM LANGE FONTEYN 6/453,
RIVERSDALE, WESTERN CAPE

By

PHS Consulting



JANUARY 2017

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1. PROJECT DESCRIPTION

1.1. Description of Proposed Activity

The proponent of the proposed development, Aquinion (Pty) Ltd, aims to establish a new approximate 440 ton abalone farm including associated infrastructure as well as a Solar Array of approximately 6.14 ha. It is envisaged that the proposed farm will be constructed and operationalised in 2 phases of equal scale. The total development footprint will be approximately 16 ha.

The area proposed for development is located on a coastal farm situated approximately 10 km west from Gouritsmond. It borders the Gourikwa Private Nature Reserve to the west, and the Gouritsmond coastline to the south. The site is currently vacant; however there is evidence of previous agricultural activities on site. The property on which the abalone farm is proposed is separated from the coast by a public dirt road.



Figure 1: Locality Map

The development site's location in terms of the urban area and road network is illustrated in Figure 2 and 3 below. The majority of the site is covered in very dense vegetation on a substrate of dark brown cover sands. Some informal internal tracks exist, with access jeep track along the western fence firebreak, where the Eskom power line will be placed above ground and a water reservoir on the 20 m contour, 30 m from the western fence line. The site is underlain by deep coastal sands which stretch from the seashore northwards to beyond the study site. The study site can be described as a gentle slope, rising from the seashore northwards to the top of the coastal escarpment. The lower portion, at roughly sea level and along the road is relatively flat after which the landscape increases in steepness fairly quickly. There is evidence of cultivation and grazing in the past.



Figure 2: Site context – Proposed Abalone Farm

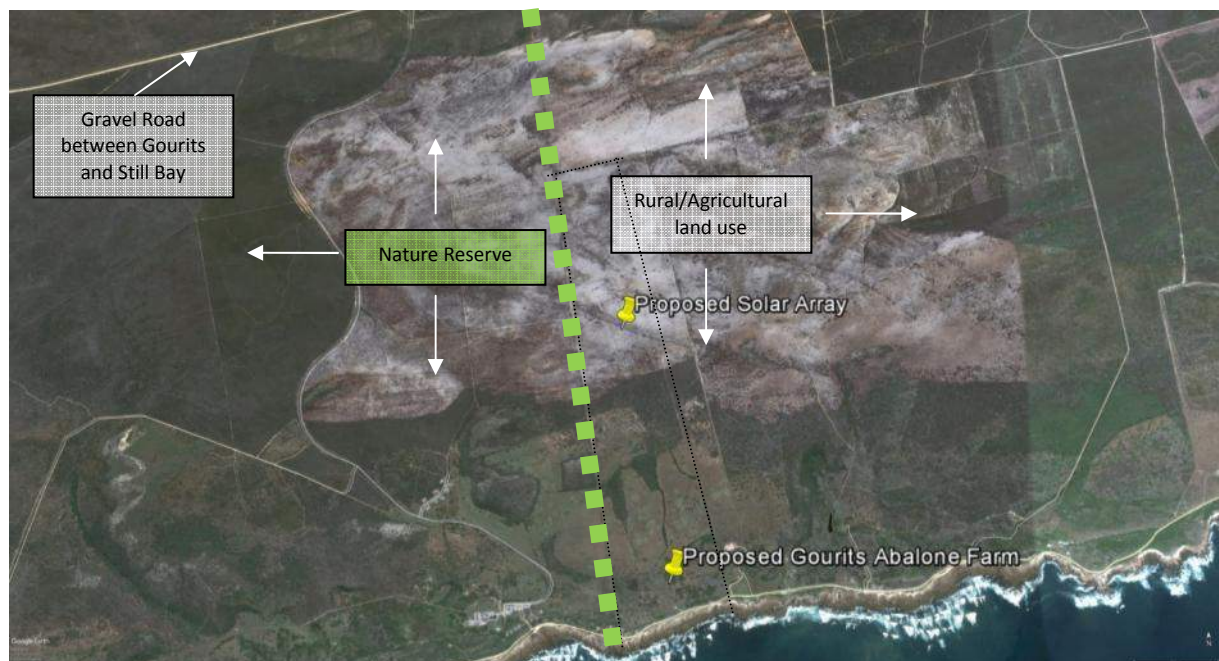


Figure 3: Site context – Proposed Solar Array

The proposed abalone farm will consist of 2 sections; a hatchery which supplies all the seed stock and grow-out areas where abalone are grown to market sizes over a period of 3 – 4 years. The southern part of the farm along the coast is situated on vegetated windblown cover sands and low coastal hills backing a rocky intertidal shoreline, about 10 km south of the mouth of the Gouritz River. Existing infrastructure comprises two holiday cottages, some old farming infrastructure (concrete drinking trough), a barely visible demolished building and fencing. A small dam/old excavation pit occurs in the north east, on the lower slopes of the proposed development site.

Surrounding the farm, land use includes agriculture, nature conservation, lifestyle residential and tourism. The northern part of the farm, and the area proposed for the solar array facility

is north facing on a slope behind the upper hill slopes of the property about 1.7 km inland from the coast, it is covered in natural veld (Restio, grassland, groundcover, Proteas & Fynbos) with a soft sandy substrate.

Initially the proposal related to the Alternative 1 description below (Figure 4). Then the project evolved through the input of various specialist reports that included a Faunal & Floral, Archaeological, Palaeontological, Heritage, Coastal Ecological and Coastal Set-back and initial Visual scoping in order to inform a preferred Alternative 2.

Alternative1

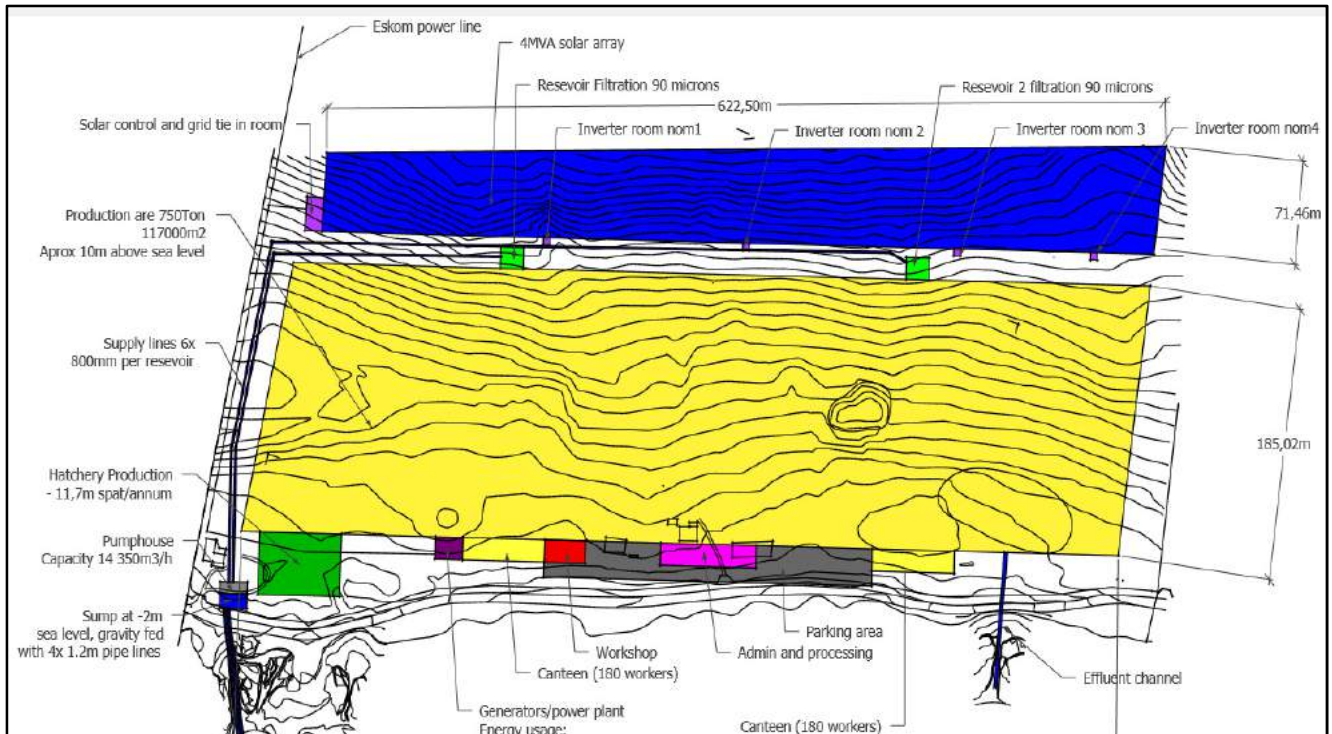


Figure 4: 1st Alternative

An approximate 750 ton abalone farm, in one phase comprising of the following:

- 12 ha production area;
- Hatchery;
- Pump house;
- Sump located at -2m sea level, gravity fed with 4 x 1.2 m pipelines;
- Generator room;
- Canteen 1 to cater for 180 employees;
- Canteen 2 to cater for 180 employees;
- Workshop;
- Parking area;
- Admin and processing;
- Effluent / intake pipelines;
- 4 MVA solar array of approximately 6 ha, **directly adjacent to the farm**;
- Solar control and grid tie in room; and
- Borehole.

TOTAL AREA = APPROXIMATELY 18 HA FOOTPRINT,

PRODUCTION TANKS 1.2 M HIGH TANKS WITH SHADED COVER OF 3 M HIGH. ALL OTHER INFRASTRUCTURE IS SINGLE STOREY MAXIMUM OF 8 METER HIGH.

Constraints analysis

The various specialist reports were combined as a constraints analysis to inform a preferred alternative. **From a visual perspective the initial layout informants related to the following:**

- *Avoid a monolithic block footprint*
- *Consider Local Cape Vernacular informants for the new buildings*
- *Approach the layout of the tanks area to reflect an agricultural feel, instead of an industrial feel*
- *Don't built inside the 30 meter building line*
- *Hide infrastructure by excavating into the landscape and rehabilitate accordingly*
- *Set-back from the coast*
- *Maintain a 20-30 meter buffer between the development and the two existing houses*



Figure 5: Combined Constraints

Preferred Alternative (Alternative 2)

The proposed development evolved from the combined constraints and will comprise an approximate 440 ton abalone farm to be developed in two phases and will include the following:

(note that the sizes and volumes described below are approximate):

- 7.1 ha production area, split into two phases –
 - Phase one – 3.7 ha, 220 ton production
 - Phase two – 3.4 ha, 220 ton production
- Hatchery (3 400 m²);
- Pump house and sump – 500 m², with a total pumping capacity of 12 000 m³/h;
- Filtration reservoir – 530 m² – includes drum filters for the filtering of incoming seawater;
- Basket cleaning area – 1 000 m² for the cleaning and repairing of the abalone baskets;
- Split and grading rooms – 95 m² x 8 rooms, for the splitting and size grading of the abalone stock;
- Blower and feed stores – 35 m² x 16 rooms, used to securely house feed stock from vermin / pests. Blower rooms – sound proof for air supply;
- Diesel store – 173 m² – on site diesel storage of 80 000 l;
- Refuse area and package plant – 600 m²;
- Power transmission room – 800 m² for backup generators and main distribution systems;
- Canteen – 1 025 m² containing canteen, ablutions and lockers for employees;
- Workshop – 450 m² for maintenance and repairs;
- Parking area – 3 930 m² comprising of entrance access and parking ;
- Admin / office building – 600 m² for admin staff;
- Transfer and pre-processing building – 1 100 m² – to transfer animals from one farm to the next and to prep animals for transport for processing;
- Effluent pipeline – transfers effluent sea water, possible surf zone discharge or beyond surf zone, dependent on the conditions of the CWDP (Approx 40 m in length);
- Main Water supply pipes – 8 x 500 mm GRP pipes (Approx. 120m in length) (the supply lines from pump house approx. 430m in length);
- Solar array of approximately 6.14 ha with an output capacity of 2.5 MVA / 2.2. MW;
- Inverter room – 225 m², used to house invertors to convert solar to usable power and step up into Eskom line at 11KV;
- Eskom overhead line;
- Jeep track to solar farm / PV– 1.7 km – two track informal road for servicing the site; and
- Borehole.

TOTAL DEVELOPMENT AREA = APPROXIMATELY 16 HA
PRODUCTION TANKS 1.2 M HIGH TANKS WITH SHADED COVER OF 3 M HIGH. ALL
OTHER INFRASTRUCTURE IS SINGLE STOREY MAXIMUM OF 8 METER HIGH.



Figure 6: 2nd / Preferred Alternative

1.2 Methodology

The following steps were used in the visual assessment process:

- A site visit and visual survey of the site and surroundings;
- Identification of issues raised in environmental Scoping Phase;
- Description of the receiving environment and the proposed project;
- Indication of the nominal viewshed and important view corridors on a map, based on topographic information;
- An assessment of the character of the landscape to determine visual characteristics, scenic resources, receptors and visually sensitive areas;
- An indication of quantitative and qualitative criteria, which would be used to measure visual impacts;
- Indication of potential visual impacts using established criteria;
- Provision of visual guidelines and mitigating actions to follow in order to reduce potential impacts of the proposed "Original Alternative"
- Receipt of an amended plan regarded as a "Revised Alternative", if any.
- Assessment of both alternatives
- Description of further mitigation measures and monitoring programmes.

1.3 Definition of 'Visual'

The term 'visual' used in this report is taken in its broadest meaning to include visual, scenic, aesthetic and amenity values represented by the natural and the built environment, which can in totality be described as the area's 'sense of place'.

1.4 Previous Studies

The qualification and experience of the author is as follow:

- Paul Slabbert – B Art EtScien (Planning Honours Degree), 15 years' experience in heritage, environmental and land use planning. Registered with the Association of Professional Heritage Practitioners (APHP) since 2007. Certified as an EAP by the interim Certification Board (EAPSA) since 2009.
- Nadine Duncan – BSc (Landscape Architecture), BSc (Hons) Geography, 11 years experience in environmental and land use planning.

2 DESCRIPTION OF VISUAL CHARACTERISTICS (SPATIAL ANALYSIS)

2.1 Location

The location of the study area in relation the farm boundaries and nearest town is shown on Figure 1, 2 and 3 above. The farm is located in the Hessequa Municipal area, 10 km West of Gouritsmond, 35 km East of Still Bay and 30 km SE of Albertina. Access to the site is via an existing gravel road.

2.2 Description of the Terrain

The majority of the site is covered in very dense vegetation on a substrate of dark brown cover sands. The site is underlain by deep coastal sands which stretch from the seashore northwards to beyond the study site. The study site can be described as a gentle undulating slope, rising from the seashore northwards to the top of the coastal escarpment. The lower portion, at roughly sea level and along the road is relatively flat after which the landscape increases in steepness fairly quickly.

- Sea & Coastal Plain – Scenic value and visually exposed. An elevated stone mound and coastal thicket exists parallel to the road and the plain with screening qualities.
- Coastal slopes – Visually exposed with scenic value.
- Hills - Ridges visually sensitive and have scenic value. Valleys are visually absorptive.

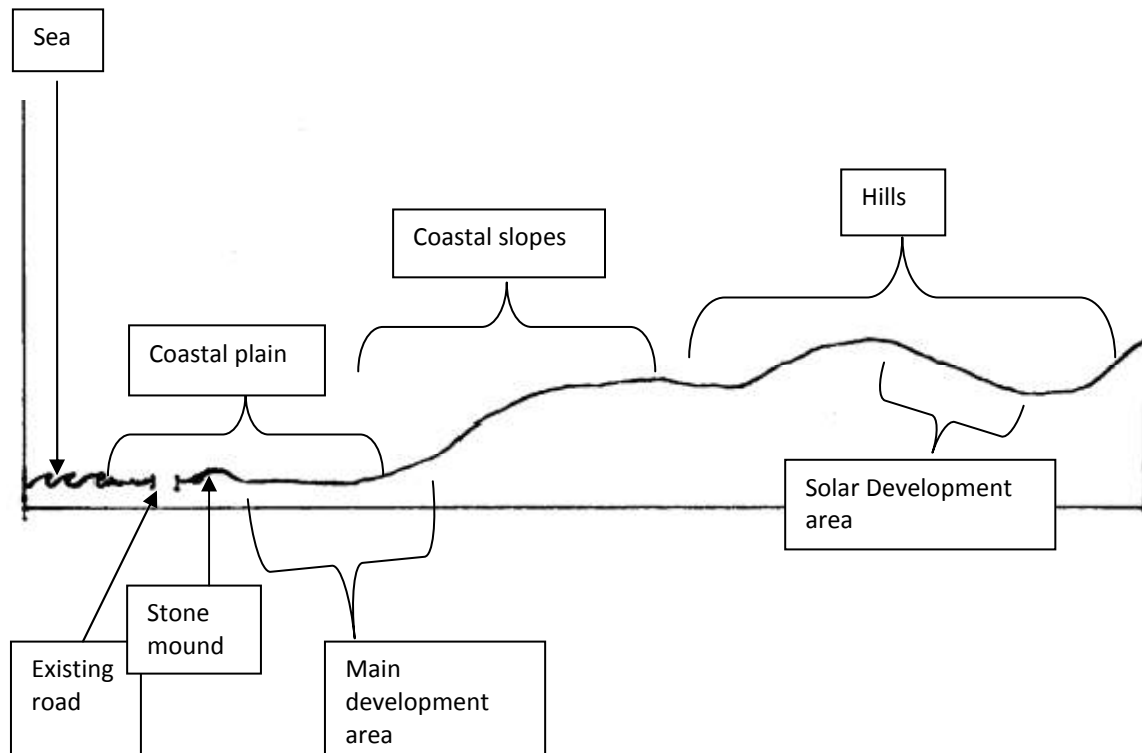


Figure 7: Terrain

2.3 Photo Report



Photo 1: Photo Positions

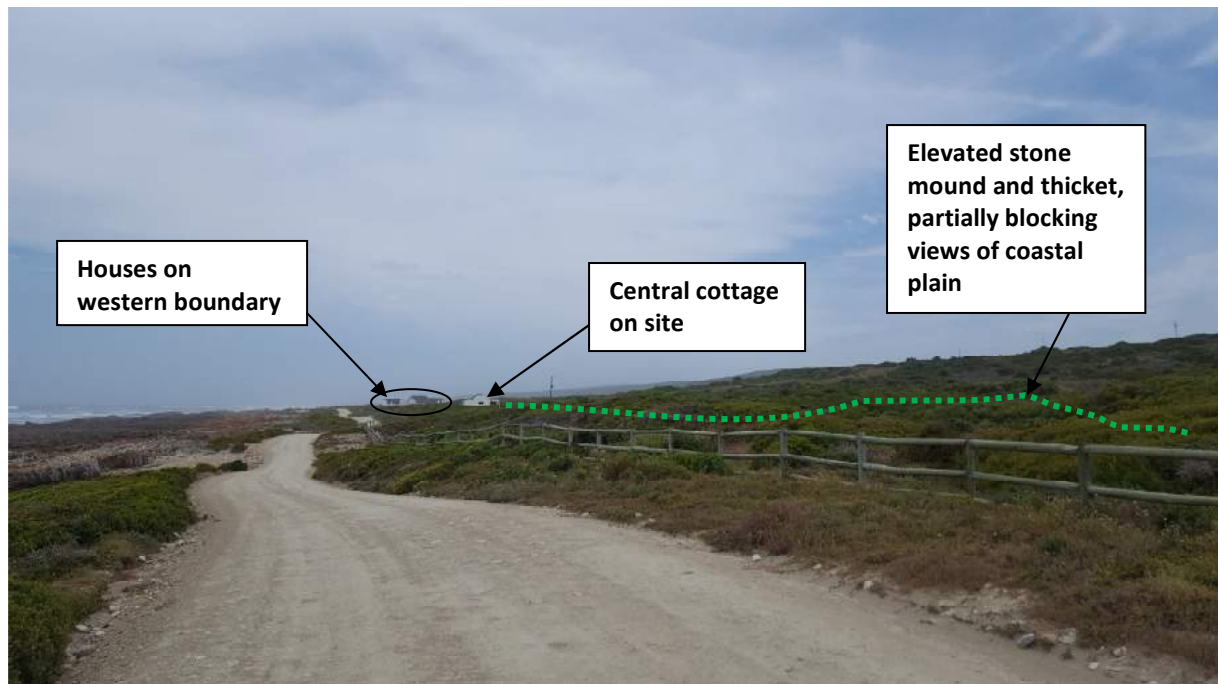


Photo 2: Coastal access road, views towards the west, development area on the right.



Photo 3: Photo showing existing western residence on site (right) and closest neighbour located to the west (left). The neighbouring building is currently vacant. Public road terminates at the access gate to the neighbours property.

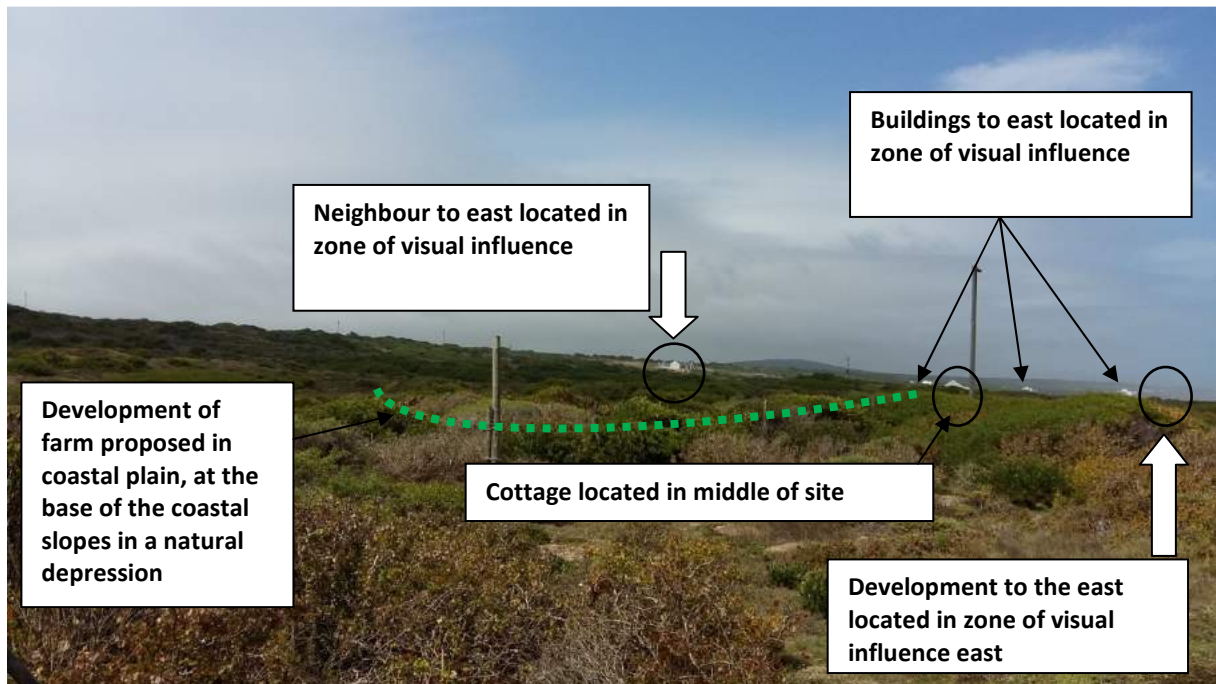


Photo 4: View east towards neighbour. Existing buildings to east, as indicated, are located within the 2.5 km zone of visual influence. Although the existing development located further east falls within the zone of visual influence, visibility will be hindered by misty conditions and distance along the coastline.

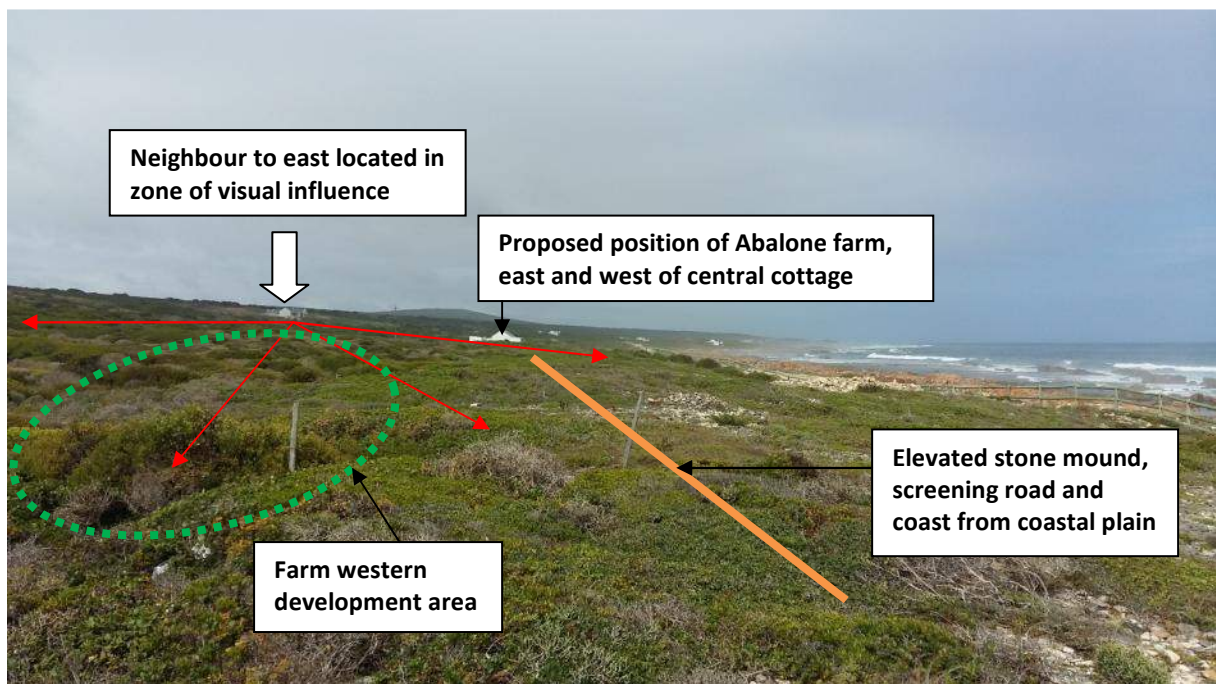


Photo 5: Neighbour to east will have views across development site. Visibility impacts to be mitigated by design measures i.e. strict adherence to Local Cape Vernacular building design.



Photo 6: Photo to the west of Gouriqua Reserve infrastructure, located in a slight dip 3 meters lower than the development site.



Photo 7: Views towards the south of the western development platform of farm. The middle cottage on farm visible in the photo. The farm werf will be developed behind the cottage.

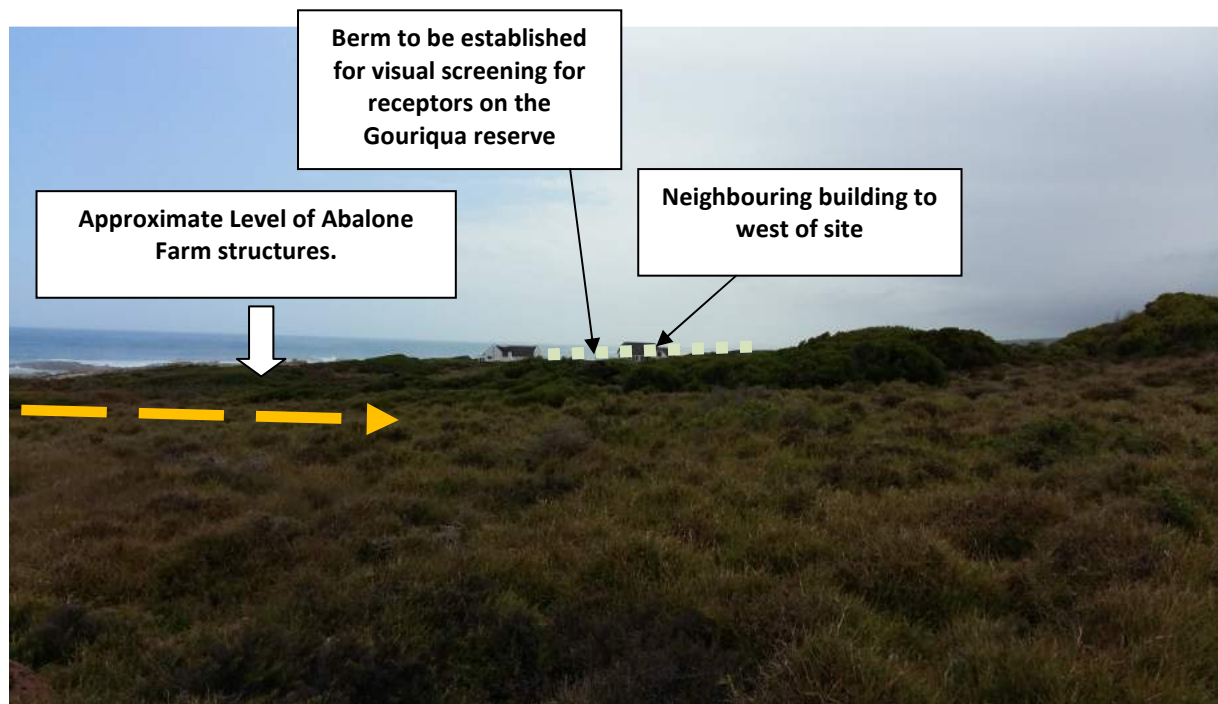


Photo 8: All proposed abalone farm structures to be constructed on one level. Construction will entail cut into slope on site as well as establishment of a berm adjacent to the western boundary. Approx. 70 m vegetated berm to provide visual screening for receptors at the Gouriqua Reserve.

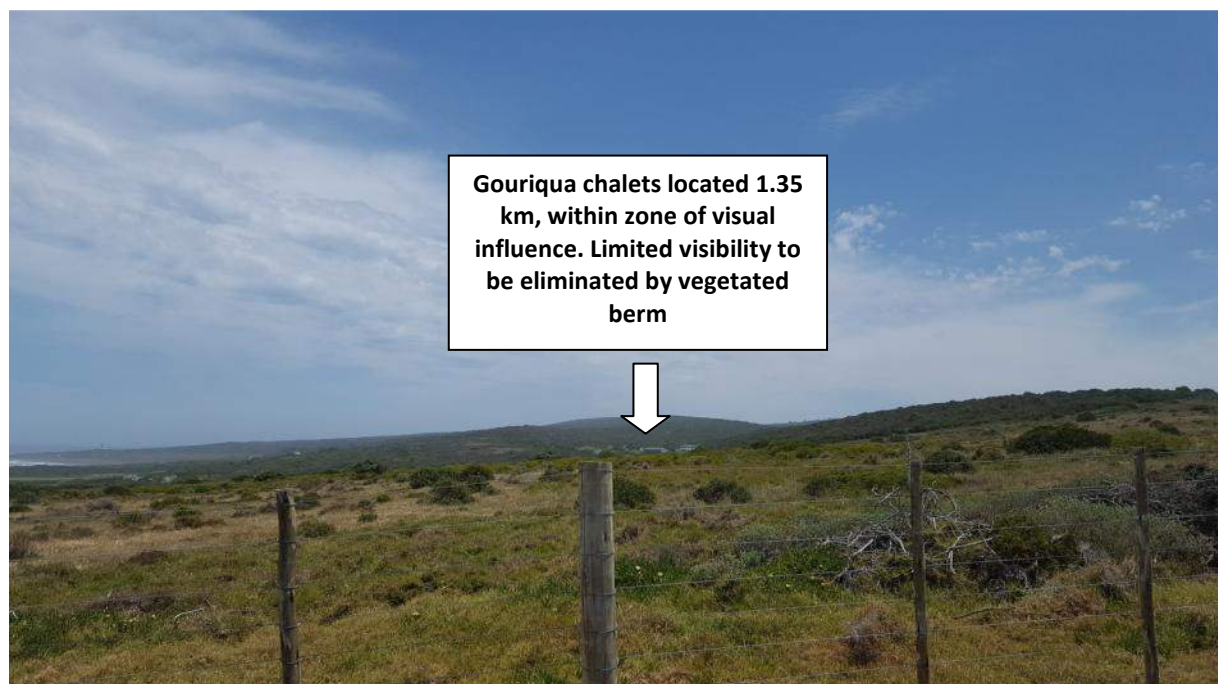


Photo 9: View west towards existing Gouriqua Reserve development. Visual Impact to be mitigated by constructing a berm.



Photo 10: Views towards the south east of the eastern development platform below the coastal hill. Central cottage visible on right of picture.

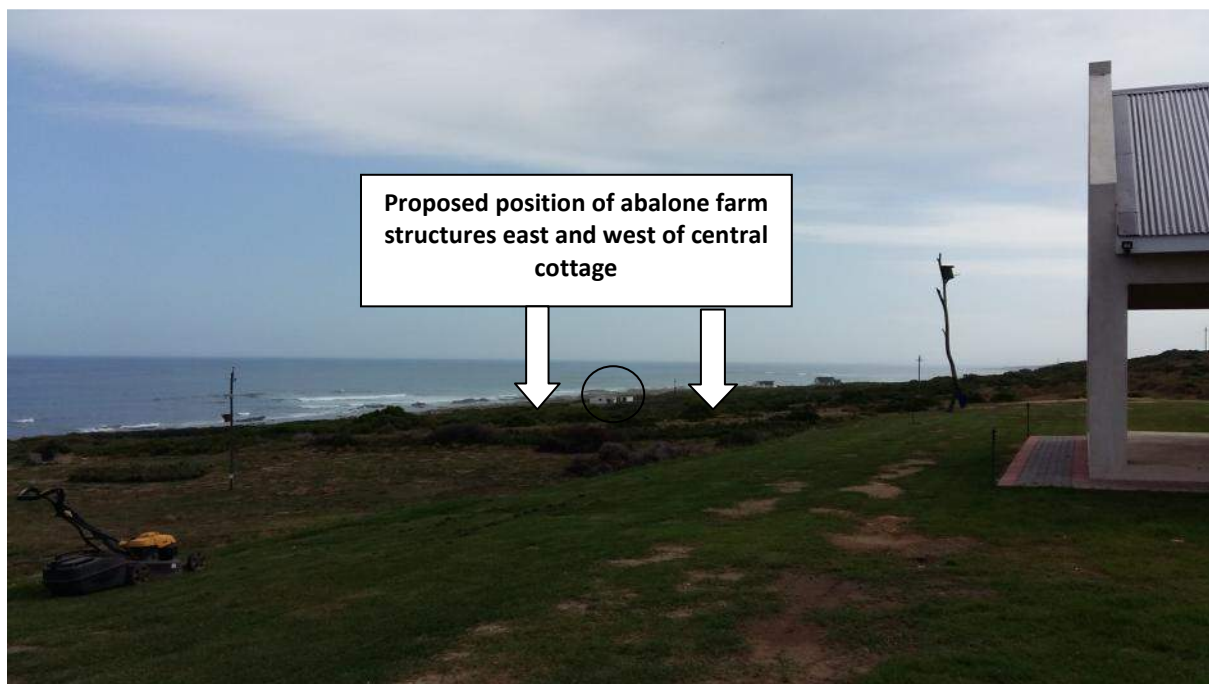


Photo 11: View of site towards the west from neighbour's property. Visual impacts although unavoidable could be successfully mitigated by design measures i.e. strict adherence to Local Cape Vernacular building design.

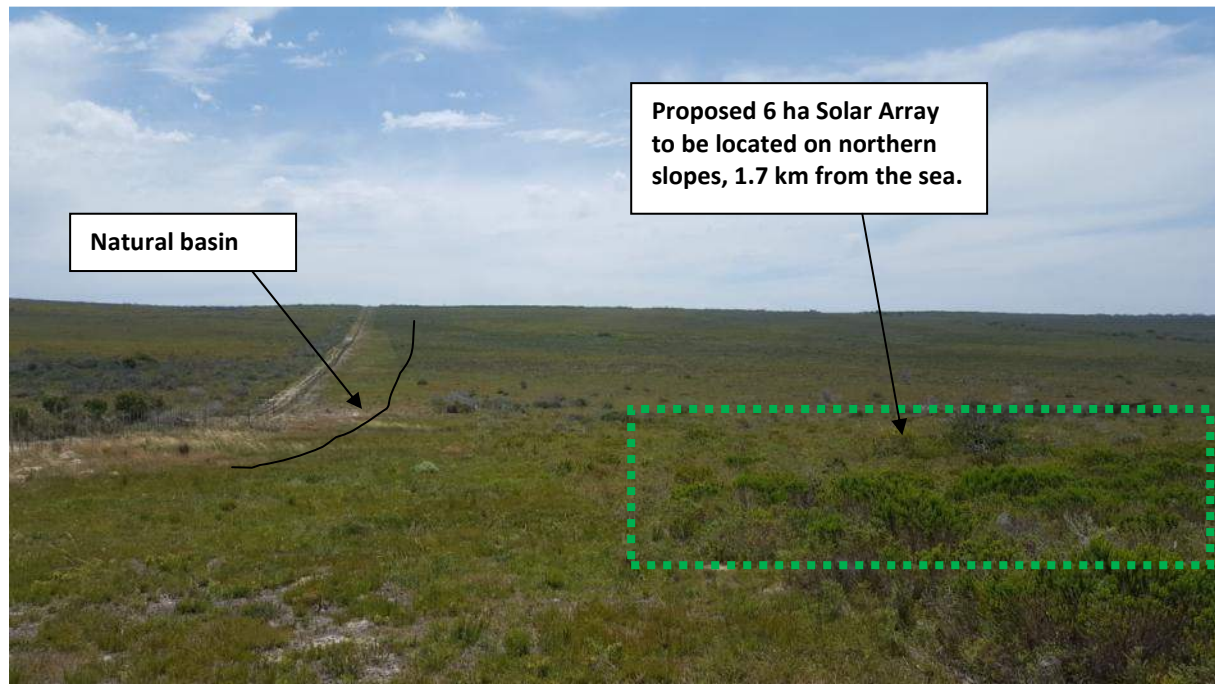


Photo 12: View towards north the proposed Solar Array site which will be located on the southern slopes of undulating hills and will thus not be visible from the southern section of the study area. It's located in a natural basin, not visible by any receptors.

2.4 Land Use

Existing infrastructure comprises two farm cottages, some old farming infrastructure (concrete drinking trough), a barely visible demolished building and fencing. A small dam/old excavation pit occurs in the north east, on the lower slopes of the proposed development site. The farm used to be cultivated and grazed in the past, but is currently unproductive and vacant agricultural land.

2.5 Viewshed and View Corridor

The viewshed, or view catchment area, is the zone within which the proposed development would be visible.

A zone of visual influence relate to the various viewsheds that exist. It is plotted in Figure 8 and 9, which also indicates 'view shadows'. The hill basin where solar array is to be located is within such a view shadow therefore not visible to receptors. The farm component is located on the coastal plain behind a secondary stone mound viewshed at the base of the coastal slopes hidden from road users.

Receptors are individuals likely to experience or receive visual impact. In other words, a receptor located in a view corridor will only see objects in front of the viewshed, the objects behind the viewshed will be in the view shadow and therefore not visible to a receptor.

With reference to the site analysis and photos above, the proposed abalone farm indicated in red block on Figure 8 below, is located at the foot of a gentle slope which limits visibility from the north, north-east and north-west. The proposed solar array indicated on Figure 9, will be located on a northern slope which limits visibility from the south, south-east and south-west. Due to the continuous rise in the landscape views from the north is also blocked. Therefore the solar component will not be visible to any receptors.

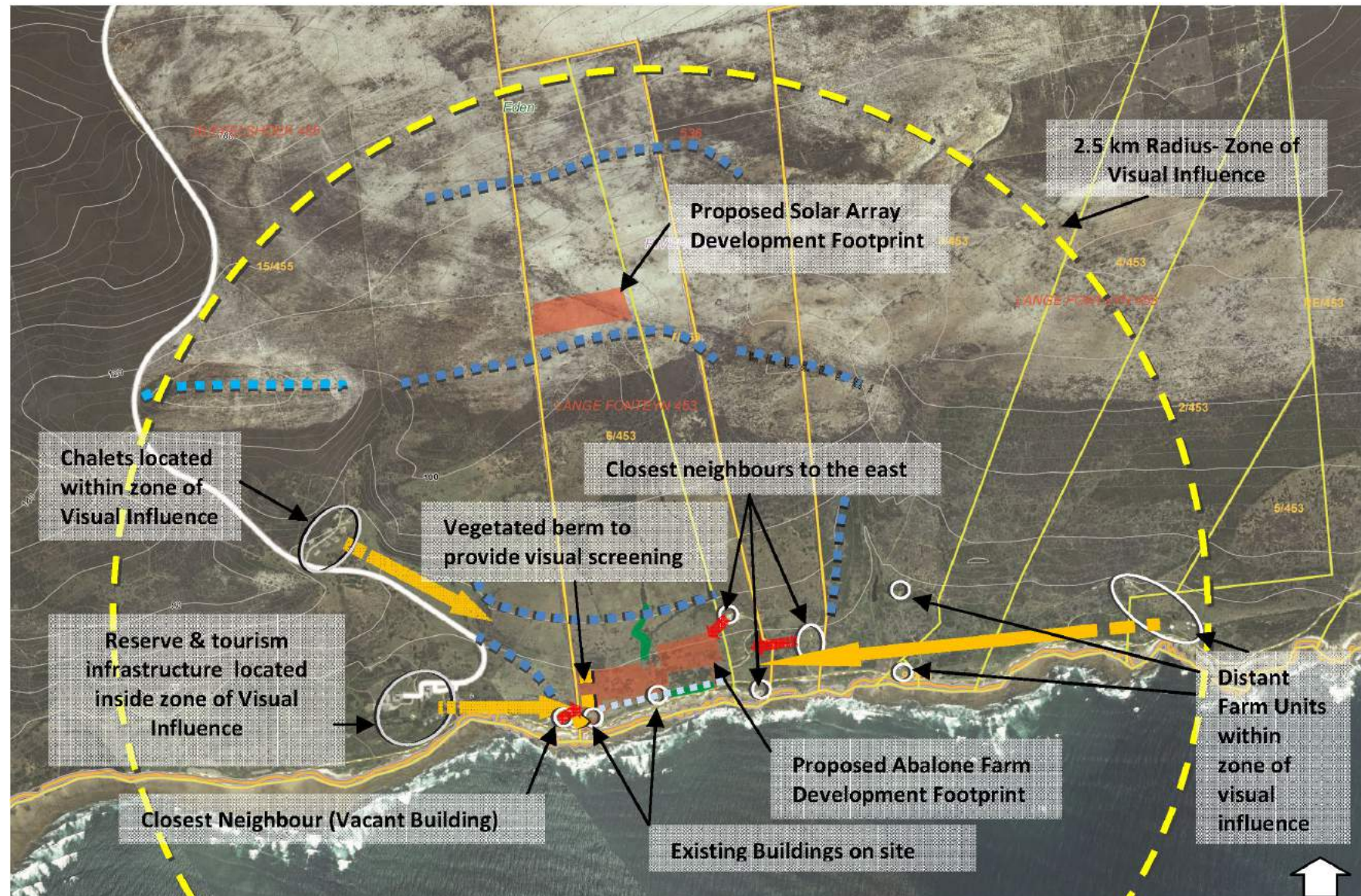


Figure 8: Zone of visual influence indicated in yellow. The viewsheds is in dotted blue lines, a secondary viewshed (natural stone mound parallel to access road) block views of site from road users. The primary view corridors from the east and west indicated by the 3 orange arrows. The development clearly visible to neighbouring residents indicated with red arrows.

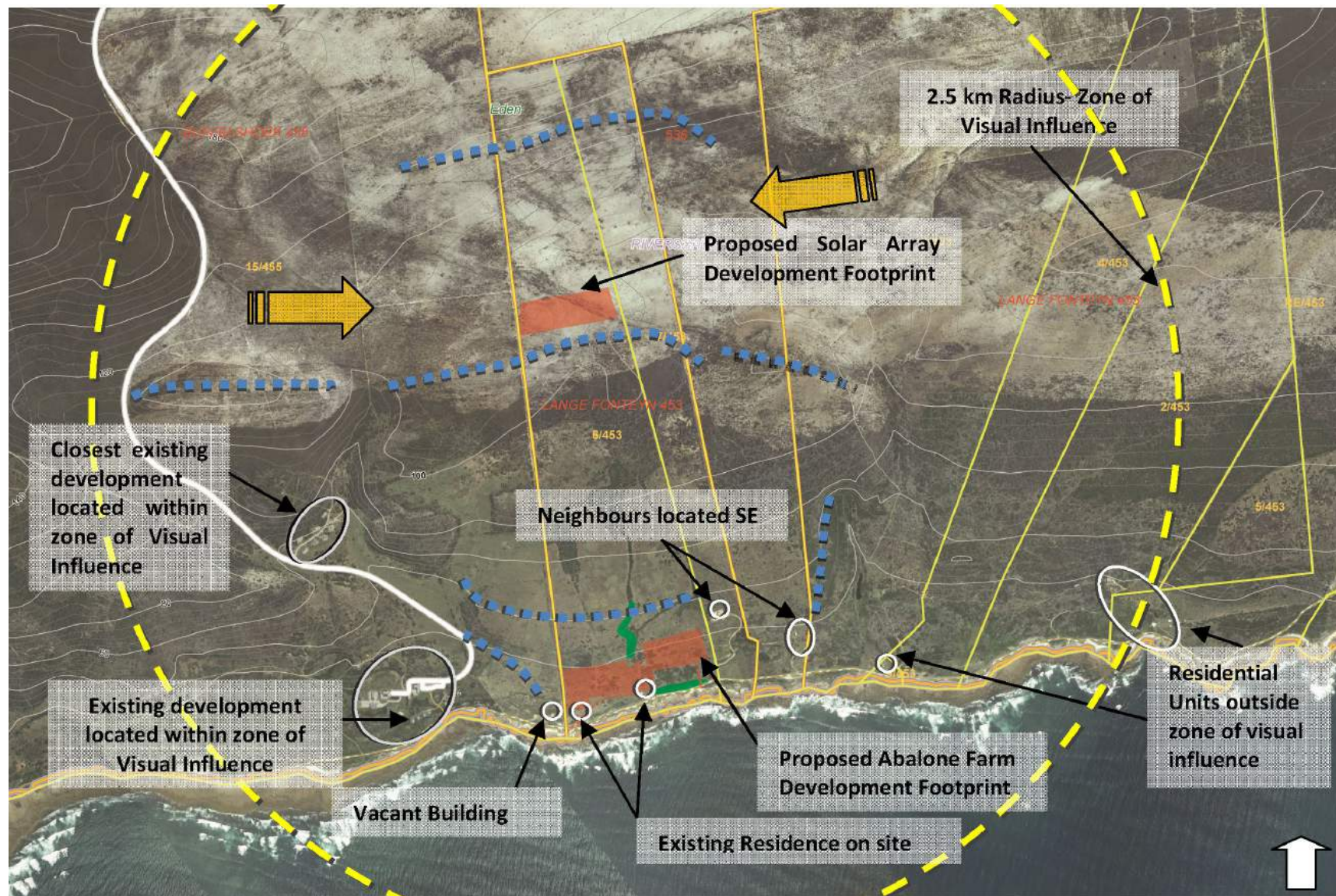


Figure 9: Solar Zone of visual influence indicated in yellow broken line with the viewsheds in blue broken line and primary view corridors from the east and west indicated in orange arrows. The Solar development will not be visible.

The assessment revealed that for the farm site next to the coastline, three limited view corridors exist. It is indicated with orange arrows on Figure 8 above.

- 1) **Narrow corridor (see photo 9) north-west to south-east.** The receptors are Gouriqua Reserve houses 1.35 km from the development with very limited sporadic views of the development area.
- 2) **Corridor from the west to the east.**
2.1 (Photo 6) - The receptors are Gouriqua Reserve infrastructure 580 m west of the development boundary. Due to topography the receptors are located at 6-9 m in a slight dip in relation to the proposed development area at 10-11 m. This and the fact that the unit's primary scenic views are towards the south-east and the west, views of the site is therefore limited. The development is proposed to the east of the receptors and not in line with the orientation of the reserve units.
2.2 (Photo 3) – The receptor is Gouriqua Reserve vacant building on the site boundary. This building is oriented towards the south-east, south and south –west. The new development will be directly east of it, not in its prime orientation. Directly west of the building is a farm residence on the development site, blocking views of the site. However the western cell of the farm will be visible through the back of this building.
- 3) **Corridor from the east to west (photo 4, 5 & 11)**
Although receptors within the corridor from the east are located within the zone of visual influence, visibility is negligible due to distance, topography and due to misty sea conditions. But the direct neighbour on the east of the development will see the development clearly.

The assessment also revealed that for the solar array site, two view corridors exist from the east and west. The site is located in a natural basin with no receptors located to the east or west from the proposed solar array site.

2.6 Visual Significance of the Area

The visual significance rating for the area is based on the scenic value of the Hessequa Coastline. The sparsely developed surrounding agricultural area plays an important role in giving the surrounds its identity. The nature of the site in this specific area relates to old farm houses and in some cases ruins and dilapidated structures. The coastline was clearly well developed in the past and recently, after many farms were sold, it's experiencing resurgence. The neighboring Gouriqua Reserve to the west consists of a large tourism development footprint representing the main manmade tourism attractions in the area. Other smaller tourism establishments exist between the site and Gouritsmond coupled with lifestyle agricultural and conservation farms. The coastline is popular for its shore angling frequented by local and visiting fisherman.

If the development can conform to presenting the local architecture, and mitigating measures to limit visual impacts, it could be integrated as part of the fishing and eco-tourism theme and the restoration of the structures along the coastline.

3. VISUAL ASSESSMENT CRITERIA

The description of the environment is undertaken with a view to presenting information for the VIA. A series of both quantitative and qualitative criteria, listed below, are used to measure the value and sensitivity of visual / scenic resources, and ultimately the potential impacts on these. When the criteria below are considered in combination, an indication of the

visual sensitivity of the property, and the potential visual impacts can be determined. This in turn gives an indication of the type of mitigation measures required.

In order to categorise the proposed development, it is clear that it relates to medium scale infrastructure or activities. It therefore can be regarded as a category 3 development, adjacent to an area of scenic, cultural or historic significance. Theoretically, a moderate to high (noticeable change) visual impact is therefore expected that constitutes a Level 3 VIA.

3.1 Viewpoints (Corridors)

Viewpoints (key observation points), or view corridors, tend to be based on prominent viewing positions in the area, or sensitive viewers identified in the public participation process. The application area was evaluated to determine from what public vantage points the development will be visible. Primary viewsheds were drawn in the landscape to determine where views of new development are possible. Two significant view corridors impacting on the neighbour to the east and west was identified. The access road stops at the western boundary; therefore it's a dead-end, primarily used by recreational fisherman. Due to a secondary viewshed of a stone mound and thicket parallel to the road the coastal platform is hidden from road users.

3.2 Visibility

Visibility tends to be determined by distance between the development and the viewer. Visibility becomes negligible when distance or speed is involved. The immediate receptors within 500 meters from the boundary could experience visibility.

3.3 Visual Exposure

Visual exposure is determined by the 'viewshed' or 'view catchment (corridor)', being the geographic area within which development would be visible. The viewshed boundary follows ridgelines and high points in the landscape. A zone of visual influence and view corridors are indicated on Figure 8 and 9. The proposed development will experience moderate visual exposure. The adjacent areas consist of tourism facilities, such as Gourikwa Private Nature Reserve. The impacts on these facilities are moderate to minimal because the reserve infrastructure is oriented toward the sea and not the east where development is proposed. Adjacent land use also consists of a private residence (to east). Although the impact on the residence will be significant, it could be mitigated.

3.4 Landscape Integrity

The surrounding landscape plays an important role as an area of landscape significance. Visual quality is enhanced by intactness of the landscape, lack of visual intrusions, and the presence of a strong 'sense of place'. The site was previously cultivated therefore it's not a virgin site. The farm development will be on previously disturbed areas.

The adjacent areas consist of tourism facilities, agriculture and nature conservation areas. The development is regarded as an agricultural industry therefore a new form in the landscape. However the coastline has been used for fishing over many centuries and fish traps exist along the coast. The development relates to the coastline and the need for its resources, therefore its potentially compatible if developed in line with the landscape constraints.

3.5 Visual Absorption Capacity (VAC)

This is the ability of the landscape to conceal or screen structures, mainly by means of topography or vegetation cover, but in this case, the location of the proposed farm on a level

area behind a raised stone mound and vegetation in a micro-basin allows the majority of the site to be less visible. Similarly the location of the solar array out of sight on a northern slope significantly reduces the visibility thereof.

3.6 Visual Sensitivity

Visual sensitivity is determined by a number of factors in combination, such as prominent topographic or other scenic features. These include the following:

- An open exposed site with limited viewsheds;
- Higher elevations and ridges tend to be more prominent and visible; and
- Steep slopes are more visible from a distance than flatter slopes.

When the criteria above are considered in combination, an indication of the visual sensitivity of the property, and the potential visual impacts can be determined. This in turn gives an indication of the type of mitigation measures required.

Due to the nature of the proposal development, it needs to be against the coastline in a level low area. The sites leans it towards this criteria, and it has sufficient space to accommodate the required development footprint of approximately 10 ha next to the coastline. There are secondary and primary viewsheds screening the site allowing for a micro-basin for the farm development.

Due to the topography and valley basin the solar component is located in an area with low visual sensitivity.

4. SUMMARY OF VISUAL CONSTRAINTS

Based on the field trip and knowledge of the area, as well as the visual criteria set out above, preliminary visual constraints and suitability for development have been determined. These are summarized in the Table 1 below.

Table 1: Visual Constraints

Type	Visual Constraints
View Corridors	Due to the level nature of the coastal plain infrastructure on the plain is visible from a distance, but most of the historic infrastructure was developed on approximately 10 m above sea level and due to micro-topographical features like rocky outcrops, and drainage lines visibility is lost within a 1km but more recent houses developed much higher against the slopes for optimal views can see much further. In this case the site is visible by both neighbours on the east and west but with varying degrees. Receptors further to the east does not enjoy clear views of the site. Road users cannot see the development areas clearly due to secondary view sheds.
Hills and ridgelines	The proposed development will have a limited footprint and although minor cutting into slopes will be required, the integrity of the area will be maintained and no development is proposed on hills and ridgelines that are visually exposed. The Solar Array will be 1.7 km from coastline in

	a view shadow with no receptors. The fresh water reservoir will be on the 20 m contour on the first ridge, but it will be hidden.
Natural areas	The biodiversity assessment suggests limited connectivity and the protection of the two thicket patches on site have been incorporated into the layout of the farm footprint.

5. VISUAL MITIGATION GUIDELINES

Visual guidelines have been proposed below to inform the layout of the farm area. Please note that these are guidelines only, which will mitigate the moderate visual impact expected.

As per introduction above initial layout informants were provided to the designer to adopt after evaluation of the 1st Alternative. This relate to the following:

- *Avoid a monolithic block footprint – **This was achieved y breaking the farm up in two cells, slightly staggered and separated by a werf and green area. The Solar Array was removed from the farm 1. 7 km inland and out of sight.***
- *Consider Local Cape Vernacular informants for the new buildings – **All buildings will be single storey reflecting the local building style along the coast***
- *Approach the layout of the tanks area to reflect an agricultural feel, instead of an industrial feel – **The vision is to develop a wine/olive farm theme, with a central werf, two agricultural blocks with landscaped fringes and landscaped surrounds depicting the local elements of stone and coastal vegetation in between***
- *Don't built inside the 30 meter building line – **This was achieved***
- *Hide infrastructure by excavating into the landscape and rehabilitate accordingly- **By lowering the two production cells, the area will not sit on top of the ground but rather in the landscape. The cut areas will be landscaped and the area will be covered by charcoal coloured shade nets***
- *Set-back from the coast– **The coastal set-back was determined on the 7 m contour with an additional 10 meter buffer. This was adopted in the design. The Solar Array was removed from the farm 1. 7 km inland and out of sight.***
- *Maintain a 20-30 meter buffer between the development and the two existing houses - **This was achieved, development was set-back from both houses by more than 20 m each.***

Further actions to be implemented as part of the conditions of authorisation

5.1 Layout

- The new development should only disturb the actual footprint and rehabilitation of areas not used should take place to optimise green zones.
- An approx. 70 meter long vegetated berm to be created on the western boundary between the existing house and the base of the rising coastal slope
- The western farm cell will be cut into the slope from the northern end of the berm point to be completely hidden from the west.

- The freshwater reservoir 30 m from the western fence on the 20 m contour need to be sunk into the site and screened with vegetation. Service liens to follow disturbed development footprint only.
- Central werf to be developed as per design guideline below.
- Werf to connect via a path with the middle ticket, as a scenic walk for visitors.
- Werf and buildings reflect wine/olive farm theme, with a visitor's educational facility area.
- Maintain the buffer area around the two current houses through landscaping of indigenous vegetation no encroachment of 100% hard surfaces.
- The eastern farm cell will be cut into the slope to be completely hidden from the east as far as possible.
- Cover both eastern and western farm cell with charcoal shade nets.
- All bulk service infrastructure to be located underground including the sea water intake sump. This will ensure that all new infrastructure that above ground is located behind the natural stone mound and thickets that run parallel to the road.

5.2 Design

- Local Cape Vernacular Architectural style to be implemented. Design elements draw from the coastal surrounds relate to simple structures.



- The following photos are examples of farm buildings reflecting an acceptable form and mood.



Approximately a 40° roof pitch and a 7.5 meter high, natural stone and plain lines were used



Photo of typical flat roof Cape Vernacular architecture in the Overberg region



Typical barn with approximately 35° roof pitch, typical corrugated sheet sliding doors



Photo of a modern acceptable example of a 7 meter high roof pitch at 35°

- **External Wall Colours and Finishes**

- Only roughcast painted plaster or bagged walls with a matt finish.
- Wall colours shall be limited to white tones only specified to pick up greys, browns and greens should be primary.
- No face brick shall be permitted.
- Real stone accents on the frontage is strongly encouraged.
- No timber buildings will be permitted; only timber components, as finishes will be accepted.
- The colours of windows, fascias, doors, shutters etc should be consistent and compliment the wall colours and the architecture of the buildings
- All security features should be located on the inside



No face brick or hard landscaped paving surfaces are allowed

- **Roofs**

Roof materials are to be charcoal coloured roof sheeting which meets 30 year warranty requirements. All roof hardware (vents, stacks, flashing etc) must be painted to match the colour of the roofing materials, or encased in structures.

With reference to the examples above, it is clear that roof pitches vary between flat roofs with gable ends or pitched roofs between 30° and 45° angles. For the purpose of this guideline the following roof types will be allowed:

Acceptable Roof type: Pitched roofs between 30° and 45° angles, maximum height 7m. "Lean-to" sections on both sides of the master structure could have limited slope flat roofs

with parapet. No flat roofs on primary structures are allowed. All gables need to have simple lines.



No flat, mono-pitched or arched roofs are allowed



Pitched roofs with 30° to 45° slopes, typical to Cape Vernacular architecture is compulsory

- **Doors & Windows**

All doors and windows need to be charcoal colour or plain silver aluminium with glass. Large doors need to be sliding with reference to the “Barn Style” or Industrial roller doors for large entrance areas on the sides of buildings. No tip-up garage doors will be allowed.



Roller doors for large entrances at the side of buildings and typical barn sliding doors for smaller entrances are allowed

- **Signs & Lights**

Lighting is also required for the security and safety. However, all lighting shall be directed solely towards the buildings or storage areas. No high mast lighting will be allowed and no

lighting shall be directed off the site. Energy saving lights is required and no “naked” spotlights will be allowed.

Company identification and signs is welcome that should meet the Local Authority By-law for Control on Outdoor Advertising or in the absence of local controls the South African Manual for Outdoor Advertising Council (SAMOAC) regulations for signs should be applicable.

No neon-signs or illuminated signage are allowed. All signs need to be framed in a rectangle shape fixed on buildings only, not exceeding 3.5 meters in length and 1.5 meters in height. No freestanding signage is allowed.



No signage on walls or fences; no freestanding spot or spray lights

- **Fencing**

It is recognised that fencing is critical for the security of the business. A fence will be erected on the landward side of the access road. 1. 8 meter clearview fencing or similar is preferred due to visual permeable qualities.

Entrance features should resemble the “Farm Werf” wall. No long solid walls are allowed to avoid the feeling of an suburban area.



No barb wire on walls or structure and novibracrete or electric fencing is allowed



*White plastered pillars with a low wall and connecting palisade fencing is acceptable.
Note the landscaping associated with the fence*



Pillar and palisade example



Treated gum pole fence with landscaping and the visual permeability



Example of light electrified fence proposed for around the farm periphery.

- **Landscaping**

Landscaping must consider seasonal fluctuations, frontage and aesthetics, screening and buffering and long term maintenance. Landscaping along either the inside or outside of the fence and buildings is recommended to soften the appearance, while not reducing the security. Where possible, screening is required for loading bay areas and other “unsightly” operational areas of the business.

Plants:Landscaping will only take place with indigenous and endemic plants. All landscaping is to take into consideration the indigenous vegetation of the area. No invasive plant species such as Kikuyu will be allowed on site.

Search and Rescue: A search and rescue is to be undertaken before the installation of services, and before construction commences. All bulbs/geophytes that are collected must be replanted as part of the landscaping project. All coastal thicket areas need to be avoided as far as possible. Similar thicket plants need to be used for hedges etc.

6. VISUAL IMPACT ASSESSMENT

The Impact Assessment phase of the assessment will evaluate the impacts of the 2 Alternatives described and mapped above.

Type	Impact	Alternatives
Visual exposure of the area	High visual exposure – covers a large area (e.g. several square kilometres).	
	Moderate visual exposure – covers an intermediate area (e.g. several hectares).	Alt 1 & Alt 2
	Low visual exposure – covers a small area around the project sites.	
Visual absorption capacity	High VAC – e.g. effective screening by topography and vegetation;	Alt 2 Solar Array
	Moderate VAC – e.g. partial screening by topography and vegetation;	Alt 1 & Alt 2 Farm
	Low VAC – e.g. little screening by topography or vegetation.	
Landscape integrity	Low compatibility – visually intrudes, or is discordant with the surroundings;	Alt 1
	Medium compatibility – partially fits into the surroundings, but clearly noticeable	Alt 2 Farm
	High compatibility – blends in well with the surroundings.	Alt 2 Solar Array
Visibility of the project	Highly visible – dominant or clearly noticeable	Alt 1
	Moderately visible – recognisable to the viewer	Alt 2
	Marginally visible – not particularly noticeable to the viewer	Alt 2 Solar Array
Extent	Site-related: extending only as far as the activity;	Alt 2 Solar Array
	Local: limited to the immediate surroundings;	Alt 1 & Alt 2 Farm
	International: affecting areas across international boundaries.	
Duration	Short term, (e.g. duration of the construction phase);	Alt 2 Solar Array
	Medium term, (e.g. duration for screening vegetation to mature);	Alt 2 Farm
	Long term, (e.g. lifespan of the project);	Alt 1
	Permanent, where time will not mitigate the visual impact.	
Intensity	Low, where visual and scenic resources are not affected;	Alt 2 Solar Array
	Medium, where visual and scenic resources are affected to a limited extent;	Alt 2 Farm
	High where scenic and cultural resources are significantly affected.	Alt 1
Probability	Improbable, where the possibility of the impact occurring is very low;	Alt 2 Solar Array
	Probable, where there is a distinct possibility that the impact will occur;	Alt 2 Farm
	Highly probable, where it is most likely that the impact will occur; or	Alt 1
	Definite, where the impact will occur regardless of any prevention measures.	
Significance	Low, where it will not have an influence on the decision;	Alt 2 Solar Array
	Medium, where it should have an influence on the decision unless it is mitigated;	Alt 2 Farm
	High, where it would influence the decision regardless of any possible mitigation.	Alt 1

Table 2: Visual Impacts

7. CONCLUSIONS AND RECOMMENDATIONS

It's clear from the assessment above that the 1st Alternative with a proposed footprint of 18 ha against the sea will have a highly significant and probable impact over the long term. It will have a local high visibility, low compatibility where only partial screening is possible.

Based on this an initial set of visual design guidelines were recommended. This related to avoiding a monolithic block footprint, the introduction of Local Cape Vernacular design informants to reflect an agricultural feel, instead of an industrial feel, try and hide infrastructure by excavating into the landscape, consider a coastal set-back and a buffer between the coastal road and the existing two houses on the site. Other bio-physical contains were also added as informants, especially the incorporation of coastal thickets as no-go areas.

The designers reacted positively and the 2nd and preferred alternative evolved, by separating the farm and the solar components. This relate to 10 ha farm along the coast and 6 ha solar component 1.7 km inland.

The farm was set-back from the existing houses and road to 10 m above the 7 meter contour, considered appropriate as a coastal set-back for a farm that requires a close proximity to the sea. To ensure limited to no intrusion in the immediate coastal zone, all infrastructure will be below ground including the intake sump. These areas will be rehabilitated. All new infrastructure will be on the landward side of the stone mound and thickets that run parallel to the road. A new central werf will be created landward of the middle cottage, buildings will not exceed 7 m in height and it will adopt the local cape vernacular as per guidelines above. The two farm cells will be separated and slightly staggered, this will allow the new werf to connect with the middle thicket where a path could connect a vantage point for visitors. The two cells will be excavated into the landscape at the base of the coastal slopes in order to "tuck" into the site for maximum visual absorption. No development will take place on the slopes. The abalone baskets are only 1.2 m high and will be covered by charcoal shade nets of 3 m high. Therefore the farm component will cover an area of 7 ha that will effectively be "camouflaged" and seamlessly integrated in the natural surrounds. All disturbed areas will be landscaped to avoid unwanted hard surfaces. This design reflects that of a wine/olive farm development footprint achieving the desired aesthetic feel.

The result is that Alternative 2 will have a medium to low significant impact with the solar array impacts being improbably and the farm probable over the short to medium term. It will have a local moderate to marginal visibility, medium to high compatibility where effective screening and design influence is possible due to the solar array location and by implementing design and layout guidelines as mitigation.

We recommend that all the visual mitigation guidelines be included in the CEMP and OEMP and made a condition of authorization.