ZIRCO ROODE HEUWEL (PTY) LTD, NORTHERN CAPE

KAMIESBERG PROJECT, NAMAQUALAND, SOUTH AFRICA

HERITAGE IMPACT ASSESSMENT

Prepared for:	**Prepared by:**
Zirco Roode Heuwel (Pty) Ltd	**Coastal & Environmental Services**
25 Mark Street Stellenbosch, 7600 South Africa	P.O. Box 934, Grahamstown, 6140 South Africa

AUGUST 2014

AGENCY FOR CULTURAL RESOURCE MANAGEMENT

EXECUTIVE SUMMARY

ACRM was appointed to conduct a Heritage Impact Assessment (HIA) for the proposed Zirco Roode Heuwel Kamiesberg Project on Portions 1, 5, 6 & 9 of the Farm Roode Heuvel 502, Klipdam 633, Leeuvlei 642, Leeuvlei 437/1 and Portions 10 & 11 of De Klip heuwel 435, located about 35 kms south west of Garies in the Namaqualand region of the Northern Cape.

The project entails the mining of proven heavy mineral sand deposits. The extent of the mining application area is about 12 000 ha, but it is not known how large the actual mining footprint area will be. Mining operations on Roode Heuvel for example, are planned to cover approximately 3 500 ha. Dry mining using front end loaders is the most likely scenario. It is planned that mining for the first 25 years will be on Roode Heuvel and thereafter on Leeuvlei.

The applicant (Zirco Roode Heuwel (Pty) Ltd) is also in the process of acquiring prospecting rights for the area called Sabies which lies adjacent to Roode Heuvel, but the focus of the HIA is on the properties referred to as Roode Heuvel and Leeuvlei.

The HIA forms part of the EIA process that is being done by Coastal and Environmental Services (CES).

In addition to the mining and associated infrastructure (mineral separation plant, primary concentrator plant, tailings dam, offices, workshops and stores, for example), the project will also require the construction of the following infrastructure such as, but not limited to the following:

- Seawater intake, pump station, and pipeline to a desalination plant on the proposed mine;
- Waste water treatment works;
- Product transfer stations;
- Airstrip[1];
- Upgrade of the provincial road to junction with the N7;
- Fuel Depot;
- Construction and operation accommodation, and
- Landfill site

Apart from the seawater intake, pump station and pipeline from the coast to the mine, all associated infrastructure will be located on Roode Heuvel.

A 35 km, high voltage transmission line to service the project is also envisaged, but is subject to a separate EIA process to be undertaken on behalf of Eskom.

A 10 day (± 70 hr) ground truth survey of the application area (i. e. Roode Heuvel and Leeuvlei) took place during March, April and July 2014.

[1] Please note that based on the outcome of this assessment as well as the Ecological assessments (Vegetation and Fauna), the position of the airstrip has subsequently been moved to an area of lower sensitivity. For a full analyses of the alternatives please refer to chapter 7 of the EIA document.

A survey of the proposed seawater intake, pump station and pipeline to the mine site (on Roode Heuvel) was also done.
Archaeological remains located during the study were mapped using a hand held GPS device set on the map datum WGS 84.
[i]

The following observations were made:

Roode Heuvel

- Isolated quartz flakes and chunks were recorded in the application area.
- One Early Stone Age (ESA) handaxe and an ESA flake were found.
- Nearly 30 quartz flakes, chunks and cores were recorded in the proposed airstrip, but the tools occur in a severely degraded context (old agricultural land). One Middle Stone Age (MSA) silcrete flake was also found.
- Scatters of Later Stone Age (LSA) tools, marine shellfish, decorated pottery and ostrich eggshell were recorded in a number of wind deflated sites.
- Large numbers of quartz, silcrete, quartzite, indurated shale, and several 100 fragments of ostrich eggshell were recorded on Brandkop on the north eastern boundary of the application area.

Leeuvlei

- Single, isolated and a few dispersed scatters of quartz flakes and chunks were encountered in the application area.
- Outcroppings of quartz are likely sources of raw material targeted by Stone Age hunter-gatherers.
- Dispersed scatters of tools and a fragment of pottery were recorded near an outcropping of granite.
- Scatters of quartz (chunks & flakes), fragments of weathered ostrich eggshell and a piece of pottery were found south west of the granite dome, but the site (located among small Heuweltjies) is heavily bioturbated.
- Thousands of pieces of stone, including flakes, chunks, chips, bladelets, cylindrical, round and bipolar cores, hammerstones, anvils, manuports and grindstone fragments, were recorded in a cluster of wind deflated sites in the south western corner of the application area. More than 95% of the material is in quartz, but tools in silcrete and chalcedony were also counted. It is maintained that the source of the raw material are the outcroppings of quartz described above. No pottery was found, but about 40 pieces of ostrich eggshell were counted in a single site.

Significance of the archaeological remains

Roode Heuvel

- The very small number of tools and the (isolated) context in which they were found mean that the archaeological remains have been rated as having low (Grade 3C) significance.
- The highly disturbed context in which they were found means that the remains documented in the proposed airstrip have been rated as having low (Grade 3C) significance.
- Wind deflated sites inland of the coast are extremely rare in Namaqualand, and while the density of stone implements, marine shellfish, ostrich eggshell and pottery in these LSA

campsites is relatively low, collectively, they have been rated as having medium-high (Grade 3B) significance.
- Scatters of tools and ostrich eggshell on Brandkop have been rated as having medium-high (Grade 3B) significance, despite the moderately disturbed context in which they were found.

Leeuvlei

- The small numbers, isolated and disturbed context in which they were found, means that the archaeological remains have been rated as having low (Grade 3C) significance.
- The highly degraded context in which they were found means that the outcropping of granite with associated tools and a few organic remains have been rated as having low (Grade 3C) significance.
- Quartz quarries are sources of raw material and are considered significant (heritage) features in the landscape. Quarry sites provide evidence of stone tool transport and also raise questions about group size and organization of activity among hunter-gatherer groups. They cannot be seen in isolation from the wind deflated sites which are the repository of the quarried stone and finished artefacts. Outcropping of quartz in the application area have therefore been rated as having medium-high (Grade 3B) significance.
- Wind deflated sites in the south western corner of the application area, in which thousands of tools have been documented, have been rated as having medium-high (Grade 3B) significance.

Seawater intake, pump station and pipeline to the desalination plant

- Archaeological remains are extremely rich at the coast. Typically, these comprise scatters of shellfish dominated by limpets and Black Mussel. A few stone flakes, some ostrich eggshell and pottery was also found. Shell scatters are essentially the remains of processing sites where meat was extracted, cooked in pots, or even dried like biltong for transport to campsites further inland.
- Large numbers of quartz, including flakes, chips, chunks, cores, a hammerstone and grindstone fragment was recorded in a dune blow out in the pipeline route about a kilometre south of the Groenrivier.
- Outcroppings of quartz in the pipeline route are likely sources of raw material targeted by Stone Age hunter-gatherers
- Diffuse scatters of stone implements, including a sherd of undecorated pottery were recorded on the south bank of the Groenrivier.
- A few stone implements and fragments of weathered shellfish (limpets) were documented on the north bank of the Groenrivier, directly below the Garies/Groenrivier road.

Significance of the archaeological remains

- Archaeological deposits at the coast have been rated as having (potentially) medium-high (Grade 3B) significance.

- The LSA campsite with scatters of tools in the proposed Kmm5 pipeline route has been rated as having medium-high (Grade 3B) significance.

- Outcroppings of quartz in the proposed Kmm5 pipeline route have been rated as having medium-high (Grade 3B) significance.

- Diffuse scatters of tools on the south and north bank of the Groenrivier have been rated as having low (Grade 3C) significance.

Conclusion

The baseline study has captured a good record of the archaeological heritage present in the Roode Heuvel and Leeuvlei application area. Sites of particular significance include rare LSA campsites/wind deflated sites with domestic debris, as well as quartz quarries which were targeted by Stone Age people as a source of raw material.

The study has also recorded a large number of shellfish scatters at the coast where the proposed sea water intake (Kmm5 & Kmm4), pump station and pipeline to the desalination plant are located.

The results of the study indicate that the proposed activity (i. e. mining of mineral sands) and associated infrastructure (mineral separation and primary concentrator plant, tailings dam, airstrip, offices, workshops and stores, for example), will not have an impact of great significance on the archaeological heritage, as these are expected to be limited.

There are no fatal flaws and any sites that cannot be avoided could be easily mitigated if required.

The position of the proposed gulley intake (Kmm5 & Kmm4), pump station and pipeline will impact negatively on archaeological heritage at the coast.

Large numbers of tools were also recorded in a wind deflated site south of the Groenrivier, in the Kmm5 pipeline route, while nearby outcroppings of quartz were exploited by hunter-gatherers as a source of raw material.

Recommendations

With regard to the proposed Zirco Roode Heuwel Kamiesberg Project, the following recommendations are made.

<u>Roode Heuvel</u>

1. Archaeological remains in wind deflated sites (Sites 328, 096, 097, 098, 086, 088, 090, 091 & 092) must be mapped (on a grid system) prior to any mining or mining related activities commencing in that particular area. Sand should also be sieved for the presence of sub-surface material. The remains must be collected, curated and written up and a report presented to the South African Heritage Resources Agency (SAHRA). No archaeological material may be collected or damaged without a permit issued by SAHRA.

It is acknowledged that some areas in which scatters of tools and organic remains occur (for example on Brandkop – Site 086) may not be mined at all, so archaeological mitigation will likely not be required.

2. Should any unmarked human remains, or ostrich eggshell caches for example be uncovered or exposed during mining or associated activities, these must immediately be reported to the archaeologist (Jonathan Kaplan 082 321 0172), or the South African Heritage Resource Agency (Ms Mariagrazia Galimberti 021 462 4502). Burials must not be removed or disturbed until inspected by a professional archaeologist.

Leeuvlei

1. Archaeological remains in wind deflated sites (Sites 050-055 & 025) must be mapped on a grid system prior to any mining or mining related activities commencing in that particular area. Sand should also be sieved for the presence of sub-surface material. The remains must be collected, curated and written up and a report presented to SAHRA. No archaeological material may be collected or damaged without a permit issued by SAHRA.

It is acknowledged that the above sites may not be mined (contingent on a final mine plan), so archaeological mitigation will therefore not be required.

2. A Heritage Management Plan (HMP) must be implemented in order to protect important archaeological sites that fall within `non-mining areas', during the Construction and Operational Phase of the project. The HMP must be included as part of the Environmental Management Plan (EMP) for the project. The HMP must be submitted to SAHRA for approval.

3. A buffer of at least 5 m must be established around outcroppings of quartz (Sites 10, 033, 037, 041 & 088). Alternatively, these sites must be fenced off. Fencing must be done in consultation with and under the supervision of an archaeologist.

4. Should any unmarked human remains or ostrich eggshell caches be uncovered or exposed during mining or mining related activities, these must immediately be reported to the archaeologist (Jonathan Kaplan 082 321 0172), or the South African Heritage Resource Agency (Att: Ms Mariagrazia Galimberti 021 462 4502). Burials must not be removed or disturbed until inspected by a professional archaeologist.

Proposed seawater intake, pump station and pipeline to the desalination plant

Kmm5

1. Shellfish deposits at the sea water intake (Site 095) must be sampled. This should take the form of a series of 1m x 1m excavations in order to test the significance and extent of the archaeological deposits. Shellfish and bone must also be collected for dating. Should significant sub-surface deposits be encountered during test excavations, a larger sample will need to be rescued.

2. Scatters of shellfish (Sites 096-103 & Sites 105-115) in the pipeline route, and between the sea water intake and the pump station (Sites 277-279, Sites 283-286 & Site 296) must be sampled using a sampling strategy designed by Dr Jayson Orton for ephemeral sites of this nature. This will entail more detailed visual recording, sub-surface sampling (i. e. sieving), and collection of shellfish (for dating) and archaeological material. Such studies have shown an improved knowledge of pre-colonial landscapes.

3. Scatter of tools in the wind deflated site (Site 136) in the pipeline route south of the Groenrivier must be mapped on a grid system. Sand must also be sieved for the presence of

sub-surface material. All the remains must be collected, curated and written up and a report presented to SAHRA. No archaeological material may be collected or damaged without a permit issued by SAHRA.

Alternatively, the pipeline must be moved to avoid this important site.

4. Outcroppings of quartz (sites 138 & 139) south west of Site 136 must be investigated. This will entail more detailed visual recording, mapping and collection. The material must be written up and a report presented to SAHRA. No archaeological material may be collected without a permit issued by SAHRA.

Alternatively, the pipeline must be moved to avoid this important site.

5. Should any unmarked human remains or ostrich eggshell caches be uncovered or exposed during mining or mining related activities, these must immediately be reported to the archaeologist (Jonathan Kaplan 082 321 0172), or the South African Heritage Resource Agency (Att: Ms Mariagrazia Galimberti 021 462 4502). Burials must not be removed or disturbed until inspected by a professional archaeologist.

Kmm4

1. Scatters of shellfish (Site 273, Sites 233, 236 & 237, Sites 244 & 245, Sites 250-255 & Site 261) in the pipeline route, and scatters of shellfish between the sea water intake and the pump station (Site 229 & Site 272) must be sampled using a sampling strategy designed by Dr Jayson Orton for ephemeral sites of this nature. This will entail more detailed visual recording, sub-surface sampling (i. e. sieving), and collection of shellfish (for dating) and archaeological material. Such studies have shown an improved knowledge of pre-colonial landscapes.

<u>Sabies</u>

1. If prospecting rights are approved, the area called Sabies must be assessed for archaeological heritage ahead of any mining or development activity.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

ACRONYMS AND ABBREVIATIONS

ACRM: Agency for Cultural Resource Management
CES: Coastal & Environment Services
HIA: Heritage Impact Assessment
EIA: Environmental Impact Assessment
SAHRA: South African Heritage Resources Agency
HMP: Heritage Management Plan
EMP: Environmental Management Plan
NHRA: National Heritage Resources Act
AIA: Archaeological Impact Assessment
ESA: Early Stone Age
MSA: Middle Stone Age
LSA: Later Stone Age
ACO: Archaeology Contracts Office
Absl: Above sea level

1. INTRODUCTION

ACRM was appointed by Coastal and Environmental Services (CES) to conduct a Heritage Impact Assessment (HIA) for the proposed Zirco Roode Heuvel Kamiesberg Project on Portions 1, 5, 6 & 9 of the Farm Roode Heuvel 502, Klipdam 633, Leeuvlei 642, Leeuvlei 437/1, and Portions 10 & 11 of De Klipheuwel 435, located about 35 kms south west of Garies (Kamiesberg Local Municipality) in the Namaqualand region of the Northern Cape (Figures 1 & 2).

The project entails the mining of proven heavy mineral sand deposits on the above properties. The extent of the mining application area is about 12 000 ha, but it is not known how large the actual mining footprint area will be. Mining operations on Roode Heuvel for example, are planned to cover approximately 3 500 ha. Dry mining using front end loaders is the most likely scenario. It is planned that mining for the first 25 years will be on Roode Heuvel and thereafter on Leeuvlei.

The applicant (Zirco Roode Heuvel (Pty) Ltd) is also in the process of acquiring prospecting rights for the area called Sabies which lies east of and adjacent to Roode Heuvel, but for the purpose of this study, the focus of the HIA is on the properties referred to as Roode Heuvel and Leeuvlei (Plate 1).

The HIA forms part of the Environmental Impact Assessment (EIA) process that is being undertaken by independent environmental consultants CES.

In addition to the mining and associated infrastructure (including mineral separation plant, primary concentrator plant, tailings dam, offices, workshops and stores, for example), the project will also require the construction of the following infrastructure such as, but not limited to the following:

- Seawater intake, pump station and pipeline to a desalination plant on the mine;
- Waste water treatment works;
- Product transfer stations;
- Airstrip[2];
- Upgrade of the provincial road to and junction with the N7;
- Fuel Depot;
- Construction and operation accommodation, and
- Landfill site

Apart from the seawater intake, pump station and pipeline from the coast to the mine, all associated infrastructure will be located on Roode Heuvel.

A 35 km, high voltage transmission line to service the project is also envisaged, but is subject to a separate EIA process to be undertaken on behalf of Eskom.

[2] Please note that based on the outcome of this assessment as well as the Ecological assessments (Vegetation and Fauna), the position of the airstrip has subsequently been moved to an area of lower sensitivity. For full analyses of the alternatives please refer to chapter 7 of the EIA document.

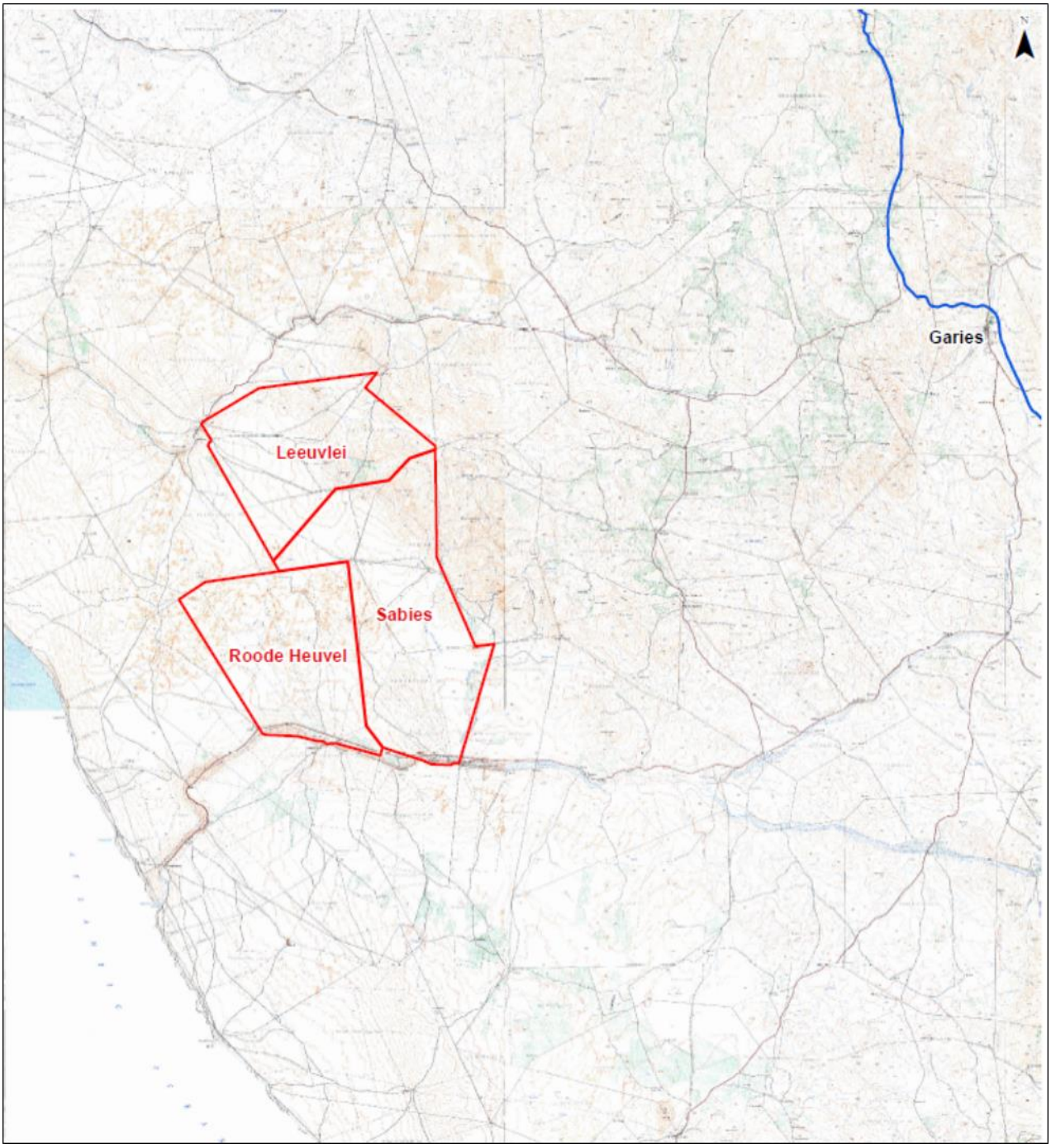

Figure 1. 1:50 000 Locality Map. 3017 CB & DA Soutfontein, 3017 DB Garies & 3017DC Nariep

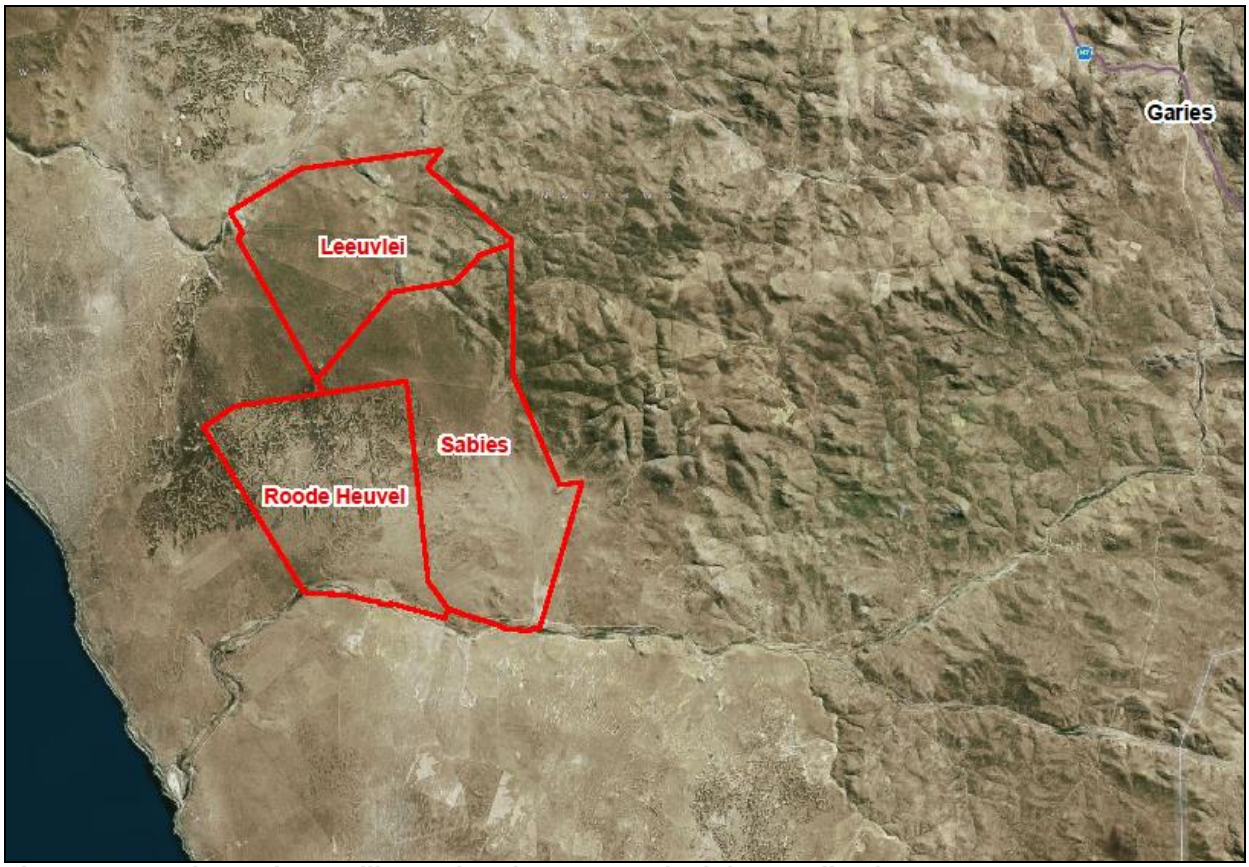

Figure 2. Google Earth map illustrating the proposed mining application area.

Plate 1. View of the mine application area (Roode Heuvel) taken from Brandkop, the highest point in the study area. View facing west toward the ocean

2. HERITAGE LEGISLATION

The National Heritage Resources 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.

In addition, Section 38 (1) (a) of the Act indicates that any person constructing a powerline, pipeline or road, or similar linear development or barrier exceeding 300m in length is required to notify the responsible heritage resources authority, who will in turn advise whether an impact assessment report is needed before development can take place.

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

- Landscapes, cultural or natural (Section 3 (3))
- Buildings or structures older than 60 years (Section 34);
- Archaeological sites, palaeontological material and meteorites (Section 35);
- Burial grounds and graves (Section 36);
- Public monuments and memorials (Section 37);
- Living heritage (defined in the Act as including cultural tradition, oral history, performance, ritual, popular memory, skills and techniques, indigenous knowledge systems and the holistic approach to nature, society and social relationships) (Section 2 (d) (xxi)).

3. DESCRIPTION OF THE RECEIVING ENVIRONMENT

The study area is located about 35kms south west of the town of Garies and about 15kms inland from the mouth of the Groenrivier.

3.1 ROODE HEUVEL

The Groenrivier defines the southern border of the Roode Heuvel application area. The slopes of the farm overlooking the gravel road alongside the river are fairly steep and covered in dense veld (Plate 2), while the slopes further to the east comprise old agricultural land (Plate 3). A gravel access road from the Groenrivier/Garies road leads to a small test plant that faces north, providing a commanding view over much of the proposed mining area (Plate 4). The receiving environment is mostly flat and undulating, covered in very thick Succulent Karoo vegetation, underlain by a mantle of red windblown sands. Extensive swathes of Restio grasses occur across the northern portion of the farm (Plates 5-8), with heuweltjies and vegetated dune ridges present as well. Large areas in the northern portion of the application area (visible on Google Earth) were previously cultivated with oats and Lucerne, constituting a highly transformed landscape (Plates 9-11). Outcroppings of Ferrecrete were also noted in the north west of the application area. Existing infrastructure includes deep sandy tracks, farm fencing, several windmills, concrete reservoirs, and grazing camps. Apart from the small test plant no buildings or structures occur in the application area. There are no rivers, streams, drainage channels, springs or natural water sources on the affected properties. Brandkop (at 210m absl) is the highest point in the application area (refer to Plate 1, 7 & 12).

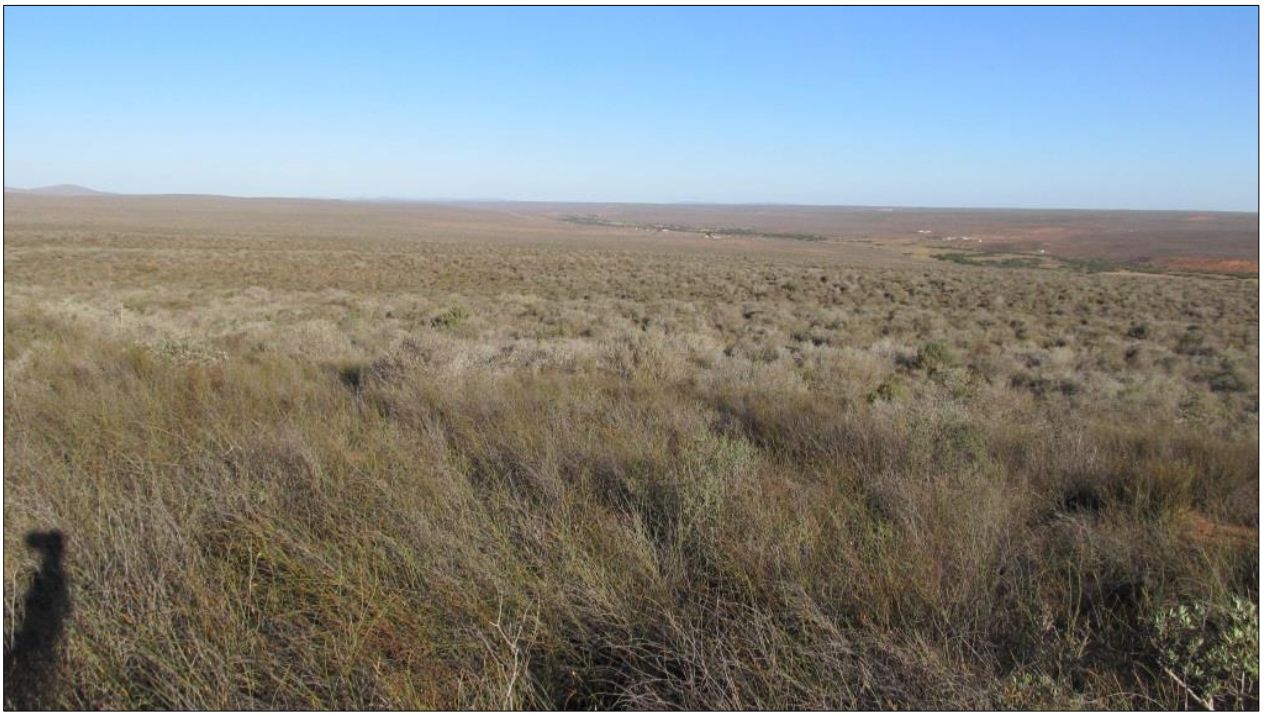

Plate 2. Overlooking the Groenrivier gravel road. View south east

Plate 3. Overlooking the Groenrivier gravel road. View south west

Plate 4. View of the application area facing north

Plate 5. Restio fields. View facing north west

Plate 6. Restio fields. View facing south. Arrow indicates test plant.

Plate 7. Restio fields. View facing south. Arrow indicates Brandkop

Plate 8. Restio fields. View facing south taken from Site 098.

Plate 9. Restio and old agricultural land dominate the landscape across the northern portion of the application area. View facing east

Plate 10. Restio and old agricultural land dominate the landscape across the northern portion of the application area. View facing south

Plate 11. Restio and old agricultural land dominate the landscape across the northern portion of the application area. View facing south east.

Plate 12. View facing south west from Brandkop to the Groenrivier

3.2 LEEUVLEI

The Soutfontein gravel road/Bitterrivier defines the northern border of the Leeuvlei application area. The receiving environment is mostly flat and undulating, covered in very dense veld, underlain red wind-blown sands (Plates 13-19). The slopes in the south west are higher and

characterised by a number of prominent dune ridges and blow outs. There are no rivers, streams, drainage channels, springs or natural water sources in the application area. No old buildings or structures occur in the study area. Existing infrastructure comprises deep sand tracks and gravel farm roads, farm fencing, farm gates, sheep camps and plastic water tanks.

Plate 13. View facing south east

Plate 14. View facing north west

Plate 15. View facing west

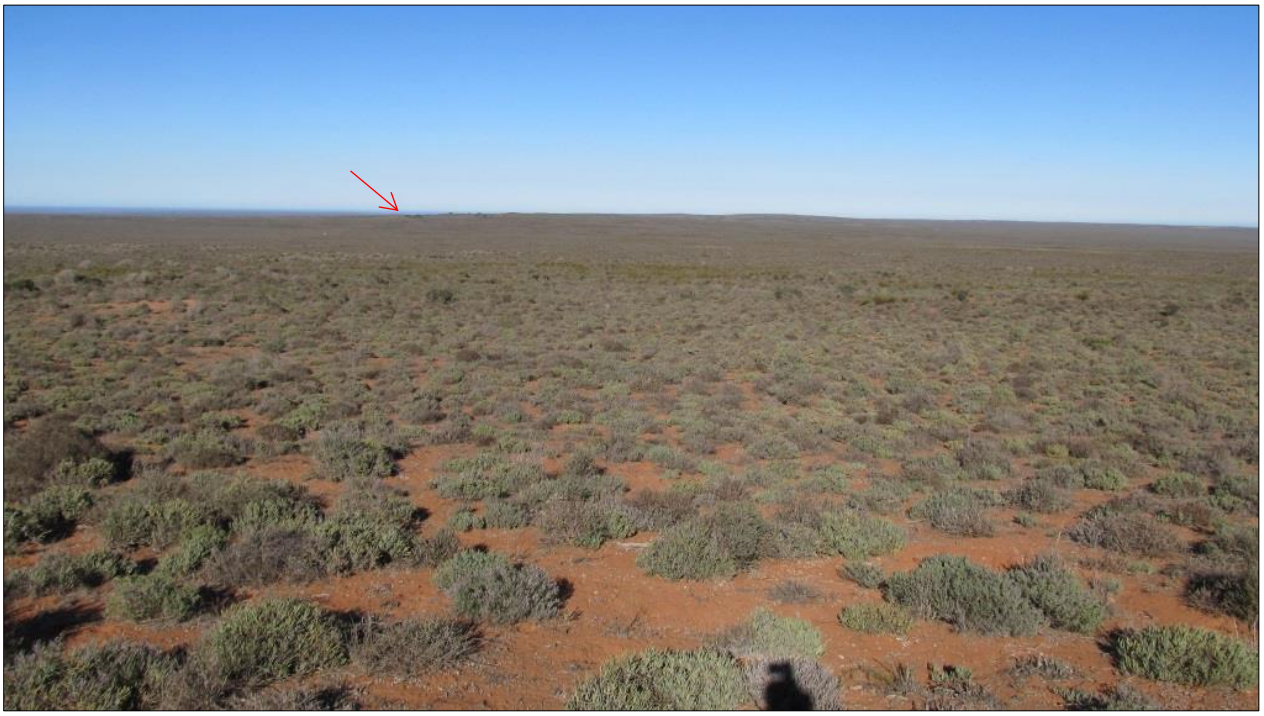

Plate 16. View facing west. Arrow indicates the cluster of wind deflated sites

Plate 17. View facing north

Plate 18. View facing north east

Plate 19. View facing north

4. STUDY APPROACH

4.1 METHOD OF SURVEY

A 10-day ground truth survey of the Roode Heuvel and Leeuvlei application area was undertaken. In total, a little over 70 hours was spent physically walking the application area. Track paths of the survey were also captured (Figures 14 & 15). A large area across the eastern portion of Leeuvlei was not surveyed as the mineral sand deposits here are very thin and will not be exploited.

The position of all archaeological remains found during the survey were recorded *in-situ* using a hand-held GPS device set on the WGS 84 map datum. A spreadsheet of the waypoints and description of the archaeological finds is presented in Tables 3, 4 & 5.

A desk top study was done which included published material and unpublished commercial archaeology reports.
The archaeologists Dr Jayson Orton and Dr Lita Webley were consulted. Both have extensive experience in the archaeology of Namaqualand.

Heritage resources are graded following the system established by Winter & Baumann (2005) in the guidelines for involving heritage practitioners in EIAs (Table 1).

Table 1. Grading of heritage resources (Source: Winter & Baumann 2005)

Grade	Level of significance	Description
1	National	Of high intrinsic, associational and contextual heritage value within a national context, i.e. formally declared or potential Grade 1 heritage resources.
2	Provincial	Of high intrinsic, associational and contextual heritage value within a provincial context, i.e. formally declared or potential Grade 2 heritage resources.
3A	Local	Of high intrinsic, associational and contextual heritage value within a local context, i.e. formally declared or potential Grade 3A heritage resources.
3B	Local	Of moderate to high intrinsic, associational and contextual value within a local context, i.e. potential Grade 3B heritage resources
3C	Local	Of medium to low intrinsic, associational or contextual heritage value within a national, provincial and local context, i.e. potential Grade 3C heritage resources

4.2 CONSTRAINTS AND LIMITATIONS

Apart from Brandkop (at 210m absl), the topography of the receiving environment is mostly flat and undulating, and the archaeologist did not have any problems walking the landscape. Large areas of the study area comprise fairly level, open areas with sparse vegetation cover and good visibility, but there are large areas in the application area (for example across much of the northern portion of Roode Heuvel, the south facing slopes overlooking the Groenrivier, & most of Leeuvlei) that are covered in very dense vegetation, resulting in low archaeological visibility. Old agricultural lands in the north western corner of Roode Heuvel were not searched as these constitute highly transformed landscapes and will also not be mined.

4.3 IDENTIFICATION OF POTENTIAL RISKS

Based on the results of the study, there are no significant archaeological risks associated with the proposed project. No fatal flaws have been identified, but where important archaeological heritage (such as wind deflated sites, Stone Age quarries and coastal shell middens) have been identified, it is maintained that these can be effectively mitigated.

4.4 ARCHAEOLOGICAL BACKGROUND

The Namaqualand coast is an arid landscape, receiving less than 150 mm of rain a year. Its rocky coastline is extremely productive, teeming with shellfish, crayfish, marine birds and mammals. The shoreline area attracted pre-colonial Stone Age hunter-gatherers, as it offered opportunities for the exploitation of marine foods, particularly shellfish. The semi-arid environment also supports a variety of terrestrial animals that are available for human subsistence.
More than 1500 archaeological sites have been documented on the Namaqualand coast (Kaplan 1993). The work done by the Archaeology Contract Office (ACO) and others has shown that there is an almost continuous distribution of shell middens along the rocky shoreline, adjacent to dune ridges, and sandy beaches. Most of these sites have been identified while conducting Archaeological Impact Assessments (AIA's) ahead of mining operations on land owned by De Beers and Namakwa Sands/Exxaro (Halkett 2003; Halkett & Hart 1987; Hart & Halkett 1993, 1994a, 1994b; Hart & Lanham 1997; Parkington & Hart 1993; Parkington & Poggenpoel 1990; Orton *et a*l 2005; Orton & Halkett 2005; Orton & Halkett 2006). Many sites were also recorded during an AIA for the proposed nuclear power station near Kleinzee on the coast (Parkington & Hart 1991a, 1991b). With the recent discovery of offshore gas deposits south of the Groenrivier, a large number of sites on the coast have been added to the archaeological record (Kaplan 2007, Orton & Hart 2011).

While little work has been done inland from the coast, ephemeral scatters of LSA sites containing stone tools, marine shellfish, ostrich eggshell and pottery have been documented on the coastal plains (Orton 2007 & pers. com. 2014). Rocky outcrops and boulders were also targeted by Stone Age people and several such rock shelters with archaeological deposits, shellfish, stone tools, pottery, ostrich eggshell and even rock art have been documented near Kotzesrus (Orton & Hart 2011). Webley & Halkett (2010) encountered a LSA site with stone tools, pottery, ostrich eggshell fragments and some 19th Century British refined earthenware on the banks of the Swartdoring River, as well as large scatters of Middle Stone Age (MSA) tools, LSA and ESA lithics, about 30kms south of Garies, 40kms inland of the coast.

Research by Dewar (2006, 2007) has revealed that parts of Namaqualand were occupied by Early Stone Age (ESA) people more than a million years ago, but the greatest number of archaeological sites (i. e. coastal shell middens) are those which relate to the ancestors of the San (hunter gatherers) and Khoekhoen (Herders) which have been dated to the last 4-5000 years (Webley 1992), although there is much variety in age with some sites being only a few hundred years old (Orton 2007). Archaeological sites with pottery post-dating 2000 years ago are also reported from a number of sites in Namaqualand. These ceramic LSA sites are believed to be associated with the introduction of pastoralism to the region about 2000 years ago and Webley (2001) has obtained some of the earliest dates for sheep from Spoegrivier Cave, about 1900 years ago.

Excavations at several localities between Brandsebaai and the Orange River Mouth have shown that MSA people have been exploiting coastal resources since the Last interglacial

period about 120 000 years ago (Hart 2006; Parkington 2006), while scatters of ancient ESA handaxes more than 500 000 years old were found amongst sand dunes on the coastal plains and around pans in a survey of the Namaqua National Park (Morris & Webley 2004).

Historically, the interior of Namaqualand was occupied by the Little Namaqua, a Khoekhoen pastoralist group, who herded sheep and cattle and lived in temporary encampments of mat houses. They are known to have moved seasonally with their livestock and historical reports indicate that they may have followed a transhumance cycle between the Kamiesberg in the summer months and the Sandveld in the winter months (Webley 1992). Early traveller reports relating to Little Namaqua settlement in the area is summarized in Webley (1992). For example, the Governor Simon van der Stel who travelled to Namaqualand in 1685, found the first Namaqua kraals north of the Doornboschrivier, which it is believed, is a reference to the Groenrivier (Webley & Halkett 2010).

Since the Little Namaqua had no clearly defined territorial boundaries, it was easy for the colonial Trekboers to settle in the area. The earliest loan farms were granted after 1750 and some were located on the Groen and Doorn Rivers. The Little Namaqua eventually retreated to so-called "reserves" such as Leliefontein, Steinkopf, Kommaggas, Concordia and the Richtersveld (Webley & Halkett 2010).

4.5 GRAVES & UNMARKED BURIALS

Historical graves are usually well marked and mostly occur in small farm graveyards. Pre-colonial graves, on the other hand, can occur at any location where sand suitable for excavation and burial exists. This is particularly the case in the coastal area where dunes abound. Pre-colonial graves are unmarked and have been found in various locations throughout the western coastal region of South Africa, including several in Namaqualand. A human burial was found at the mouth of the Groenrivier (Jerardino *et al* 1992), while several skeletons were exposed in a large excavation alongside the road near the mouth of the river (Petrus Schreuder Namanqua National Park, pers. comm. 2014).

The location of pre-colonial graves cannot be predicted and no plans can be made to avoid intersecting burials.

5. FINDINGS

5.1 ROODE HEUVEL

Isolated pieces of quartz were encountered on the red sands in the Roode Heuvel application area (Table 2 & Plate 20). A chalcedony flake (Site 096) was also found in old grazing lands alongside the Groenrivier road but the remains are all lacking in context. An ESA silcrete handaxe and flake (Site 329) was found near the small water dam close to the mine test plant.

A few quartz flakes and chunks, quartzite and mica were encountered in several wind deflated sites (Sites 181 & 184) on the higher dune ridges in the north western portion of the farm, including a large Ferrecrete flake (Site 185), while several quartz flakes and a silcrete flake (Site 193) were encountered in a wind deflated hollow on a dune ridge in the north east (Plates 21-24).

A relatively large number of quartz flakes, chunks, chips, manuports, a blade and three small round cores including a crystal core were recorded in a wind deflated dune (Site 328 & Figure 3) on the heavily vegetated slopes overlooking the Groenrivier road (Plate 25). Two utilized silcrete flakes, a quartzite hammerstone and fragments of weathered marine shell (*Scutellastra argenvillei*), including one whole shell was also counted (Plate 26). Initially, no pottery or ostrich eggshell was found, but in a follow up visit to the site in July a single undecorated fragment of coarse-tempered pottery and a fragment of ostrich eggshell were found (Plate 27), indicating that archaeological remains are routinely exposed as well as buried by the windblown sands.

Plate 20. Collection of quartz lithics, including chalcedony flake (Site 096). Scale is in cm

Plate 21. Site 184. Chunks and flakes. Scale in cm

Plate 22. Site 184. View facing north

Plate 23. Site 193. View facing north east

Plate 24. Site 193. Quartz & silcrete flakes. Scale in cm

Plate 25. Site 328. View facing north

Plate 26. Site 328. Scatter of tools and shellfish. Arrow

Plate 27. Pottery sherd, Site 328. Scale is in cm

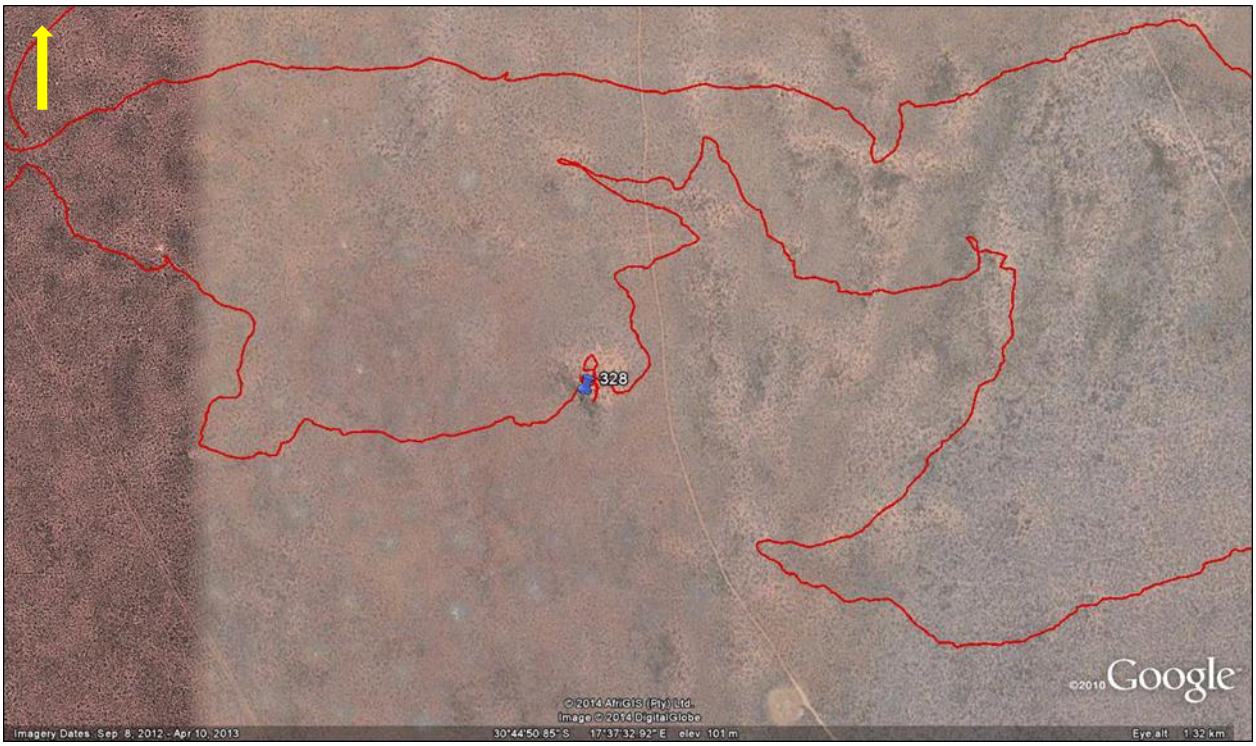

Figure 3. Google image showing location of Site 328. Red lines are track paths

Seven wind deflated sites were documented in the north eastern portion of Roode Heuvel (Figure 4). A handful of quartz flakes and chunks were found in a large dune slack (Site 095) alongside the fence line, while a low density scatter of quartz flakes, chunks and chips (Site 096) was encountered in a blow out about 700m further to the north (Plate 28).

A diffuse scatter (Site 097) of quartz flakes, chunks and chips, a large fragment of thin-walled undecorated black burnished pottery, and fragments of weathered limpet (*S. argenvillei*) was found in a deflated site overlooking a large clump of trees/sheep camp (Plates 29 & 30). Six more pieces of clay tempered pottery, including four decorated (vertical incisions) body sherds and a rim sherd (Plate 31) were found during a follow up visit to the site in July, while the limpet shell and potsherd recorded in May, could no longer be found, indicating that artefactual remains are being exposed and buried by the windblown sands.

Relatively large numbers of quartz flakes, chunks, chips, flaked chunks, round cores and several quartz manuports were documented in a large wind deflated site (Site 098) about 300m west of Site 097 (Plate 32). Discreet scatters of stone artefacts (possibly activity areas) were noted in the sandy hollow and on the north and west facing slopes that include a large quartzite grindstone fragment/anvil, flakes and chunks, as well as several large chunks of quartz and smaller pieces of flaked quartz (Plates 33-35). Fragments of colonial glass including the base of a case bottle, a fragment of a medicine bottle and a broken bottle neck with a crown top were also found on the slopes of this LSA (possible Herder) encampment.

Large chunks of quartz, several flakes, and a round core were found in a dune blow out (Site 088) about 1.2kms west of Site 098, while about 20 pieces of ostrich eggshell and a large Ferrecrete chunk were found in a wind deflated site (Site 090) a little further to the west. A flake, a core and several chunks of quartz (Site 091) were found in a wind eroded dune about 300m south of Site 090, while a low density scatter of quartz flakes, chunks, chips, and several cores were found in dune blowout (Site 092) a little further to the south east.

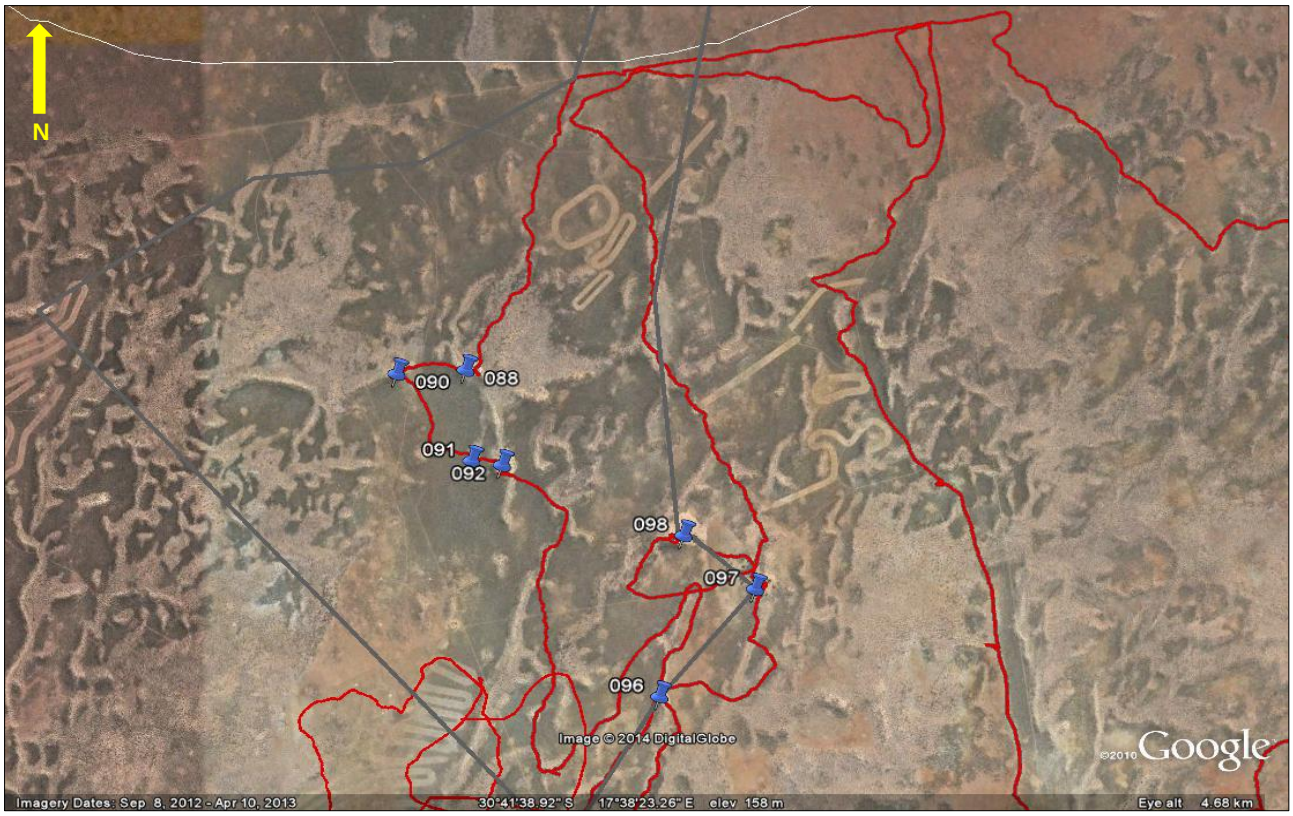

Figure 4. Google map showing location of wind deflated sites in the north eastern portion of Roode Heuvel. Red lines are track paths

Plate 28. Site 096. View facing north east

Plate 29. Site 097. View facing north

Plate 30. Site 097. Pot sherd & limpet shell. Scale in cm

Plate 31. Site 097. Decorated pottery. Scale is in cm

Plate 32. Site 098. View facing north

Plate 33. Site 098. Discreet scatter of in-situ tools

Plate 34. Site 098. Discreet scatter of in-situ tools

Plate 35. Site 098. Discreet scatter of in-situ tools.

A few quartz flakes and chunks (085) were found in a large, south facing wind eroded hollow on top of Brandkop (Figure 5 & Plate 36), while a large number of flaked tools (Site 086) and several 100 of pieces of ostrich eggshell were found alongside the collapsed trig beacon about 50m further to the north (Plate 37). The surrounding area is quite heavily disturbed (there is a 4 x 4 track to the top of the mountain), but the scatter of tools appears to be relatively well preserved. Raw material frequencies are dominated by quartz, but tools in silcrete, indurated shale and quartzite were also noted. Chips, chunks and flakes dominate the stone tool frequencies, but round and bipolar cores, a thumbnail scraper, and a combined grindstone fragment/quartzite hammerstone were also counted. No pottery was found.

Figure 5. Sites 085 & 086. Red lines are track paths

Plate 36. Site 085. View facing south west

Plate 37. Site 086. View facing west. Note the collapsed trig beacon to the right of the plate

5.1.1 Proposed airstrip

A proposed airstrip is planned in the far north western portion of Roode Heuvel, where the lands have been heavily transformed by agriculture. Wide strips of ploughed lands are surrounded by vegetated dunes, and dune slacks that are covered in dense Restio grasses (Figure 6 & Plate

38). Nearly 30 quartz flakes, chunks, cores, a hammerstone and manuports (Sites 296-317) were counted in the planned airstrip (Plate 39), while a Middle Stone Age (MSA) silcrete flake (Site 300) and a LSA silcrete core (Site 312) were also found (Plates 40 & 41). The tools occur in a severely transformed context.

Plate 38. View of proposed airstrip. View facing north east. Note the dense fields of Restio grasses

Plate 39. Proposed airstrip. View facing west

Plate 40. Collection of tools in proposed airstrip. Scale

Plate 41. Collection of tools in proposed airstrip. Scale is in cm

Figure 6. Track paths and waypoints of archaeological finds in the proposed airstrip. The darker patches are thick Restio grasses, while the stippled areas are vegetated dune ridges.

5.2 SIGNIFICANCE OF THE ROODE HEUVEL ARCHAEOLOGICAL REMAINS

- The small number of tools and (isolated) context in which they were found means that the archaeological remains recorded in the application area have been rated as having low (Grade 3C) significance (refer to Table 3).

- The highly transformed context in which they were found means that the archaeological remains documented in the proposed airstrip (Sites 296-317) have been rated as having low (Grade 3C) significance.

- Wind deflated sites inland of the coast are extremely rare in Namaqualand (Orton pers comm.), and while the density of stone implements, marine shellfish, ostrich eggshell and pottery in these LSA encampments is relatively low, collectively, they have been rated as having medium-high (Grade 3B) significance

- Scatters of tools and ostrich eggshell on Brandkop (Site 086) have been rated as having medium-high (Grade 3B) significance, despite the moderately disturbed context in which they occur.

5.3 LEEUVLEI

A small number of quartz flakes and chunks were encountered across the Leeuvlei application area (Plates 42 & 43). These include a diffuse scatter of flakes and chunks, a few fragments of gritty (red) haematite, and a shotgun casing on the high lying vegetated dunes close to the

fence line in the north western portion of the farm (Sites 020 & 021 & Plate 44). A diffuse scatter of tools (Sites 007 & 008), mainly quartz chunks, flakes, a core and a utilized pointed flake were found on the west facing sandy slopes alongside the fence, near the Soutfontein Farm gate (Plates 45 & 46). The source of these implements is probably an outcropping of quartz (010) located on the red sandy slopes (Plate 47).

A large number of quartz (Site 032) including flakes, chunks, manuports, several cores and chips were found on a heuweltjie overlooking a degraded pan. The heuweltjie and surrounding area has been extensively burrowed by animals. Again, it appears that the source of the tools is an outcropping of quartz (Site 033) located about 200m to the west that overlooks the pan (Plate 48).

An outcropping of granite (Site 034) occurs 300m north of Sites 032 and 033, alongside a gravel farm road (Plate 49). Heuweltjies surrounding the outcropping are severely degraded as a result of trampling and extensive animal burrowing. No archaeological deposit occurs in the shallow overhang and the sands are leached and gritty. A thin scatter of tools, mainly quartz chunks, flakes and chips were found in the immediate area and on a flat slab of granite, while a silcrete flake and a small piece of undecorated coarse tempered pottery and a fragment of refined earthenware was also found (Plate 50).

Quartz flakes, including a silcrete utilized flake, chips, chunks, cores, weathered fragments of ostrich eggshell and a small piece of undecorated, coarse grained pottery (Sites 035 & 036) were found among the degraded, bio-turbated heuweltjies west of the granite outcrop (Plates 51 & 52). Once again, the source of the raw material is most likely an outcropping of quartz (Site 037) located about 75m behind the low granite dome (Plate 53), while a another outcrop of quartz (Site 041) is located about 80m from Site 037 further to the north (Plate 54).

A very thin scatter of quartz (Site 040) was encountered near a small outcropping of granite, while a few dispersed quartz flakes and some ostrich eggshell (Sites 038 & 039) were found on a degraded Heuweltjie a further 150m to the north west of the outcrop.

Isolated quartz chunks and flakes (Sites 059-079) were recorded in old and deeply burrowed agricultural land on a flattish dune ridge in the south eastern portion of the application area.

Outcroppings of quartz, most likely represent sources of raw material which were targeted by LSA people for making stone tools. Another outcropping of quartz (Site 088 & Plate 55) is located nearly 3kms north east of a cluster of wind deflated sites where thousands of tools were also recorded.

Plate 42. Collection of quartz lithics. Scale is in cm

Plate 43. Collection of quartz lithics. Scale is in cm

Plate 44. Collection of tools from 020 & 021. Scale in cm

Plate 45. Collection of tools from Site 007. Scale in cm

Plate 46. Site 007/008. View facing south east

Plate 47. Site 010.View facing west

Plate 48. Site 033. View facing north west

Plate 49. Site 034. View facing north

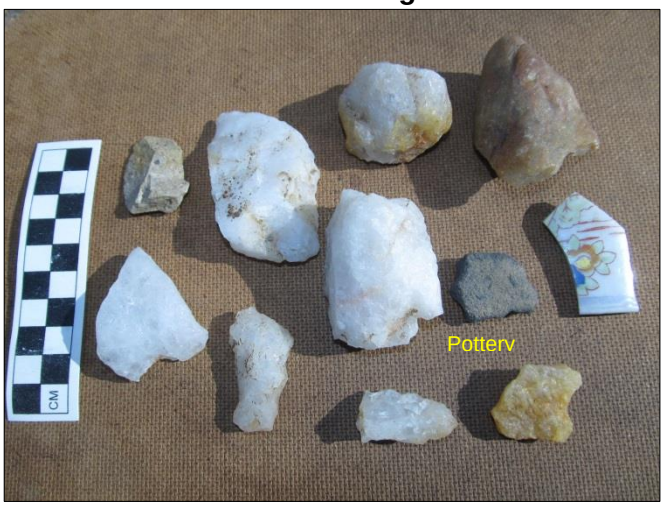

Plate 50. Site 034. Collection of remains. Scale is in cm

Plate 51. Site 035. Collection of remains. Scale is in cm

Plate 52. Site 036. Collection of remains. Scale is in cm

Plate 53. Site 037. View facing south east

Plate 54. Site 041. View facing north west

Plate 55. Site 088. View facing west

Seven wind deflated sites were encountered in the far south western corner of the Leeuvlei application area (Figure 7 & refer to Plate 16). The density and range of archaeological remains suggests that these are occupation, or domestic campsites. People (possibly Herders) would have stayed in temporary grass or mat huts which have disappeared over time, leaving only stone tools and domestic debris lying about.

A low density scatter of quartz flakes, chunks, chips and a few round cores were recorded in a wind deflated hollow (Site 050) close to the farm fence (Plates 56 & 57), while thousands of tools were documented in a large wind deflated basin (Site 051), a little further to the west (Plates 58-60). The scatter of remains cover a wide surface area and several discreet activity areas were noted. While stone frequencies are dominated by flakes, chips and chunks, a large number of round cores, bladelet cores and bipolar cores were also counted, including bladelets, blades and modified flakes. Two anvils and one hammerstone were counted, while a number of large manuports were found scattered about. More than 99% of the tools are made from locally available quartz (possibly sourced from the outcroppings described above), but several utilized/retouched flakes in imported silcrete and chalcedony were also found. Despite a detailed search, no ostrich eggshell, pottery or bone was found on the site, but these may be covered over by the fine wind-blown sands.

A relatively high density scatter of tools (Site 052) occurs in a sloping dune hollow about 250m west of Site 051 (Plate 61). More than 99% of the tools are in quartz including many flakes, chunks, chips, large and small round cores, flaked chunks and manuports, while a lump of flaked silcrete was also recorded. No pottery, bone or ostrich eggshell was found.

A low density scatter of tools (site 053) comprising a few dispersed quartz flakes, chunks, a round core and a quartzite cobble core was found in a dune hollow less than 150m further to the north, while about 40 pieces of ostrich eggshell and a few quartz flakes were counted in a smaller blow out (Site 054) about 100m east of Site 053.

A few quartz flakes and a quartzite grindstone/anvil were recorded in a dune blow out (Site 055) about 250m north east of Site 052 (Plate 62).

Site 025 comprises a large number of tools, including quartz flakes, chunks, chips, a utilized bladelet, some weathered ostrich eggshell, several round cores, manuports and a crystal flake, in a wind deflated site 200m west of Site 053 (Plate 63). No pottery was found.

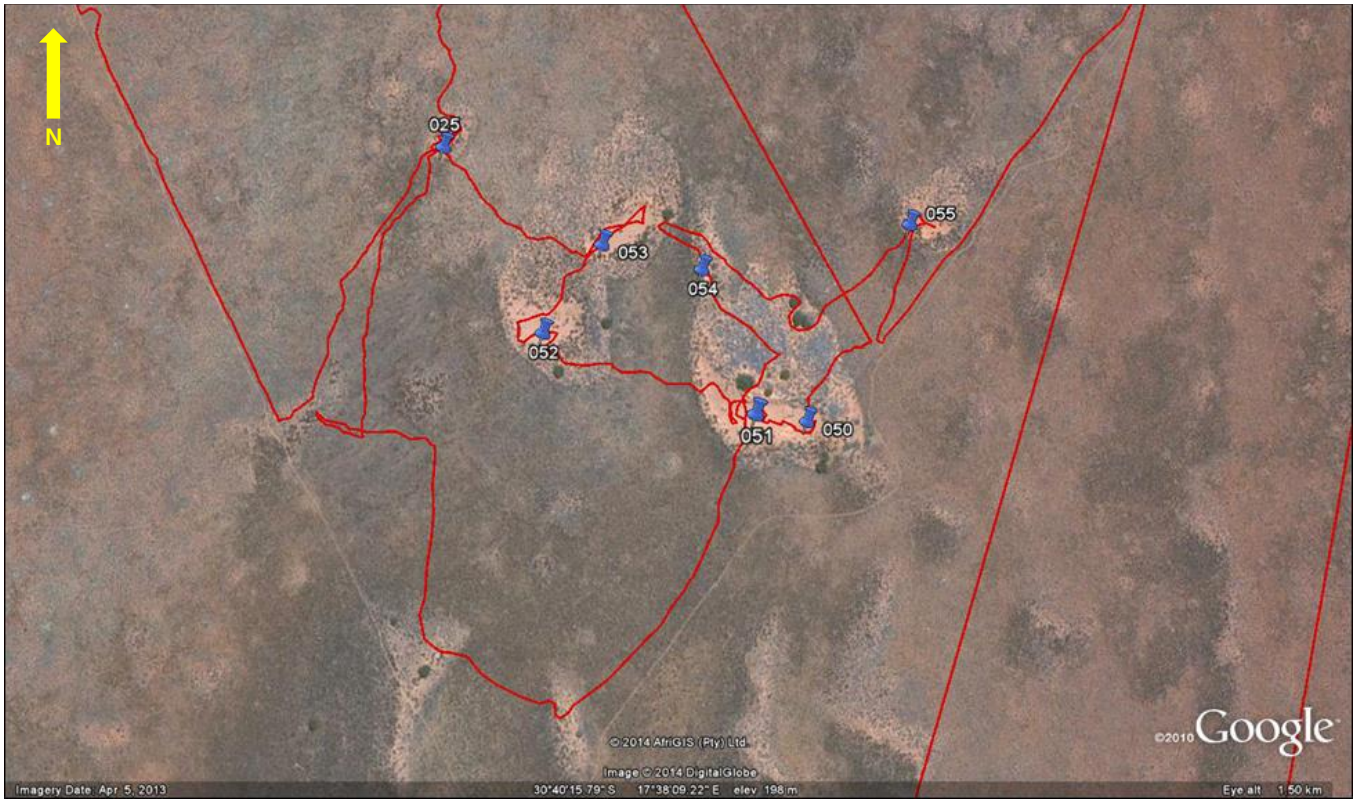

Figure 7. Cluster of wind deflated sites in the Leeuvlei application area. Red lines are track paths

Plate 56. Site 050. View facing north east

Plate 57. Site 050. Scatter of tools

Plate 58. Site 051. View Facing north east

Plate 59. Site 051. View facing north east

Plate 60. Scatter of tools in Site 051. View facing east

Plate 61. Site 052. View facing north

Plate 62. Site 055. View facing north east

Plate 63. Site 025. View facing north

5.4 SIGNIFICANCE OF THE LEEUVLEI ARCHAEOLOGICAL REMAINS

- The relatively small numbers, isolated and mostly very disturbed context in which they were found, means that the archaeological remains (Sites 007, 008, 020, 021, 032, 035, 036, 040, 059-079) have been rated as having low (Grade 3C) significance (refer to Table 4).

- The highly degraded context in which they were found means that the outcropping of granite with associated remains (Site 034) has been rated as having low (Grade 3C) significance.

- Outcroppings of quartz (Sites 010, 033, 037, 041 & 088) are very likely sources of raw material that were targeted by Stone Age people, and have been rated as having medium-high (Grade 3B) significance. The quarries are considered to be significant (heritage) features in the landscape. The sites provide evidence of stone tool transport and also raise questions about group size and organization of activity among hunter-gatherer groups. They cannot be seen in isolation from the wind deflated sites/campsites which are the repository of the quarried stone and finished artefacts.

- The cluster of rare wind deflated domestic campsites (Sites 050-055 & 025) have been rated as having medium-high (Grade 3B) significance.

5.5 PROPOSED SEAWATER INTAKE, PUMP STATION AND PIPELINE

A field assessment of the proposed seawater intake, pump station and pipeline to the desalination plant on Roode Heuvel was undertaken.

Five proposed alternative sites were initially investigated by the archaeologist. Kmm4 and Kmm5 are the two preferred sites undergoing detailed engineering to facilitate final selection, while the other sites have been screened out of the study (Figure 8). The pipeline will be built above ground.

The proposed sea water pipeline, from the gulley (at Kmm5), till the discharge point at Roode Heuvel, a distance of about 19kms, was searched on foot.

The proposed Kmm4 pipeline, a distance of nearly 12kms, was also searched on foot.

It is well known that the Namaqualand coastline is a sensitive archaeological landscape (Kaplan 1993). Research has shown that 95% of shell middens recorded are concentrated within a narrow band adjacent the shoreline, although ephemeral scatters of shellfish have been recorded up to 1 km further inland (Orton 2007). Figure 9 illustrates this point where the vast majority of archaeological sites are clustered around the pump station, while only a few isolated remains were encountered along the bulk of the pipeline route.

Figure 8. Archaeological sites are clustered around the coastal zone, and virtually absent along the remainder of the pipeline route. Red lines are track paths

5.5.1 Kmm5

The proposed gulley intake is located about 7 kms south of the mouth of the Groenrivier (Plate 64). The coastline is rocky, but not very steep. 4 x 4 tracks, illegal camping and parking have transformed much of the shoreline area. A flat dune cordon is located immediately behind the rocky shoreline, which gives way to a vast sandy coastal plain that is covered in dense succulent veld (Plates 65-72). The proposed pipeline eventually crosses the Groenrivier and the southern boundary of Roode Heuvel where it will discharge at the proposed desalination plant on the farm (Figures 73-75).

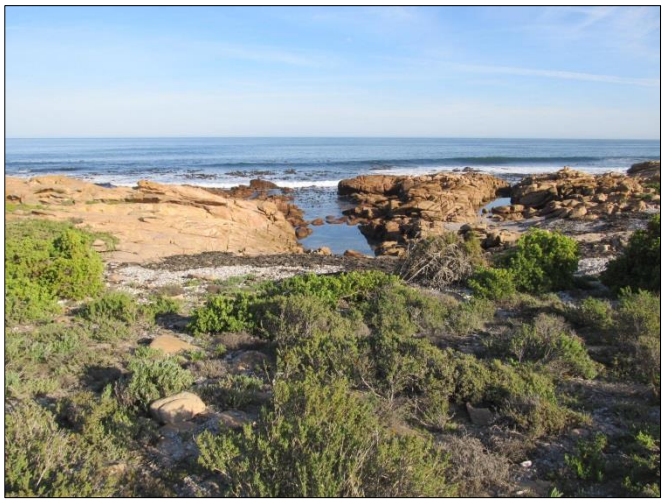

Plate 64. Kmm 5 sea water/gulley intake

Plate 65. Kmm 5 Pipeline route. View facing north

Plate 66. Kmm 5 pipeline route, view south to the gulley

Plate 67. Kmm 5 pipeline route. View facing south

Plate 68. Kmm 5 pipeline route. View facing south

Plate 69. Kmm 5 pipeline route. View facing south

Plate 70. Kmm 5 pipeline route. View facing south

Plate 71. Kmm 5 pipeline route. View facing north to the Groenrivier

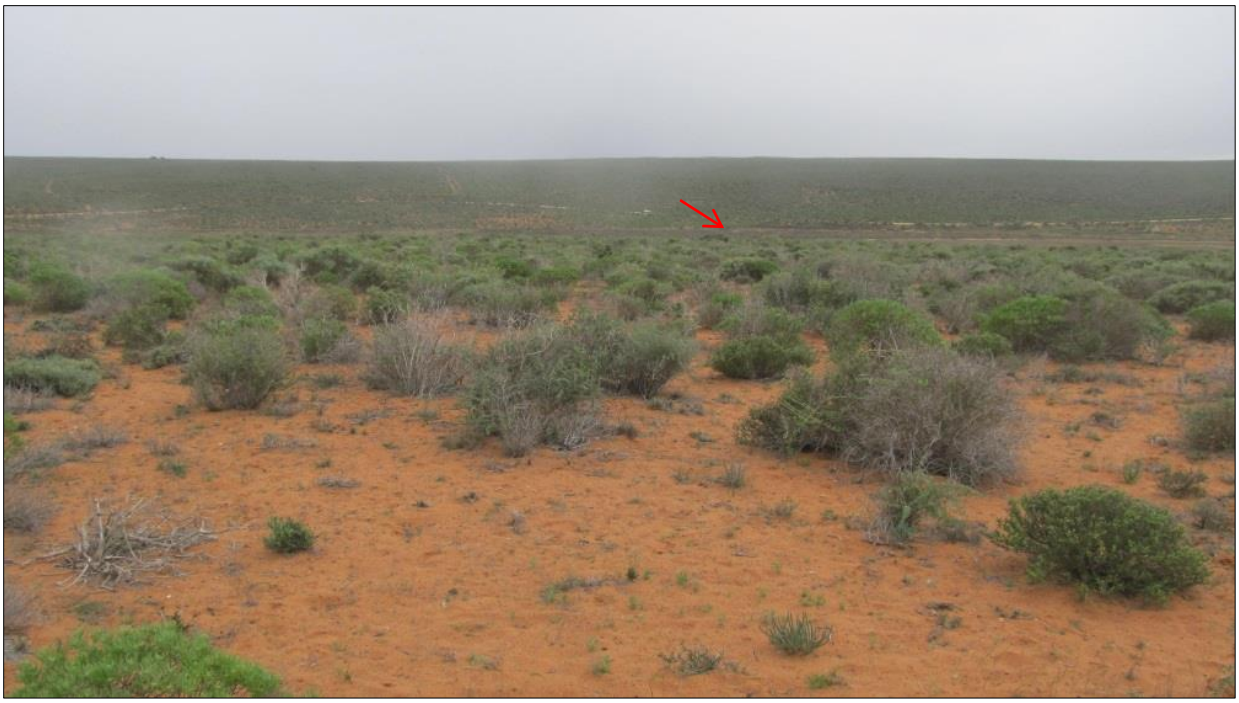

Plate 72. Kmm 5 pipeline route. View facing north. Arrow indicates Groenrivier road.

Plate 73. Kmm 5 pipeline route. View facing north over the Groenrivier.

Plate 74. Kmm 5 pipeline route. View facing north over the Groenrivier, from Roode Heuvel.

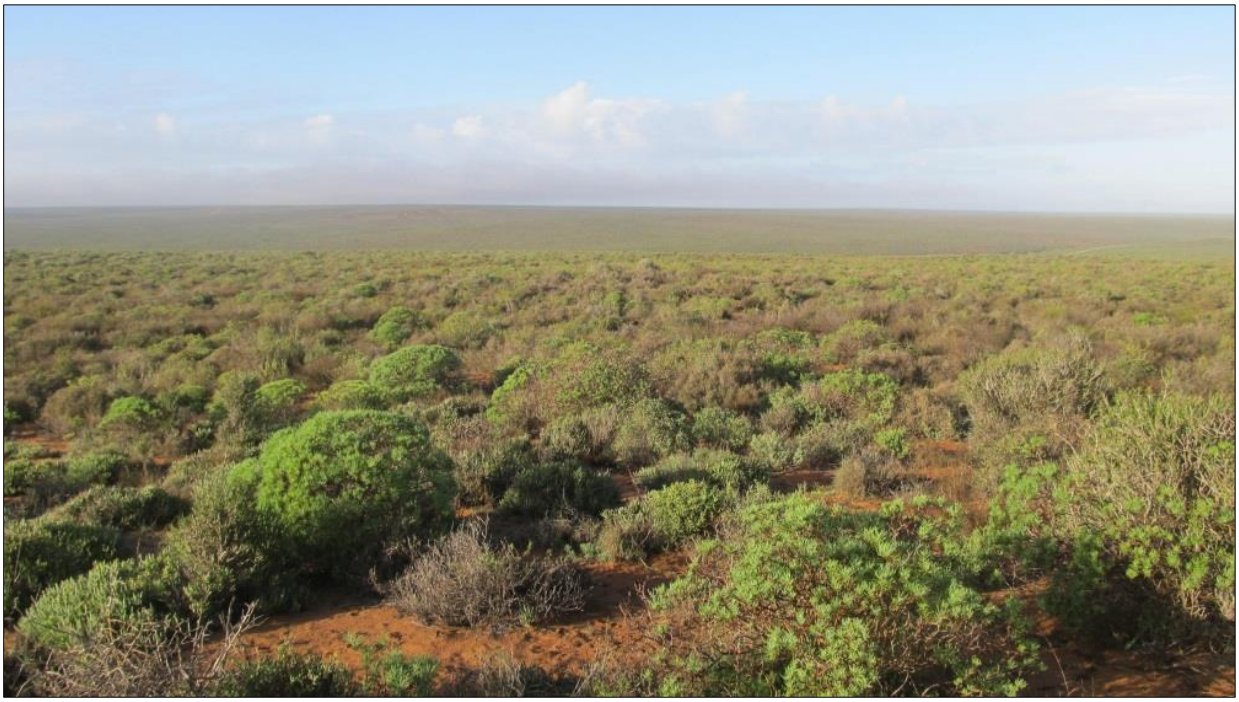

Plate 75. Kmm 5 pipeline route. View facing north from Roode Heuvel.

The slightly sloping beach immediately behind the gulley intake is covered in a compact layer of shellfish (Site 095) dominated by limpets (*S. argenvillei, C. granatina*) and Black Mussel (*Choromytilus meridionalis*) (Plate 76). Scatters of shell including *S. argenvillei*, *C granatina*, ribbed mussel and whelk occur alongside the pipeline route on the flat, elevated ridge adjacent the shoreline (Plates 77 & 78). Some large whole limpets (*S. argenvillei*) were also counted. Small outcroppings of weathered sandstone occur in places. A single quartz chunk, a fragment of ostrich eggshell and a seal bone was found on the ridge alongside the road, but no pottery was recorded.

Scatters of shellfish occur on the soft windblown sands between the sea water intake and the proposed pump station. Such scatters (Sites 096-103) are typically found `trapped' among bushes and in wider open patches of sand (Plates 79-82 &). Most of the shell is dominated by limpets (*S. argenvillei*) and Black Mussel, with occasional large whole limpets also counted. A fragment of ostrich eggshell was found on Site 103, while a quartz core (Site 098) and two quartz chunks (Site 104) were found alongside the road.

Diffuse scatters of shellfish (Sites 105-113 & 115) were also recorded in the pipeline route about 30m west of the coastal road. Limpet (*S. argenvillei*) dominates the shellfish frequencies, but Black Mussel and a few whelk, were also counted. Site 108 is a fairly extensive scatter of shell, where a few fragments of ostrich eggshell and a single undecorated piece of quartz-tempered pottery were found (Plates 83 & 84). Ostrich eggshell occurs on Sites 109, 111 and 114, while a single quartz flake was found on Site 110. An anomaly is Site 113 where several hundred fragments of ostrich eggshell occur alongside some dense bush (Plate 85). None of the pieces appear to be worked or nibbled which may indicate a cache of broken water containers, and it is therefore more likely that the remains are a clutch of modern (hatched) ostrich eggshells. Diggings (Site 114) alongside the pipeline route were also investigated, but no shellfish was noted in any of the cuttings suggesting that most, if not all the shellfish recorded in the pipeline servitude (at the coast) is confined to the surface.

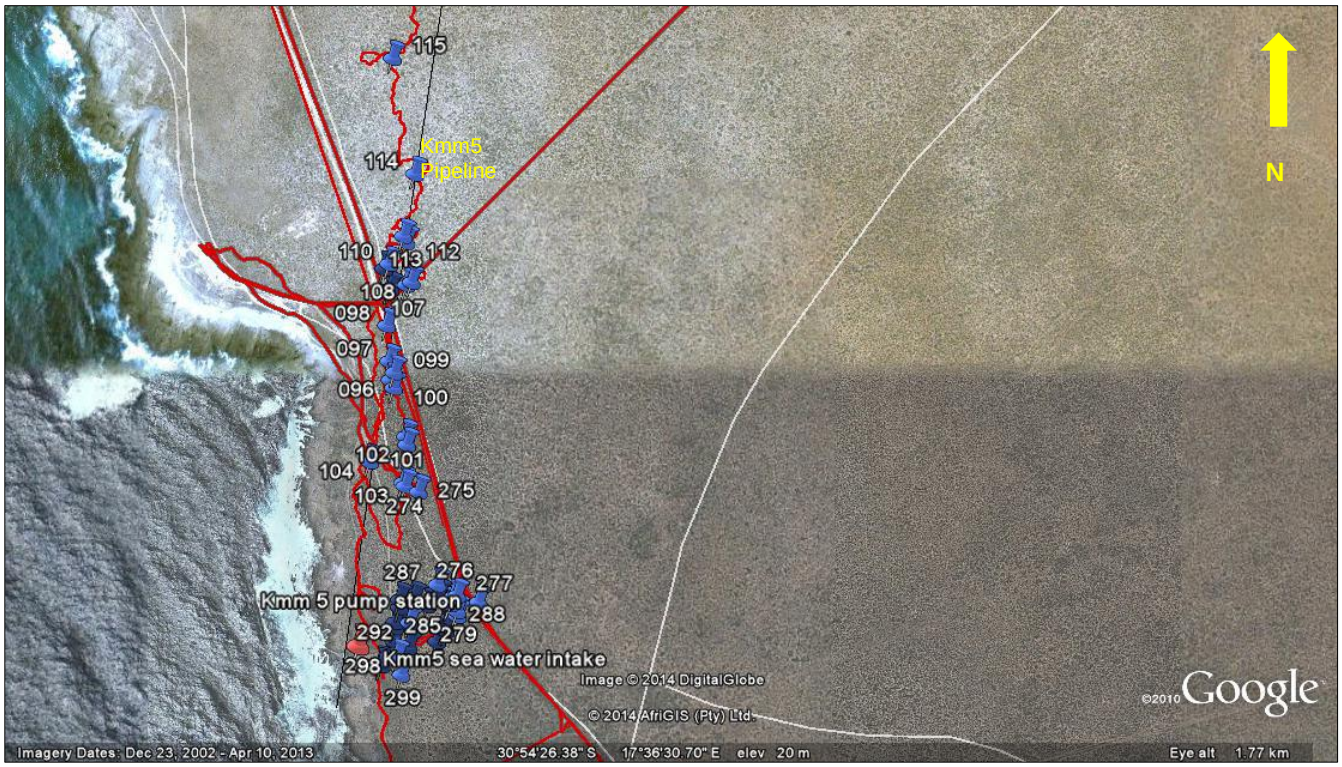

Figure 9. Extensive shellfish deposits occur at the coast.

Plate 76. Site 095. Arrow indicates the gulley intake. Not the shellfish in the foreground of the plate

Plate 77. Dispersed scatters of shellfish on the dune ridge in the pipeline route

Plate 78. Patches of shellfish in the pipeline route

Plate 79. Site 100.

Plate 80. Site 102

Plate 81. Site 105

Plate 82. Site 105

Plate 83. Site 108

Plate 84. Potsherd from Site 108

Plate 85. Site 115

Diffuse scatters of shellfish (Sites 295-298) were encountered on the soft, windblown sands directly adjacent the coastal road (between the gulley intake & the pump station), while higher densities of shell (Sites 282, Site 283, Sites 290-294 & Site 295) occur on the mid and upper slopes of the frontal dune (Figure 10). Shellfish is visible on patches of sand and among low bushes where they are trapped by the wind. The shellfish is dominated by limpets (*S. argenvillei*), including some large whole shell, but fragments of Black Mussel, as well as fragments of the limpet *C. granatina* were also noted.

Cultural remains are very thin on the ground, and only a few fragments of ostrich eggshell were found on Sites 283 (n = 2), 290 (n = 1) and 296 (n = 1). A quartz flake was found on Site 296 and a translucent, utilised chalcedony flake was found on the upper slopes of the dune (Site 283), about 20m south of the beacon on the crest of the dune ridge (Plates 86-89).

Shellfish, dominated by limpets (*S. argenvillei*) occurs in open patches of sand all along the top of the dune, adjacent the road and the proposed Kmm5 pump station (Figure 10). Black Mussel is also present as well as some whelks and the limpet *C. granatina*. While a number of GPS co-ordinates were logged on the flattish dune top, the scatters of shellfish most likely represent a single site that was occupied by resident hunter-gatherers during periods of gathering and harvesting shellfish.

The presence of cultural artefacts such as ostrich eggshell, on Sites 284 (n = 2) and 279 (n = 2), coarse tempered burnished pottery on Sites 286 (n = 1) and 287 (n = 2), a split sandstone cobble (Site 287), as well as a silcrete and quartz flake (Site 284), suggests longer term occupation, or multiple visits to the coast, with the dune top providing a commanding view over the surrounding landscape (Plates 90-95).

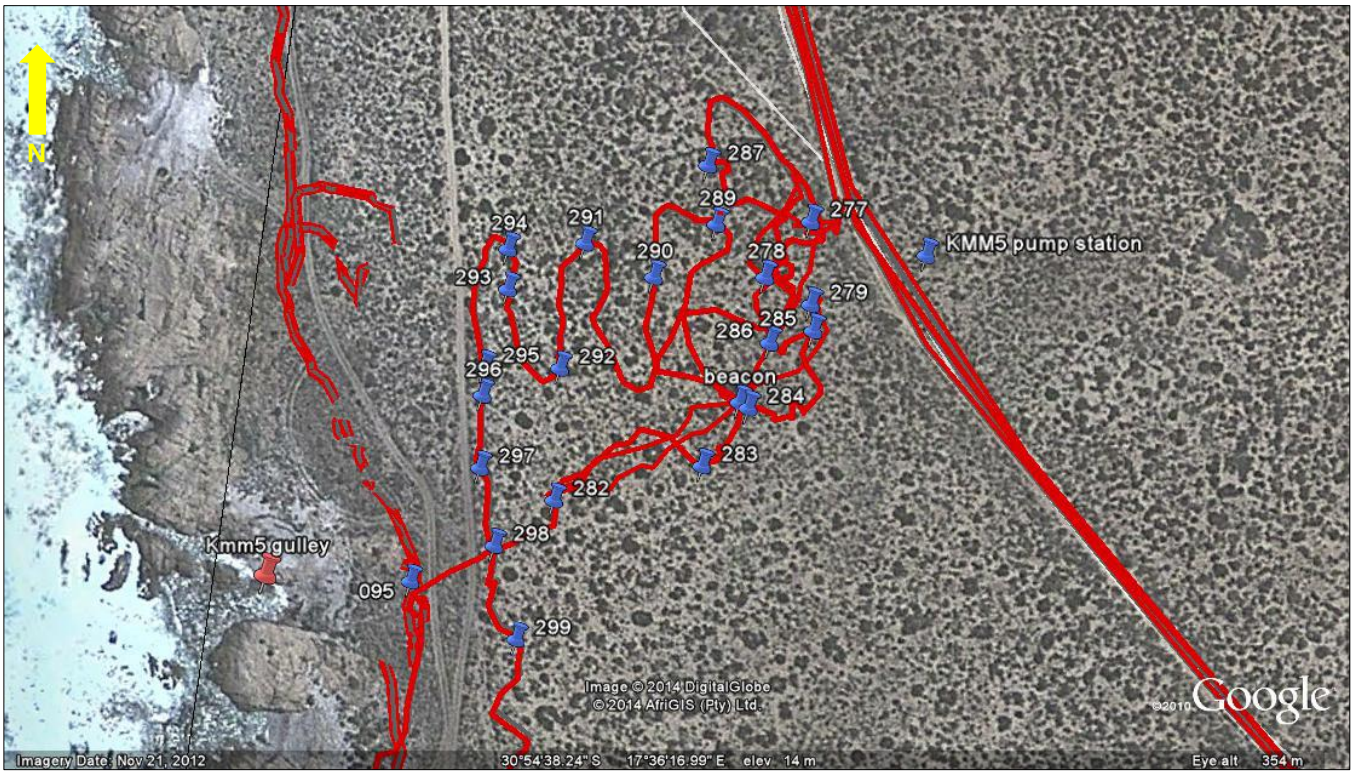

Figure 10. Extensive scatters of shellfish occur on dune slopes and on the flat dune crest adjacent Kmm5 pump station. Red lines are track paths.

Plate 86. Diffuses scatters of shellfish alongside coastal track (Site 298)

Plate 87. Shell scatters on mid-upper slopes

Plate 88. Scatter of shell on mid-upper slopes

Plate 89. Scatter of shellfish on upper slopes (Site 283)

Plate 90. Scatter of shellfish on dune top

Plate 91. Scatter of shellfish on dune top.

Plate 92. Scatters of shellfish on dune top (Site 286).
Arrow indicates beacon

Plate 93. Site 278. Arrow indicates beacon

Plate 94. Site 284, south east of concrete beacon

Plate 95. Collection of cultural remains. Scale is in cm

No archaeological heritage was encountered between Sites 115 and 117 (a small hammerstone/upper grindstone), a distance of nearly 12.5kms along the pipeline route, while a single quartz flake and chunk (Sites 140 & 141) were found in a wind eroded dune slack a further 1km to the north (Figure 11). The receiving environment (the coastal plain and Sandveld) along this section of the pipeline route is mostly flat and meandering, covered in dense Succulent Karoo vegetation on a substrate of red windblown sands (refer to Plates 68-71). There are no streams or rivers or any other water source, apart from the Groenrivier further to the north. Several wind eroded dunes in the surrounding area were searched but no archaeological remains were found.

Figure 11. No archaeological heritage was encountered between Site 115 & 117. Red lines are track paths

A diffuse scatter of quartz flakes, chunks and chips (Sites 119-121) including a fragment of undecorated quartz tempered pottery were found on the red sandy slopes on the south bank of the Groenrivier (Figure 12 & Plate 96).

Isolated quartz flakes and chunks (Sites 122-135), including a broken MSA (re-used) retouched silcrete flake (Site 124), and a low density scatter of quartz lithics including a snapped MSA silcrete flake (Site 123) were recorded on the soft sands alongside the proposed pipeline about 270m south of the river.

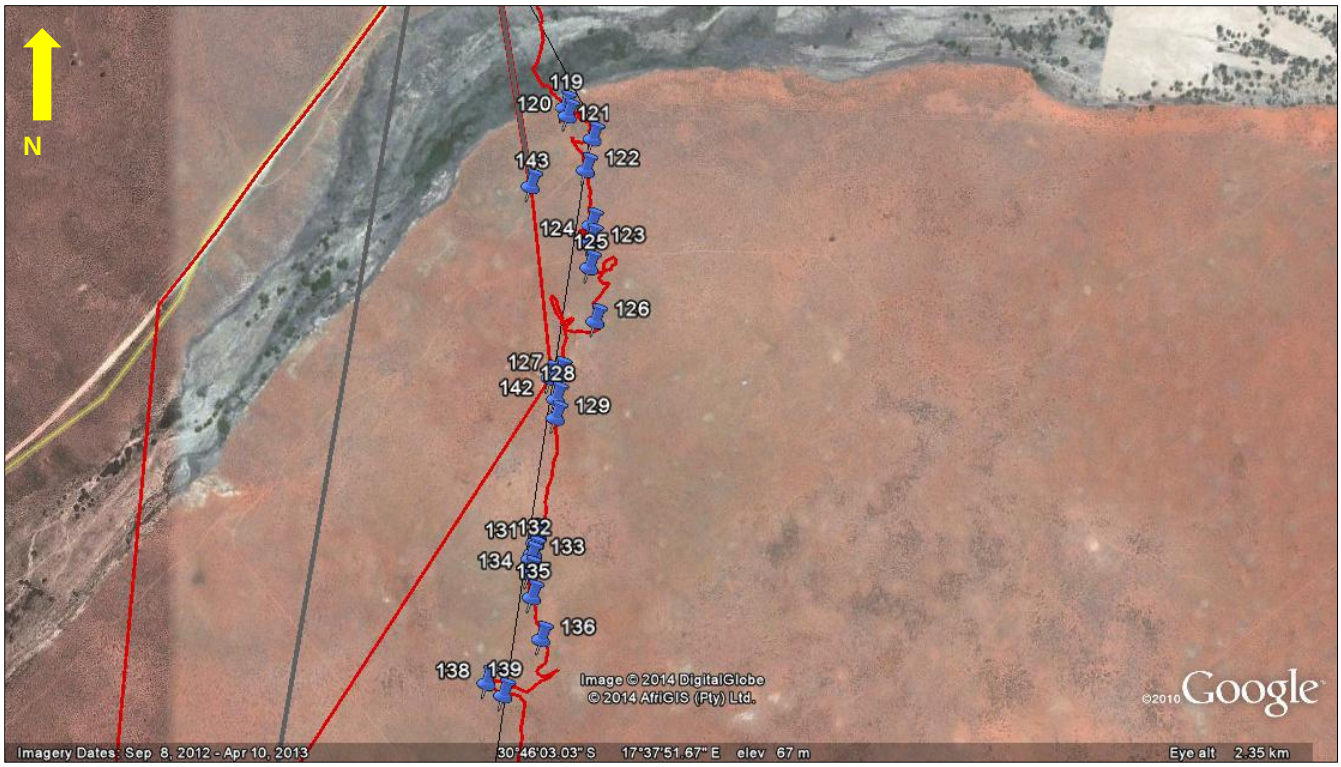

Figure 12. Archaeological remains in the pipeline route on the southern bank of the Groenrivier. Red lines are track paths

A large number of artefacts (Site 136) were recorded in a sandy, wind deflated hollow just over a kilometre from the Groenrivier (Figure 13 & Plates 97). The site measures about 25 m x 15 m and contains many quartz flakes, chunks, chips, flaked chunks, round cores and several large manuports. A number of bladelets and cortex flakes were also counted. A silcrete flake, quartzite hammerstone, and a large MSA silcrete flake were also found. No pottery, ostrich eggshell or bone was recorded.

An extensive outcropping of quartz (Sites 138 & 139) occurs about 100m south west of Site 136, on a west facing, wind eroded dune slope (Plates 98 & 99). Large numbers of loose quartz stone lie scattered about, and a few large quartz boulders are present. Many of the loose pieces of stone are smashed and worked and there is also flake debris lying about. These quarry sites most likely provided the raw materials for the artefacts and debris found in Site 136.

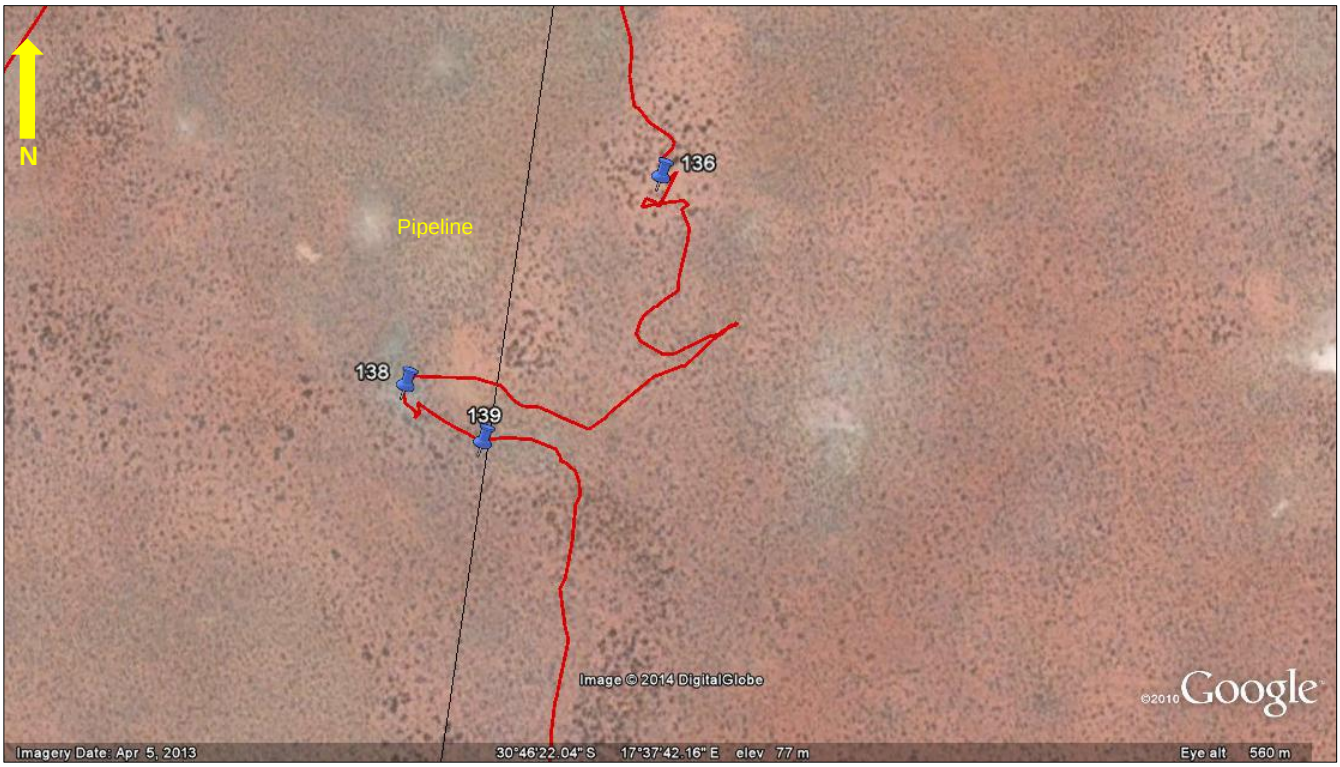

Figure 13. Sites 136 (wind deflated site) and 138 & 139 (quarry sites)

Plate 96. Potsherd (Site 121)

Plate 87. Site 136. View facing north west

Plate 98. Site 138. View facing north west

Plate 99. Site 139. View facing north west

A diffuse scatter of quartz flakes and chunks (Site 118), a few weathered fragments of limpet (*S. argenvillei*) and some small whelk were found on the red sandy slopes immediately below the Garies gravel road on the north bank of the Groenrivier (Figure 14).

A quartz chunk (Site 144) and a very low density scatter of quartz (Site 145), including seven chunks, two flakes, a round core, a manuport and a sandstone chunk was recorded in a slight depression/dry pan directly alongside the road on Roode Heuvel.

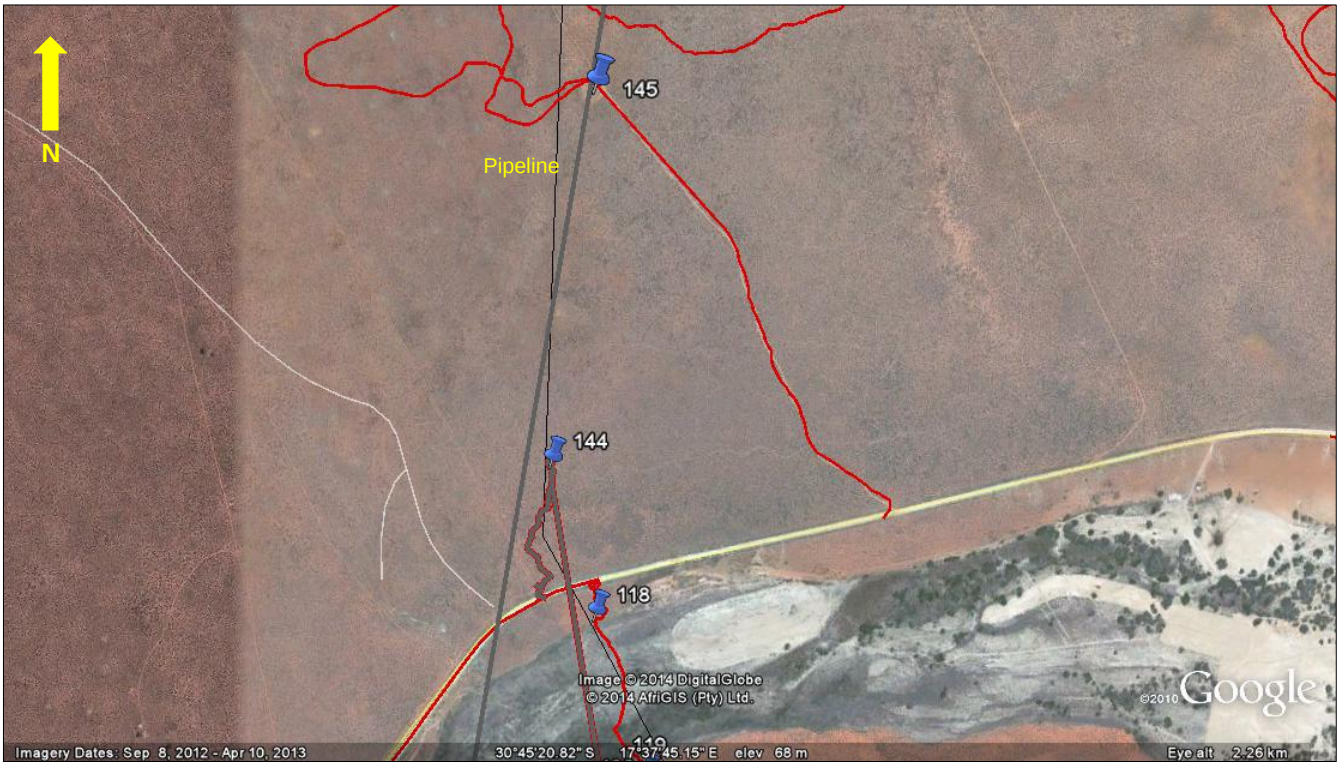

Figure 14. Archaeological remains in the pipeline route on the northern bank of the Groenrivier. Red lines are track paths

5.5.2 Kmm4

The proposed sea water intake is located about 12 kms south of the mouth of the Groenrivier (Plate 100). The coastline is very rocky, but there is a long sandy beach (Island Point) further to the south. The shoreline is not very steep, and a flattish, frontal dune system slopes gently to the beach which is covered in washed-up Black Mussels. The vegetated dune gives way to a flat, sandy coastal plain that is covered in dense Succulent Karoo veld on a substrate of red sands (Plates 101-107). The proposed Kmm4 pipeline eventually joins up with the Kmm5 pipeline, a distance of nearly 12kms (refer to Figure 17).

Plate 100. Gully/sea water intake Kmm4

Plate 101. Kmm 4 pipeline route. View facing south

Plate 102. Kmm4 pipeline route. View facing north

Plate 103. Kmm4 pipeline route. View facing south.

Plate 104. Kmm4 pipeline route. View facing south

Plate 105. Kmm4 pipeline route. View facing south

Plate 106. Kmm4 pipeline route. View facing south.

Plate 107. Kmm4 pipeline route. View facing south

Archaeological remains are concentrated around the proposed pump station, and for a short distance, alongside the proposed pipeline (Figure 15). Large beds of grey-coloured (whole) Black Mussel and limpets – *S. argenvillei*), and rolled cobbles occur alongside the track behind the gulley intake, but these deposits (Site 231) are not archaeological and may relate to a mid-

Holocene (5000 year old) raised beach (Plate 108). The bulk of the archaeological deposits occur on the soft, windblown sands on the sloping frontal dune behind the coastal track. These comprise mainly diffuse scatters of shellfish (Sites 229, 272, 234 & 237) dominated by limpets (*S. argenvillei*), and smaller amounts of Black Mussel and whelks. Four fragments of ostrich eggshell and a quartz flake were found on Site 229.

Fairly extensive scatters of fragmented shellfish (Sites 233, 236 & 237) also occur on the flatter dune cordon, which are also dominated by limpets (*S. argenvillei*) including a few large whole shells, and some Black Mussel and whelks (Plates 109-111). One piece of ostrich eggshell was found on Site 236. A few larger patches of crushed and whole, grey coloured Black Mussel and limpet (Site 235) occur on the flat dune tops alongside the main coastal road which may also be evidence of possible Holocene raised beach deposits described earlier (Plate 112).

Large patches of (fresh looking) fragmented Black Mussel occur alongside the coastal road (Site 236) but these are related to modern camping activities which is very visible along this stretch of coastline (Plate 113).

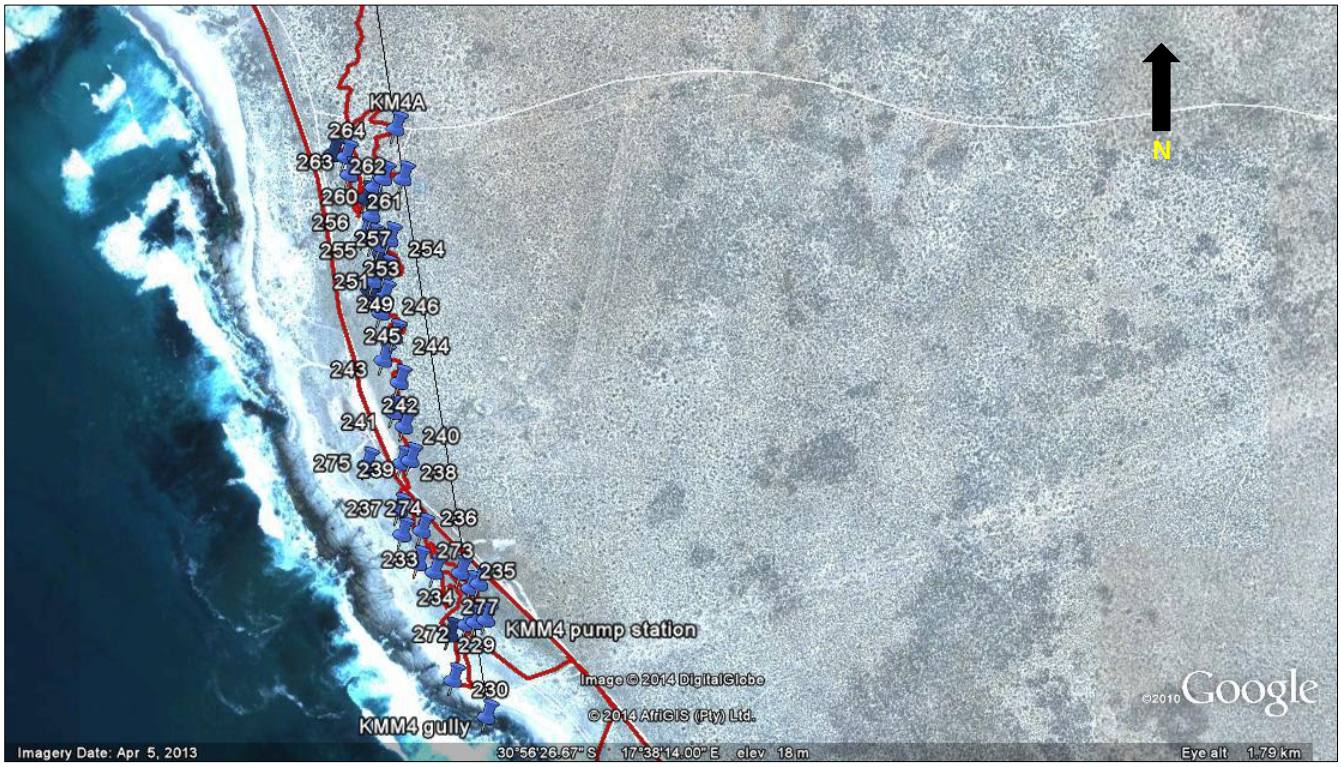

Figure 15. Archaeological sites are clustered around the coastal zone. Red lines are track paths

Plate 108. Possible mid-Holocene raised beach deposits. View facing south.

Plate 109. Site 233. View facing south

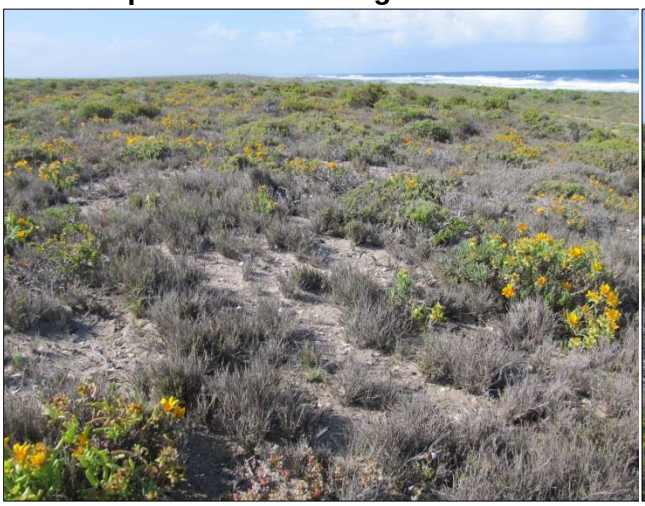

Plate 110. Site 236. View facing south

Plate 111. Site 237. View facing south

Plate 112. Site 235. View facing south.

Plate 113. Site 236 - shellfish associated with camping

Archaeological remains were recorded north of the fence line, but these comprise mainly diffuse scatters of shellfish and several pieces of ostrich eggshell (Sites 238, 240, 245 & 246). A wider scatter of shell, including a few whole large *S. argenvillei* (Site 244) occurs about 70m from the road.

Shellfish and diggings, associated with recent camping activities also occurs north of the fence line (Sites 239, 241-243 & 256-264), some of which appears to be mixed with archaeological deposits. A number of pit toilets and rubbish pits are present and the surrounding terrain is littered with fragments of `fresh' Black Mussel, glass beer bottles, broken glass, building rubble/concrete, rusted metal, plastic, old tiles and broken asbestos sheets (Plate 113).

Like Kmm5, the density of archaeological remains decreases dramatically as the pipeline moves further inland from the coast. A few fragments of shellfish and a quartz flake (Site 266), two quartz flakes and a few pieces of shell on a dune top overlooking a pan (Site 269), and a large quartzite chunk and a piece of weathered ostrich eggshell (Site 271) were encountered along the remainder of the pipeline route (Figures 16 & 17).

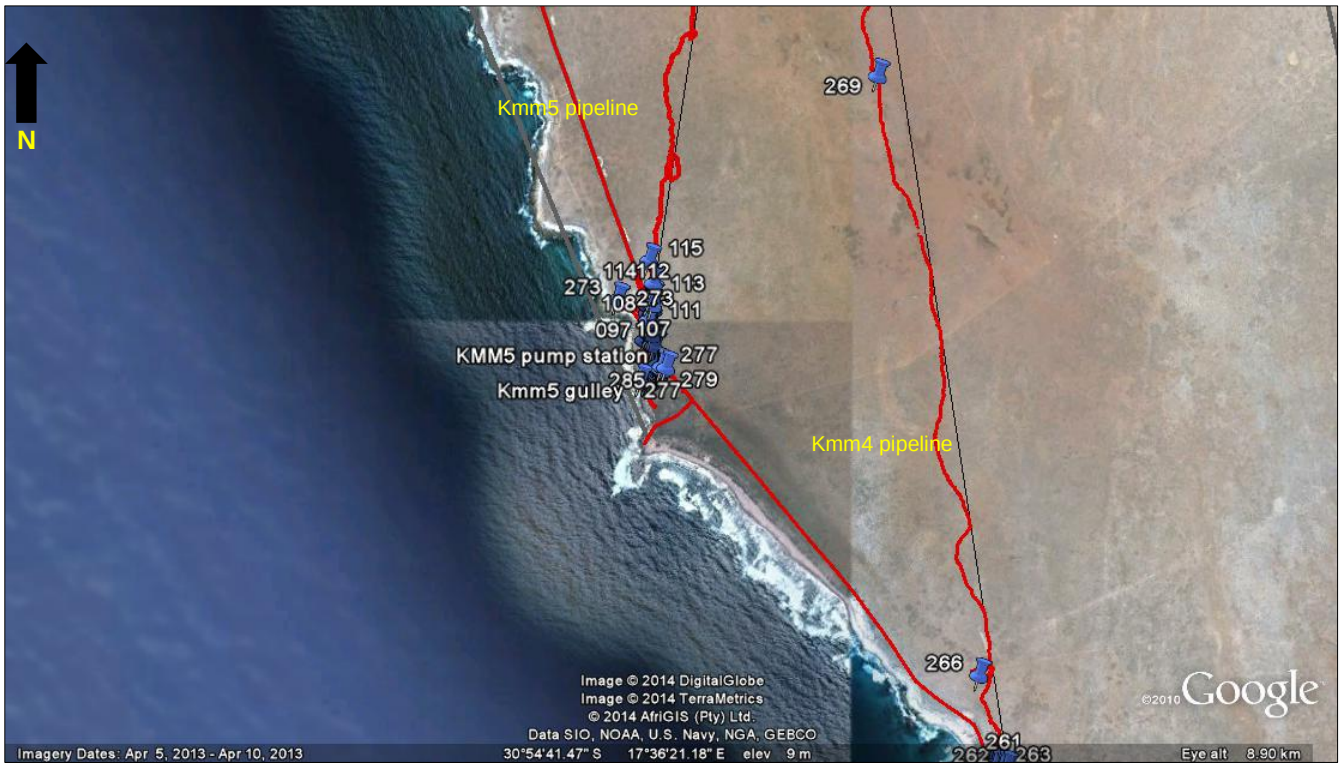

Figure 16. Few archaeological remains occur inland of the coast.

Figure 17. Few archaeological remains occur inland of the coast

5.6 SIGNIFICANCE OF THE ARCHAEOLOGICAL REMAINS

Kmm5

- Shell middens (Site 095) and scatters of shellfish (Sites 096-115, Sites 277-279, Sites 283-286 & Site 296), have been rated as having (potentially) medium-high (Grade 3B) significance.

- The wind deflated LSA domestic campsite (Site 136) in the proposed pipeline route south of the Groenrivier has been rated as having medium-high (Grade 3B) significance.

- Outcroppings of quartz (Sites 138 & 139), a likely source of raw material have been rated as having medium-high (Grade 3B) significance.

- Diffuse scatters of tools on the north and south bank of the Groenrivier have been rated as having low (Grade 3C) significance.

Kmm4

- Scatters of shellfish (Sites 229, 272 & 273, Sites 233-237, Sites 244 & 245, Sites 250-255 & Site 261) have been rated as having (potentially) medium-high (Grade 3B) significance.

6. ASSESSMENT IMPACTS

Table 2 assess the overall impacts to archaeological resources and assumes that archaeological sites with heritage significance will be impacted during the Operational Phase of the project. There are no fatal flaws and any sites that cannot be avoided could be easily mitigated, if required. It is acknowledged that some areas in which LSA campsites with scatters of tools and organic remains occur, for example, may not be mined at all, so archaeological mitigation will therefore not be required. This is contingent, however, on a final mining map being produced. It is therefore assumed (at this point) that most, if not all, archaeological sites recorded during the study will be impacted. Roode Heuvel will be mined for the first 25 years, and thereafter Leeuvlei. Sites 025 and 050-055 occur in an area with thin sand cover, and it is not anticipated that the area will ever be mined. It is recommended that mitigation of archaeological sites on Roode Heuvel application area, and sea water intake and pipeline should commence simultaneously (in the Pre-construction Phase). The greatest threat is from mining, as well as the sea water intake pipeline to the proposed desalination plant on Roode Heuvel, although the alignment of the pipeline can be moved to avoid important archaeological heritage (for example Sites 136, 138 & 139).

It should be noted that in Table 3, 4 and 5, the assessment of significance with mitigation assumes that archaeological mitigation will take place. Should the sites be avoided completely then the significance would drop to Low – almost negligible – which effectively reflects the status quo. However, it will be important to protect those sites where they occur in non-mining areas. It is maintained that the most effective way of addressing cumulative impacts (during the Operational Phase) is through a Heritage Management Plan (HMP).

Table 2. Assessment of archaeological impacts

Impact	Effect			Risk or Likelihood	Overall Significance
	Temporal Scale	Spatial Scale	Severity of Impact		
Without Mitigation	Long Term	Study Area	Severe	Definite	MODERATE
With Mitigation	N/A	Localised	Low	Low	LOW

7. CONCLUSION

The baseline study has captured a good record of the archaeological heritage present in the Roode Heuvel and Leeuvlei application area. Sites of particular importance include rare wind deflated sites with stone implements, decorated pottery, marine shellfish and ostrich eggshell, all attributes of domestic campsites. Sites with similar decorated pottery (i. e. vertical incisions, or punctuations) such as that found at Site 097 appear in the archaeological record after 1300 years ago in the Knersvlakte and Richtersveld (Orton 2012; Webley 1997). Historical records show that Governor Simon van der Stel travelled to Namaqualand in 1685 and found the first Namaqua kraals north of the Groenrivier (Webley & Halkett 2012). It is tantalising to suggest that the Leeuvlei and Roode Heuvel encampments may be remnants of some of these Namaqua kraals.

It is maintained that outcroppings of quartz in the Leeuvlei application area were targeted by Stone Age people as a source of raw material. As such quartz quarries are considered significant (heritage) features in the landscape. Quarry sites provide evidence of stone tool transport and also raise questions about group size and organization of activity among hunter-gatherer groups. They cannot be seen in isolation from the (above) wind deflated sites/campsites which are the repository of the quarried stone and finished artefacts.

The study has also recorded well preserved archaeological deposits at the coast (shell middens and scatters of shellfish). Most of these scatters are probably the remains of brief occupations, where small quantities of food debris were discarded, perhaps from one or two meals. Other sites may have been more substantial but have been ravaged by wind and blowing sand, leaving only a light scatter of weathered shell fragments (Orton 2007).

Large numbers of tools were also recorded in a wind deflated site south of the Groenrivier, in the pipeline route, while nearby outcroppings of nearby quartz were likely exploited by hunter-gatherers as a source of raw material.

The nature, type and distribution of archaeological sites in the study area reveal a dynamic use of pre-colonial landscapes by Later Stone Age hunter-gatherers and Herders.

The results of the study indicate that the proposed activity (i. e. mining of mineral sands) and associated infrastructure (mineral separation and primary concentrator plant, tailings dam, airstrip, offices, workshops and stores, for example), will not have an impact of great significance on the archaeological heritage, as these are expected to be limited.

The position of the gulley intake (Kmm4 & Kmm5), pump station and pipeline at the coast will impact negatively on archaeological heritage (shell scatters & shell middens).

The sea water intake pipeline (Kmm5) to the desalination plant on Roode Heuvel, will impact negatively on a wind deflated site (Site 136) and outcropping of quartz (Site 138) on the southern bank of the Groenrivier.

In archaeological terms, no fatal flaws have been identified and any sites that cannot be avoided could be easily mitigated if required. Mitigation also provides opportunities for better understanding pre-colonial land use patterns in this region of Namaqualand.

8. RECOMMENDATIONS

With regard to the proposed Zirco Roode Heuwel Kamiesberg Project, the following recommendations are made, which are subject to the approval of the South African Heritage Resources Agency (SAHRA).

8.1 ROODE HEUVEL

1. Archaeological remains in wind deflated sites (Sites 328, 096, 097, 098, 086, 088, 090, 091 & 092) must be mapped (on a grid system) prior to any mining or mining related activities commencing in that particular area. Sands should also be sieved for the presence of sub-surface material. The remains must be collected, curated and written up and a report presented to the South African Heritage Resources Agency (SAHRA). No archaeological material may be collected or damaged without a permit issued by SAHRA.

It is acknowledged that some areas in which scatters of tools and organic remains occur (for example Site 096 on Brandkop) may not be mined at all, so archaeological mitigation will likely not be required.

2. Should any unmarked human remains, or ostrich eggshell caches for example, be uncovered or exposed during mining or associated activities, these must immediately be reported to the archaeologist (Jonathan Kaplan 082 321 0172), or the South African Heritage Resource Agency (Ms Mariagrazia Galimberti 021 462 4502). Burials must not be removed or disturbed until inspected by a professional archaeologist.

8.2 LEEUVLEI

1. Archaeological remains in wind deflated sites (Sites 025 & 050-055) must be mapped on a grid system prior to any mining or mining related activities commencing in that particular area. Sands should also be sieved for the presence of sub-surface material. The remains must be collected, curated and written up and a report presented to SAHRA. No archaeological material may be collected or damaged without a permit issued by SAHRA.

It is acknowledged that the above sites may not be mined (contingent on a final mine plan), so archaeological mitigation will therefore not be required.

2. A Heritage Management Plan (HMP) must be implemented in order to protect important archaeological sites that fall within `non-mining areas', during the Construction and Operational Phase of the project. The HMP must be included as part of the Environmental Management Plan (EMP) for the proposed project. The HMP must be submitted to SAHRA for approval.

3. A buffer of 5m must be established around outcroppings of quartz (Sites 101, 033, 037, 041 & 088). Alternatively, these sites must be fenced off. Fencing must be done in consultation with and under the supervision of the archaeologist.

4. Should any unmarked human remains or ostrich eggshell caches be uncovered or exposed during mining or mining related activities, these must immediately be reported to the archaeologist (Jonathan Kaplan 082 321 0172), or the South African Heritage

Resource Agency (Att: Ms Mariagrazia Galimberti 021 462 4502). Burials must not be removed or disturbed until inspected by a professional archaeologist.

8.3 PROPOSED SEAWATER INTAKE, PUMP STATION AND PIPELINE

8.3.1 Kmm5

1. Shellfish deposits (Site 095) at the sea water intake must be sampled. This should take the form of a series of 1m x 1m excavations in order to test the significance and extent of the archaeological deposits. Shellfish and bone must also be collected for dating. Should significant sub-surface deposits be encountered during test excavations, a larger sample will need to be rescued.

2. Scatters of shellfish (Sites 096-103 & Sites 105-115) in the pipeline route, and between the sea water intake and the pump station (Sites 277-279, Sites 283-286 & Site 296) must be sampled using a sampling strategy designed by Dr Jayson Orton for ephemeral sites of this nature. This will entail more detailed visual recording, sub-surface sampling (i. e. sieving), and collection of shellfish (for dating) and archaeological material. Such studies have shown an improved knowledge of pre-colonial landscapes.

3. Scatter of tools (Site 136) in the wind deflated site in the pipeline route south of the Groenrivier must be mapped on a grid system. Sand must also be sieved for the presence of sub-surface material. All the remains must be collected, curated and written up and a report presented to SAHRA. No archaeological material may be collected or damaged without a permit issued by SAHRA.

Alternatively, the pipeline must be moved to avoid this important site.

4. Outcropping of quartz (sites 138 & 139) alongside the pipeline must be investigated. This will entail more detailed visual recording, mapping and collection. The material must be written up and a report presented to SAHRA. No archaeological material may be collected without a permit issued by SAHRA.

Alternatively, the pipeline must be moved to avoid this important site.

5. Should any unmarked human remains or ostrich eggshell caches be uncovered or exposed during excavations for the pump station for example, these must immediately be reported to the archaeologist (Jonathan Kaplan 082 321 0172), or the South African Heritage Resource Agency (Att: Ms Mariagrazia Galimberti 021 462 4502). Burials must not be removed or disturbed until inspected by a professional archaeologist.

8.3.2 Kmm4

1. Scatters of shellfish (Site 273, Sites 233, 236 & 237, Sites 244 & 245, Sites 250-255 & Site 261) in the pipeline route, and scatters of shellfish between the sea water intake and the pump station (Site 229 & Site 272) must be sampled using a sampling strategy designed by Dr Jayson Orton for ephemeral sites of this nature. This will entail more detailed visual recording, sub-surface sampling (i. e. sieving), and collection of shellfish (for dating) and archaeological material. Such studies have shown an improved knowledge of pre-colonial landscapes.

8.4 SABIES

If prospecting rights are approved, the area known as Sabies must be assessed for archaeological heritage ahead of any mining or development activity.

9. REFERENCES

Dewar, G.I. 2007. The Archaeology of the Coastal Desert of Namaqualand, South Africa: A regional synthesis. Unpublished PhD Dissertation, Department of Archaeology, University of Cape Town.

Dewar, G. 2006. Survival and culture in the coastal desert of Namaqualand. What people ate and where they sat to eat it. The Digging Stick 23:2. South African Archaeological Society.

Halkett, D. 2003 A report on the archaeological mitigation program at De Beers Namaqualand mines March 2002 to June 2003, Report prepared for De Beers Namaqualand Mines Division. Archaeology Contracts Office, University of Cape Town.

Halkett, D. and Hart, TJG.1987. An archaeological assessment of the coastal strip, and a proposed heritage management plan for De Beers Namaqualand Mines. Unpublished report prepared for De Beers Namaqualand Mines Division. Archaeology Contracts Office, University of Cape Town.

Hart, T.J.G. 2006. Scoping Heritage Impact Assessment of a proposed wind energy facility to be situated at Bakoond 617, 620 and Grave Water Kop 158/5 situated on the Namaqualand coast in the Vredendal District South Western Cape. Draft Report prepared for Savannah Environmental. Archaeology Contract Office, University of Cape Town.

Hart, T.J.G and Halkett, DJ. 1993. Excavations at six archaeological sites in the Near-Shore Diamond Mining Area, Brandsebaai, Namaqualand. Archaeology Contracts Office, University of Cape Town.

Hart, T.J.G and Halkett, DJ .1994. Report on the Phase 2 Archaeological Excavations at the Namakwa Sands Project (first Phase), Vredendal District, Namaqualand, Namakwa Sands Ltd. Archaeology Contracts Office, University of Cape Town.

Hart, T.J.G and Lanham, J. 1997. Phase 2 archaeological excavations at two Late Stone Age sites in the Phase II (WOB) mining area, Namakwa Sands, Vredendal District, Namaqualand, Namakwa Sands Ltd. Archaeology Contracts Office, University of Cape Town.

Kaplan, J. 2011. Archaeological Impact Assessment the proposed Port Nolloth Waste Site. Report prepared for Bvi Consulting Engineers. ACRM Cape Town

Kaplan, J. 2007. Archaeological Impact Assessment of the proposed Ibhubesi Gas Field Development and Associated Infrastructure, Northern Cape Province. Report prepared for CCA Environmental. Agency for Cultural Resource Management. Cape Town

Kaplan, J. 1994. The state of archaeological information in the coastal zone of the Orange River to Ponta do Oura. Unpublished report for the Department of Environmental Affairs and Tourism.

Morris, D. & Webley, L. 2004. Cultural History in and adjacent the Namaqua National Park. Unpublished SANParks report.

Orton, J. 2012. Late Holocene archaeology in Namaqualand, South Africa: hunter-gatherers and herders in a semi-arid environment. Thesis submitted for the degree of Doctor of Philosophy, University of Oxford.

Orton, J. 2007. The sampling of ephemeral shell scatters in Namaqualand, South Africa. South African Archaeological Bulletin 62:74-78.

Orton, J. & Halkett, D. 2005. A report on the archaeological mitigation programme at De Beers Namaqualand Mines, August to September 2004. Unpublished report prepared for De Beers Consolidated Mines NM. Archaeology Contracts Office University of Cape Town.

Orton, J. & Halkett, D. 2006. Mitigation of archaeological sites within the Buffels Marine and Koingnaas Complex, November 2005 till May 2006. Unpublished report prepared for De Beers Consolidated Mines NM. Archaeology Contracts Office University of Cape Town.

Orton, J. & Hart, T. 2011. Baseline heritage assessment of electrical and road infrastructure for the proposed Ibhubesi gas power plant in southern Namaqualand, Western and Northern Cape. Report prepared for CCA Environmental. ACO Associates Cape Town.

Parkington, J. 2006. Shorelines, Strandlopers and shell middens. Creda Communications. Cape Town

Parkington, J.E. and Hart, TJG 1991a Archaeological assessment of 3 potential power station sites, De Beers Namaqualand mines, Kleinzee. Unpublished report prepared for the EEU. Archaeology Contracts Office, University of Cape Town.

Parkington, J. & Hart, T. 1991b. An assessment of the archaeological sensitivity of Tweepad, Brazil and Skulpfontein, Kleinzee. Report prepared for De Beers. Archaeology Contracts Office University of Cape Town.

Parkington, J.E and Hart, T.J.G. 1993. Namakwa Sands main access road: archaeological survey, Environmental Evaluation Unit, UCT. Archaeology Contracts Office, University of Cape Town.

Webley, L. 2001. The re-excavation of Spoegrivier Cave on the West Coast of South Africa. Annals of the Eastern Cape Museums Vol 2: 19-49.

Webley, L. 1997. Jakkalsberg A and B: the cultural material from two pastoralist sites in the Richtersveld, Northern Cape. Southern African Field Archaeology 6:3-19.

Webley, L. 1992. The history and archaeology of pastoralist and hunter-gatherer settlement in the north-western Cape, South Africa. Unpublished D.Phil. thesis: University of Cape Town.

Webley, L. & Halkett, D. 2010. Archaeological (inc. Heritage) Impact Assessment: Proposed prospecting on Portion 2 and Remainder Portion of the Farm Zandkopdrift 537 Garies, Northern Cape. Report prepared for Sedex Minerals (Pty) Ltd. ACO Associates. Cape Town.

Winter, S. & Baumann, N. (2005). Guideline for involving heritage specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 E. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

10. APPENDIX

Table 3. Roode Heuvel: Spreadsheet of waypoints & description of archaeological finds

Site	Name of farm	Lat/Long	Description of finds	Grading	Mitigation
	Roode Heuvel				
172		S30 43.892 E17 37.830	Quartz chunk	3C	None required
174		S30 44.412 E17 37.620	Quartz flake	3C	None required
175		S30 44.421 E17 37.619	Quartz flake	3C	None required
176		S30 44.475 E17 37.452	Quartz chunk	3C	None required
177		S30 44.583 E17 37.460	Quartz broken core	3C	None required
178		S30 44.508 E17 37.818	Quartz flake	3C	None required
179		S30 44.450 E17 38.260	Quartz flake	3C	None required
180		S30 44.085 E17 37.267	Quartz edge rounded (weathered) flake	3C	None required
181		S30 43.819 E17 37.069	Broken quartzite grindstone fragment & quartz flake in small **dune hollow**	3C	None required
183		S30 43.787 E17 37.163	Small quartz pebble flake	3C	None required
184		S30 43.635 E17 37.140	4 quartz chunks, 2 quartz flakes, soft mica chunk, rough sandstone chunk in small **dune blow out**	3C	None required
185		S30 43.545 E17 37.094	Ferrecrete flake in **dune blow out**	3C	None required
186		S30 43.683 E17 36.878	Ferrecrete	3C	None required
187		S30 43.509 E17 36.968	Quartz chunk and quartz flake; Ferrecrete	3C	None required
188		S30 43.374 E17 37.028	Ferrecrete	3C	None required
189		S30 43.318 E17 37.104	Ferrecrete	3C	None required
190		S30 43.309 E17 37.184	Ferrecrete	3C	None required
191		S30 43.276 E17 37.365	Ferrecrete	3C	None required
192		S30 43.136 E17 37.789	Quartz flake	3C	None required
193		S30 43.025 E17 37.846	4 quartz flakes, and a silcrete flake in **dune hollow**	3C	None required
196		S30 45.526 E17 39.514	Chalcedony flake	3C	None required
197		S30 44.644 E17 39.217	Quartz chunk	3C	None required
198		S30 45.108 E17 39.680	Quartzite chunk/flake	3C	None required

199		S30 45.676 E17 39.707	Quartz chunk	3C	None required
200		S30 45.751 E17 39.722	Quartz flake	3C	None required
202		S30 45.005 E17 38.971	Quartz chunks	3C	None required
293		S30 44.637 E17 37.047	Quartz chunk	3C	None required
294		S30 44.261 E17 36.865	Quartz core	3C	None required
Airstrip				3C	
296		S30 43.155 E17 36.259	Quartz chunk		None required
297		S30 42.990 E17 36.239	Quartz flake	3C	None required
298		S30 42.995 E17 36.237	Quartz flake	3C	None required
299		S30 43.022 E17 36.222	Quartz chunk	3C	None required
300		S30 43.012 E17 36.234	Quartz chunk & **MSA** utilized chalcedony flake	3C	None required
301		S30 42.998 E17 36.239	Quartz flake	3C	None required
302		S30 42.925 E17 36.289	Small quartz core	3C	None required
303		S30 42.928 E17 36.250	Quartz flake	3C	None required
304		S30 43.026 E17 36.162	Large quartz core	3C	None required
305		S30 43.016 E17 36.164	Quartz chunk	3C	None required
306		S30 42.997 E17 36.187	Quartz flake	3C	None required
307		S30 42.980 E17 36.207	Quartz chunk & chip	3C	None required
308		S30 42.976 E17 36.215	Large quartz core	3C	None required
309		S30 42.975 E17 36.219	Quartz chunk & flake	3C	None required
310		S30 42.971 E17 36.219	Quartz chunk	3C	None required
311		S30 42.975 E17 36.217	Quartz chunk/cobble	3C	None required
312		S30 42.973 E17 36.223	Quartz flake and silcrete minimal core	3C	None required
313		S30 42.919 E17 36.251	Quartzite flake	3C	None required
314		S30 42.904 E17 36.303	Large quartz chunk	3C	None required
315		S30 42.881 E17 36.309	Large quartz core	3C	None required
316		S30 42.866 E17 36.328	Quartz chunk	3C	None required
317		S30 42.827 E17 36.390	Quartz flake	3C	None required
Airstrip ends					
318		S30 43.247 E17 36.466	Quartz chunk	3C	None required
319		S30 43.252 E17 37.684	Quartz chunk	3C	None required
320		S30 42.363 E17 37.970	Massive quartz chunk	3C	None required

321		S30 42.553 E17 37.997	Large quartz chunk	3C	None required
322		S30 42.805 E17 38.102	Quartz chunk	3C	None required
323		S30 42.797 E17 38.154	Large quartz chunk and 2 smaller chunk	3C	None required
325		S30 42.804 E17 38.173	Quartz flake	3C	None required
326		S30 42.971 E17 38.195	Quartz chunk	3C	None required
327		S30 43.705 E17 37.512	Quartz chunk	3C	None required
328		S30 44.856 E17 37.518	Wind deflated hollow/**dune blow out** – on the high upper slopes overlooking the Groenrivier road, comprising a scatter of tools dominated by quartz flakes, blade, & chunks, 2 round cores, small round crystal core, quartz manuport, 2 utilized silcrete flakes, quartzite hammerstone, quartzite chunk, and fragments of weathered limpet (S. argenvillei), including 1 whole S. argenvillei. Small fragment of coarse tempered pottery and fragment of OES	3B Medium	Archaeological remains to be collected. Sands to be sieved for presence of sub-surface material
329		S30 44.610 E17 38.197	Silcrete **ESA biface/handaxe** and silcrete flake alongside slimes dam	3C	None required
094		S30 41.414 E17 36.831	Quartz chunk in old fields	3C	None required
095		S30 42.708 E17 38.172	A few quartz flakes, chunks & chunks in a large **dune blow** out near fence	3C	None required
096		S30 42.340 E17 38.422	Low density scatter of quartz flakes, chunks & chips in **dune blow** out.	3C	Archaeological remains to be collected. Sands to be sieved for presence of sub-surface material
097		S30 42.080 E17 38.666	Low density scatter of quartz flakes and chunks, single large fragment of undecorated (black burnished) pottery and fragments of weathered limpet (S. argenvillei in dune blow out near large clump of trees – cattle/sheep station – concrete reservoir	3C	Archaeological remains to be collected. Sands to be sieved for presence of sub-

					surface material
098		S30 41.951 E17 38.484	Relatively large numbers (high density) of quartz flakes, chunks, flaked chunks/minimal cores, chips, large manuports, old Colonial glass (fragments and bottle neck), rusted metal, quartzite grindstone fragment/anvil. Important – possible discreet activity areas, in larger **dune blow out**	**3B**	Archaeological remains to be collected. Sands to be sieved for presence of sub-surface material
099		S30 41.377 E17 38.405	Quartz chunks & flakes on a dune slope	3C	None required
079		S30 41.972 E17 39.222	Quartz chunk in sandy track	3C	None required
080		S30 42.563 E17 39.329	Quartz chunk in sandy track	3C	None required
081		S30 42.730 E17 39.386	Quartz chunk & flake near fence	3C	None required
082		S30 42.419 E17 40.065	Several quartz flakes	3C	None required
083		S30 42.412 E17 40.094	Quartz flake and chunk	3C	None required
084		S30 42.331 E17 40.209	Diffuse scatter of quartz flakes, chips, chunks on sandy slopes on Rondekop	3C	None required
085		S30 42.346 E17 40.263	Several quartz flakes and chunks on large wind deflated hollow on Rondekop	3C	None required.
086		S30 42.300 E17 40.301	Large numbers of LSA quartz flakes, chunks, chips, flaked chunks, manuports, cores, thumbnail scraper. Some silcrete, quartzite and indurated shale as well. Many 100s of pieces of OES. Highest point in application area on Rondekop (210m absl). On red sands alongside knocked down trig beacon. Some disturbance, trampling, 4 x 4 road, but relatively well preserved. Good sample	**3B**	Archaeological remains to be collected. Sands to be sieved for presence of sub-surface material
088		S30 41.554 E17 37.927	Diffuse scatter (6-7 large quartz chunks, 2 thin quartz flakes, single quartz core in wind deflated site	3C	Archaeological remains to be collected. Sands to be sieved for presence of sub-surface material
090		S30 41.563 E17 37.751	15-20 pieces of ostrich eggshell and large	3C	Archaeological

			piece of Ferrecrete in wind deflated hollow 300m west of 088		remains to be collected. Sands to be sieved for presence of sub-surface material
091		S30 41.772 E17 37.942	Quartz flake, round core, 3 quartz chunks in deflated hollow	3C	Archaeological remains to be collected Sands to be sieved for presence of sub-surface material
092		S30 41.783 E17 38.020	Low density scatter of tools, including 2 chunks, 4-5 flakes, chips, core, 3-4 manuports together, flaked chunk, large flake and round core – all in quartz	**3B**	Archaeological remains to be collected Sands to be sieved for presence of sub-surface material

Table 4. Leeuvlei: Spreadsheet of waypoints & description of archaeological finds

Site	Name of farm	Lat/Long	Description of finds	Grading	Mitigation
	Leeuvlei				
004		S30 37.101 E17 36.251	Quartz core	3C	None required
005		S30 37.321 E17 36.263	Quartz pointed flake	3C	None required
006		S30 37.408 E17 36.282	Large quartz chunk	3C	None required
007		S30 37.323 E17 36.469	Diffuse scatter of quartz chunks, flakes, utilized pointed flake on west facing sandy slope alongside fence	3C	None required
008		S30 37.360 E17 36.488	Same as above, diffuse scatter on sandy slopes	3C	None required
009		S30 37.378 E17 36.470	Isolated quartz chunk	3C	None required
010		S30 37.408 E17 36.556	**Outcropping of quartz** – probable source of raw material. Lots of smashed up quartz and chunks, inc. blade	**3B**	Buffer of 5m to be set around the site. Alternatively, site to be fenced off
011		S30 37.691 E17 36.421	Quartz chunk	3C	None required
012		S30 37.527 E17 36.749	Quartz chunk	3C	None required
013		S30 37.721 E17 36.439	Quartz chunk	3C	None required
014		S30 37.721 E17 36.439	Quartz chunk, minimal core, and 2 flakes on soft sands about 15m from the fence	3C	None required
015		S30 37.604 E17 36.729	Quartz core/chunk	3C	None required
016		S30 37.696 E17 37.099	**MSA** flake	3C	None required
017		S30 37.701 E17 37.115	Quartz chunk	3C	None required
018		S30 38.878 E17 37.149	Quartz flake	3C	None required
019		S30 38.370 E17 36.904	Quartz utilized/partially retouched flake	3C	None required
020		S30 39.651 E17 37.982	Low density scatter of a quartz flakes, a few pieces of gritty haematite, several chunks	3C	None required
021		S30 39.739 E17 37.710	Low density scatter, including a number of quartz chunks, flakes on high lying dunes close to the fence. Also shotgun casing	3C	None required
022		S30 39.762 E17 37.689	Quartz chunks lying around – extension of above	3C	None required
023		S30 40.213 E17 37.917	Quartz chunk	3C	None required
024		S30 40.175 E17 37.937	Quartz chunk	3C	None required
025		S30 40.112 E17 37.991	Low-medium density scatter of quartz flakes, chunks, chips, utilized bladelet, some weathered	3B	Archaeological remains to be

			OES (n = 5), several round cores, manuports, quartz crystal flake, broken flaked chunks, in large **dune blow out** in high lying area in the south western corner of the proposed site, with excellent view overlooking the application area. N = about 40 - 60 implements. No pottery found		collected Sand to be sieved for sub surface material
026		S30 40.021 E17 37.989	Quartz flake	3C	None required
027		S30 37.300 E17 36.466	Quartz flake in path alongside the fence	3C	None required
028		S30 37.759 E17 37.393	Quartz flake and chunk in path alongside the fence	3C	None required
029		S30 38.354 E17 38.765	Quartz flake alongside the fence	3C	None required
030		S30 38.478 E17 39.245	Quartz chunk	3C	None required
031		S30 38.452 E17 39.394	Quartz chunk	3C	None required
032		S30 38.443 E17 39.435	Low-medium density scatter of quartz implements (flakes, large chunks, flaked chunks, chips) around a severely degraded area/heuweltjie alongside the fence overlooking degraded pan, lots of animal burrowing	3C	None required
033		S30 38.395 E17 39.570	**Outcropping of quartz** on flattish hill overlooking 032 – probable source of raw material for 032 targeted by Stone Age hunter-gatherers	3B	Buffer of 5m to be set around the site. Alternatively, site to be fenced off
034		S30 38.318 E17 39.362	Shallow outcropping/overhang of granite alongside farm road, surrounding area is severely degraded by trampling, road works, and extensive burrowing among surrounding heuweltjies. No deposit in the overhang (which appears to have leached out), sands are gritty. Low density scatters of tools found in surrounding area including mainly quartz chunks, flakes, chips, but also several silcrete flakes and at least one tiny piece of undecorated coarse tempered pottery. Piece of decorated Colonial ceramic also found. Quartz flakes, chips, chunks, cores, several pieces of weathered ostrich eggshell and another piece of pottery were found among the severely degraded, heavily bio-turbated heuweltjies.	3C	None required
035		S30 38.327 E17 39.329	Highly degraded heuweltjies about 25 m south	3C	None required

			west of 034 – see above		
036		S30 38.325 E17 39.328	Same as above	3C	None required
037		S30 38.297 E17 39.333	**Outcropping of quartz** with lots of broken and bashed quartz – mostly probably source of raw material targeted by Stone Age people	3B	Buffer of 5m to be set around the site. Alternatively, site to be fenced off
038		38.267 E17 39.227	Quartz flake and chunk	3C	None required
039		S30 38.248 E17 39.295	Diffuse scatter of a few quartz chunks and flakes, including a few small pieces of OES on a severely degraded heuweltjie (extensive burrowing).	3C	None required
040		S30 38.192 E17 39.279	A very thin scatter of quartz associated with a very shallow outcropping of granite.	3C	None required
041		S30 38.173 E17 39.226	**Outcropping of quartz** – likely source of raw material		Buffer of 5m to be set around the site. Alternatively, site to be fenced off
042		S30 38.235 E17 38.996	Quartz flake	3C	None required
043		S30 37.516 E17 36.924	Quartz flake	3C	None required
044		S30 37.500 E17 36.856	Quartz flake & 3 quartz chunks	3C	None required
045		S30 37.369 E17 36.656	Quartz chunk and flake on large Heuweltjie – extensive burrowing	3C	None required
046		S30 37.310 E17 36.582	Scatter of MSA tools on highly eroded surface overlooking large quarry alongside Soutfontein Road. Tools include mainly quartzite flakes, chunks, also some quartz and a few LSA type silcrete pieces. Highly eroded – outside the application area	3C	None required
047		S30 37.145 E17 36.385	Same as above	3C	None required
048		S30 36.861 E17 36.324	Same as above	3C	None required
049		S30 36.681 E17 36.248	Sam as above	3C	None required
050		S30 40.275 E17 38.243	Low density scatter of tools including quartz flakes, chips, chunks, cores elliptical chunk (minimal grinding), small crystal core on soft red sands in **dune blow out**.	**3B**	Archaeological remains to be collected. Sand to be sieved for sub surface material

051		S30 40.270 E17 38.207	High density-scatter (1000s of tools) in large **dune blow-out** in the south western corner of application area – largest and richest of a cluster of blow out sites. Evidence of extensive knapping – flakes, including bladelets/blades, chips, chunks, utilized and modified pieces, relatively large numbers of cores (small and larger round cores, elliptical and bipolar), flaked chunk/minimal cores, manuports, hammerstone, anvils. No pottery or OES. 99% in quartz, but also several utilized chalcedony, silcrete and quartzite flakes.	**3B**	Archaeological remains to be collected. Sand to be sieved for sub surface material
052		S30 40.222 E17 38.059	High density scatter of tools in large **dune blow** out west of 051. 99% of tools in quartz including many flakes, chunks, chips, large and smaller round cores, flaked chunks, manuports, lump of flaked silcrete. No pottery of OES	**3B**	Archaeological remains to be collected. Sand to be sieved for sub surface material
053		S30 40.169 E17 38.100	Low density scatter of tools in **dune blow out**, comprising dispersed flakes, chunks, round core, round quartzite cobble core.	3C	Archaeological remains to be collected. Sand to be sieved for sub surface material
054		S30 40.184 E17 38.169	± 30-40 pieces of ostrich eggshell, mostly small fragments, in small dune blow out. A handful of quartz flakes and chunks also counted.	**3B**	Archaeological remains to be collected
055		S30 40.157 E17 38.315	Low density scatter in dune blow, comprising handful of quartz flakes, and chunks, quartzite anvil/grinding fragment	**3B**	Archaeological remains to be collected. Sand to be sieved for sub surface material
059		S30 39.047 E17 39.284	Dispersed quartz flakes and chunks on flatter ridge, old agricultural lands, severely disturbed (burrowing)	3C	None required
060		S30 38.962 E17 39.278	Quartz flakes and chunks – same as above	3C	None required
061		S30 38.940 E17 39.327	Quartz chunk – degraded lands – same as above	3C	None required
062		S30 38.918 E17 39.340	Quartz chunk	3C	None required

063		S30 38.888 E17 39.357	Quartz chunk and flake	3C	None required
064		S30 38.824 E17 39.373	Quartz chunks and flakes – old agricultural lands – same as above	3C	None required
065		S30 38.754 E17 39.251	Dispersed quartz chunks and flake – same as above	3C	None required
066		S30 39.164 E17 38.723	Quartz flake	3C	None required
070		S30 39.264 E17 38.513	Very dispersed scatter of a few quartz chunks and a single flake among Heuweltjies on mid slopes	3C	None required
075		S30 38.906 E17 39.209	Quartz chunk	3C	None required
076		S30 38.829 E17 39.259	Dispersed scatter of quartz of quartz chunks, flakes and quartz manuports on flatter ridge, old agricultural lands, highly degraded and bio-turbated	3C	None required
079		S30 38.581 E17 39.034	Dispersed tools in graded area around green water tank, and in gravel road and pan. Quartz chunks, flakes, silcrete flake. Severely degraded	3C	None required
084		S30 38.943 E17 38.196	Quartz chunk	3C	None required
086		S30 38.785 E17 38.612	Quartz core/minimal chunk	3C	None required
087		S30 38.752 E17 38.720	Quartz chunk	3C	None required
088		S30 38.707 E17 38.763	**Outcroppings of quartz** on flattish ridge about 100m from fence line. Close to drill hole. Many smashed quartz chunks and fragments, including a few flakes – probable source of raw material. Surrounding area severely burrowed/degraded	3B	Buffer of 10m to be set
089		S30 38.583 E17 38.957	Quartz chunk	3C	None required
090		30 38.646 E17 38.660	Quartz flake	3C	None required
091		S30 39.694 E17 38.668	Quartz flake in sandy road	3C	None required

Table 5. Gulley/sea water intake, pump station & sea water intake pipeline: Spreadsheet of waypoints & description of archaeological finds

Site	Name of farm	Lat/Long	Description of finds	Grading	Mitigation
	Kmm5 – sea water intake, pump station & pipeline				
95		S30 54.668 E17 36.234	Fairly dense and compacted shell midden deposits on raised beach (± 3-4m) immediately behind sea water intake – shellfish dominated by limpet (*S. argenvillei* & some *C. granatina* and Black Mussel. Fragmented shellfish (limpet, black mussel, ribbed mussel, large whelk) occurs (in pipeline route) alongside raised beach adjacent rocky shoreline but patchy, thin & dispersed. A few outcrops of weathered sandstone. Quartz chunk, small piece of OES, seal bone. No pottery	Potential 3B	Test excavations/trial pits to be excavated to assess the significance of the sub-surface archaeological deposits. Shellfish/bone to be collected for dating.
277		S30 54.611 E17 36.308	A diffuse scatter of fragmented shellfish, dominated by limpet (*S. argenvillei*) and Black Mussel. *Some C granatina*. Note: shellfish is visible all along the dune crest south (**see below**)	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
278		S30 54.620 E17 36.299	Large scatter of fragmented shellfish, on soft loose sands, dominated by limpet (*S. argenvillei*) and black mussel. Large whole S. argenvillei, including **burnt shell**. **Potsherd**	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.

279		S30 54.624 E17 36.308	Scattered fragments of limpet (*C. argenvillei* and *S. granatina*), including some large whole *S. argenvillei* on loose, soft sands on dune crest, about 20m north of beacon. Fragments of Black Mussel including larger fragments. X 2 pieces of OES	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
282		S30 54.655 E17 36.261	Very diffuse scatter on dune slopes above road	3C	None required
283		S30 54.649 E17 36.288	Larger scatter of fragmented shell about 20m south west of beacon. Shell dominated by limpets (S. argenvillei). **X 2 pieces of OES and chalcedony flake**	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
284		S30 54.640 E17 36.296	Wide scatter of fragmented shellfish, a few m from the beacon. Shellfish bunched up against bushes, on soft loose sands. Shellfish dominated by limpet fragments & some whole, large S. argenvillei. Also some whelk, *C. granatina* & Black mussel. **X 2 OES, silcrete flake, & quartz flake**	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
285		S30 54.628 E17 36.308	See Site 276 – shell scatters all along the dune crest, and alongside the road, on soft loose sands and also clustered around small bushes. No cultural remains	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
286		S30 54.630 E17 36.300	Shell scatters all along the dune crest, on soft loose sands and also clustered around small bushes. **One pottery sherd**	Potential 3B	Test excavations/trial pits to be excavated to assess the significance of the sub-surface archaeological deposits. Shellfish/bone to be collected for dating.
287		S30 54.603 E17 36.289	Scatter of shellfish dominated by	Potential	Shell to be sampled using a sampling

			limpet and black mussel, with shellfish concentrated among bushes. Some whole limpet (*S. argenvillei*). **Sandstone cobble chunk & potsherd**	3B	strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
289		S30 54.612 E17 36.290	Diffuse scatter of fragmented shell just below the crest of the dune top. A few whole limpet (*S. argenvillei*)	3C	Non required
290		S30 54.620 E17 36.279	Fragments of shell further down slope crest of the dune. **X 1 OES**	3C	None required
291		S30 54.614 E17 36.266	Fragments of shell further down slope crest of the dune – same as above	3C	None required
292		S30 54.634 E17 36.262	Same as above	3C	None required
293		S30 54.622 E17 36.252	Same as above, including a few whole *S. argenvillei*	3C	None required
294		S30 54.615 E17 36.252	Same as above, on soft sands	3C	None required
295		S30 54.634 E17 36.248	Fragments of shellfish alongside the road	3C	None required
296		S30 54.638 E17 36.247	Fragments of shellfish alongside the road. **X 1 OES** and **quartz flake**	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
297		S30 54.650 E17 36.247	Fragments of shellfish (limpet) alongside the road, including some whole limpet (*S. argenvillei*) and *granatina* fragments	3C	None required
298		S30 54.662 E17 36.249	Fragments of shellfish alongside the road	3C	None required
299		S30 54.677 E17 36.253	Fragments of shellfish alongside the road and on mid slopes	3C	None required
96		S30 54.435 E17 36.244	Diffuse isolated, scatters of shellfish, mainly limpet and black mussel on soft loose sands above coastal track. A few whole limpets	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-

			(*S. argenvillei*)		surface sampling, and collection of shellfish (for dating), and archaeological material.
97		S30 54.420 E17 36.243	Diffuse isolated, scatters of shellfish, mainly limpet and black mussel on soft loose sands above coastal track. A few whole limpets (*S. argenvillei*)	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
98		S30 54.390 E17 36.240	Quartz core alongside sand road	3C	None required
99		S30 54.429 E17 36.248	Diffuse isolated, scatters of shellfish, mainly limpet and black mussel on soft loose sands above coastal track. A few whole limpets (*S. argenvillei*). No cultural remains	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
100		S30 54.441 E17 36.247	Diffuse isolated, scatters of shellfish, mainly limpet and black mussel on soft loose sands above coastal track. A few whole limpets (*S. argenvillei*). No cultural remains	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
101		S30 54.481 E17 36.259	Diffuse isolated, scatters of shellfish, mainly limpet and black mussel on soft loose sands above coastal track. A few whole limpets (*S. argenvillei*). No cultural remains	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
102		S30 54.488 E17 36.260	Diffuse isolated, scatters of shellfish, mainly limpet and black mussel on soft loose sands above coastal track. A few whole limpets (*S. argenvillei*). No cultural remains	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.

103		S30 54.522 E17 36.258	Larger, but still diffuse, isolated, scatters of shellfish, mainly limpet and black mussel on soft loose sands above coastal track. A few whole limpets (*S. argenvillei).*Fragment of ostrich eggshell, but no other cultural remains	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
104		S30 54.502 E17 36.223	2 quartz chunks in sandy road	3C	None required
105		S30 54.361 E17 36.242	Larger patch of shellfish (13m x 15 m) on soft loose sand. Shell dominated by limpet (*S. argenvillei*) including some *C. granatina*. Some Black mussel and larger whelk. No cultural remains	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
106		S30 54.360 E17 36.244	Diffuse scatter of shellfish, mainly fragmented limpet, but also some whelk and black mussel. No cultural remains	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
107		S30 54.357 E17 36.260	Diffuse scatter of shellfish, mainly fragmented limpet, but also some whelk and black mussel. No cultural remains	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
108		S30 54.355 E17 36.264	Diffuse scatter of shellfish, mainly fragmented limpet, but also some whelk and black mussel. Some burnt shell. Small fragment of coarse tempered **pottery**, and a few pieces of OES, but no stone or bone.	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
109		S30 54.344 E17 36.238	Diffuse scatter of shellfish, mainly fragmented limpet, but also some	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for

			whelk and black mussel. Two fragments of OES		ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
110		S30 54.340 E17 36.243	Diffuse scatter of shellfish, almost 100% limpet. Quartz flake	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
111		S30 54.337 E17 36.247	Small patch of shellfish, mainly limpet but also small *C. miniata*. Quartz chip	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
112		S30 54.322 E17 36.260	4 large fragments of OES and bits of fragmented shellfish	3C	None required
113		S30 54.317 E17 36.257	Scatter of several 100 pieces of OES none nibbled or worked – no water containers, probably modern clutch of eggs	3C	None required, should could be more closely examined
114		S30 54.267 E17 36.268	Diggings		
115		S30 54.173 E17 36.247	Thin, but fairly extensive scatter of shellfish on soft sands about 350m from high water mark. Includes weathered limpet (S argenvillei) and some black mussel. . 1-2 whole limpets. No cultural remains	Potential 3B	Shell to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
117		S30 47.787 E17 37.025	Small miscellaneous grindstone/hammerstone	3C	None required
118		S30 45.578 E17 37.666	Diffuse scatter of quartz flakes, chunks, fragments of weathered limpet (C. granatina), and some small whelk, on slopes on north	3C	None required

			bank of Groenrivier, directly below Garies rod		
119		S30 45.749 E17 37.727	Quartz chunk on red sand north bank of river	3C	None required
120		S30 45.758 E17 37.730	Broken quartz flake, core reduced flake, chunk on red sand north bank of river	3C	None required
121		S30 45.783 E17 37.762	Quartz flake, chunks, and fragment of coarse tempered **pottery** on red sands north bank of river	3C	None required
122		S30 45.818 E17 37.754	Quartz chunk in farm road	3C	None required
123		S30 45.878 E17 37.761	Quartz flake on red sand	3C	None required
124		S30 45.894 E17 37.761	3-4 quartz chunks, quartz flake, MSA broken retouched silcrete flake on upper slope, red sands	3C	None required
125		S30 45.924 E17 37.759	Diffuse, fairly wide scatter of a few quartz flakes and chunks, snapped MSA silcrete flake, on red sands	3C	None required
126		S30 45.982 E17 37.766	Quartz chunk	3C	None required
127		S30 46.039 E17 37.722	Quartz chunk	3C	None required
128		S30 46.065 E17 37.718	Quartz chunk	3C	None required
129		S30 46.085 E17 37.717	Quartz flake	3C	None required
130		S30 46.211 E17 37.696	Quartz chunk	3C	None required
131		S30 46.218 E17 37.693	Quartz chunk	3C	None required
132		S30 46.229 E17 37.690	Quartz chunk	3C	None required
133		S30 46.235 E17 37.687	Quartz flake	3C	None required
134		S30 46.250 E17 37.685	Quartz chunk	3C	None required
135		S30 46.276 E17 37.689	Quartz flake	3C	None required
136		S30 46.320 E17 37.700	Large numbers of quartz flakes, chunks, chips, round cores, flaked chunks, manuports, bladelets, silcrete flake, silcrete MSA flake, grindstone fragment, quartzite hammerstone, a few pieces of soft red haematite/ochre, in wind deflated hollow	3B	Archaeological remains to be collected. Alternatively, pipeline to be moved
138		S30 46.367 E17 37.633	Outcropping of quartz, eroding against a sandy, west facing heuweltjie. Includes many pieces of	3B	Buffer of 10m to be set around the site. Alternatively, site to be fenced off

			loose quartz stone and chunks, flaked and smashed. Quarry site – Likely source for Site 136		Alternatively, pipeline to be moved
139		S30 46.380 E17 37.653	Outcropping of quartz, eroding against a sandy, west facing heuweltjie. Includes many pieces of loose quartz stone chunks, flaked & smashed. Large boulders of quartz/outcrop. Quarry site – Likely source for Site 136	3B	Buffer of 10m to be set around the site. Alternatively, site to be fenced off Alternatively, pipeline to be moved
140		S30 47.339 E17 37.333	Quartz flake and chunk in wind deflated hummock	3C	None required
141		S30 47.185 E17 37.250	Quartz chunk	3C	None required
142		S30 46.042 E17 37.711	Quartz chunk and flake in eroded dune slack, lots of gravel	3C	None required
143		S30 45.835 E17 37.684	Quartz chunk	3C	None required
144		S30 45.417 E17 37.615	Quartz chunk in pipeline route on Roode Heuvel	3C	None required
145		S30 45 327 E17 37.396	7 quartz chunks , quartz manuport, 2 flakes, round core and sandstone chunk in depression/dry pan alongside farm road – in pipeline route, on Roode Heuvel	3C	None required
	Kmm4 – sea water intake, pump station & pipeline				
229		S30 56.642 E17 38.043	Diffuse scatter of shellfish on sandy rise frontal dune overlooking the coastal roads. Shellfish is dominated by limpet (*S argenvillei*) with some black mussel and a few whelks. 4 pieces of **OES and 1 flat vein quartz flake** – diffuse, and patchy scatters occur all along the west facing dune on soft loose sands	Potential 3B	Shell on frontal dune to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
272		S30 56.386 E17 38.025	Dispersed shellfish (mainly limpet fragments) on soft sands on frontal dunes alongside coastal track.	Potential 3B	Shell on frontal dune to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this

			Some whole *C. granatina*. No cultural remains		nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
230		S30 56.691 E17 38.021	Thick layer of compacted shellfish (not archaeological) on flat rise directly behind beach/gulley intake. Large numbers of whole black mussel, grey coloured limpets (*S. argenvillei*) and large whelks. No cultural remains	3 C	None required.
231		S30 56.653 E17 38.018	Thick compacted shell layer on beach – same as above	3C	None required
233		S30 56.600 E17 38.003	Large, but discreet, patch of fragmented shell, on dune ridge. Mainly limpet, some whelk, no cultural remains	Potential 3B	Shell on frontal dune to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
273		S30 56 356 E17 38.592	Dispersed shellfish, mainly limpet (*S. argenvillei*) on soft sands all along frontal ridge. A few whole *C. granatina* & *S. argenvillei*	Potential 3B	Shell on frontal dune to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
234		S30 56.614 E17 38.038	Diffuse scatter of limpet shell very close to the road. No cultural remains	3C	None required
277		S30 56.366 E17 38.028	Very fragmented patch of (fresh looking) black mussel shell, limpet including a few whole shell (*S. argenvillei)*, and water worn/edge rounded pebbles.	3C	None required
235		S30 56.601 E17 38.030	Large (20m x 20m), thick patch of fragmented and large, whole grey coloured limpets (*S. argenvillei*), lots of small stone pebbles/gravel,	3C	Non required

			rolled stone, lots whelk. No cultural remains. Possible shell/beach dump		
236		S30 56.566 E17 37.991	Large patch of mainly fragmented shell, about 15m from the main road. Shellfish is dominated by fragmented & crushed black mussel, with some large whole *S. argenvillei*. Also some whelk. 1 large piece of **OES**. Small pieces of pebbles and beach stone	Potential 3B	Shell on frontal dune to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
237		S30 56.549 E17 37.968	Thin patch of diffuse shell fish on soft sand on dune ridge and dune slope overlooking coastal track. Shell is dominated by limpet, including a few whole shell (S. argenvillei), sandstone outcropping. Diffuse scatters of shell all along the dune ridge. Close to camping area.	Potential 3B	Shell on frontal dune to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
238		S30 56.510 E17 37.971	Small, but fairly thick, patch of fragmented shellfish, dominated by black mussel and limpet. No cultural remains. Capers	3C	None required
239		S30 56.507 E17 37.980	Larger patch of fragmented shellfish – limpet and black mussel (same as above), including some ribbed mussel and a few whole *S. argenvillei*. Glass, metal, plastic, lots of small beach/stone pebbles. Toilet pit. Campers	3C	None required
240		S30 56.479 E17 37.974	Small, isolated fragments of limpet. No cultural remains	3C	None required
241		S30 56.467 E17 37.964	Large patch of fragmented shellfish – black mussel & limpet including some large whole *S. argenvillei* and large whelks (same as 231). Lots of stone pebbles and flat beach stone, diggings, campers, toilet pit, some	3C	None required

			glass and concrete		
242		S30 56.442 E17 37.970	Occasional large whole limpet (S. argenvillei), and fragments of shell.	3C	None required
243		S30 56.424 E17 37.954	Same as 241 & 239. Lots of crushed shell and small stone pebbles and patches of gravel. Some large whole S. argenvillei and fragments of black mussel. No cultural remains	3C	None required
244		S30 56.404 E17 37.965	Fairly widespread but diffuse scatter of bitty fragments of limpet (*S. argenvill*ei & *C. granatina*) on soft sands. A few whole S. argenvillei. No cultural remains	Potential 3B	Shellfish to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material
245		S30 56.384 E17 37.952	Very thin, dispersed, patch of fragmented shellfish, including a few large whole S. argenvillei. 5 pieces of **OES**	Potential 3B	Shellfish to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material.
246		S30 56.371 E17 37.954	Very small, thin patch of fragmented shellfish, mainly limpet (*S. argenvillei)*. 1 piece of OES	3C	None required
247		S30 56.371 E17 37.947	Small, thin patch of fragmented shell. Same as above. No cultural remains	3C	None required
248		S30 56.365 E17 37.941	Same as above. No cultural remains	3C	None required
249		S30 56.358 E17 37.945	Same as above, but including several large, whole *S. argenvillei*. No cultural remains, but some stone gravel	3C	None required
250		S30 56.350 E17 37.947	Same as above, but small, dense patches behind bushes. No cultural remains	Potential 3B	Shellfish to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual

					recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material
251		S30 56.351 E17 37.956	Same as above	Potential 3B	Shellfish to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material
252		S30 56.335 E17 37.952	Same as above	Potential 3B	Shellfish to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material
253		S30 56.329 E17 37.951	Same as above, including weathered piece of **OES**	Potential 3B	Shellfish to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material
254		S30 56.324 E17 37.960	Same as above	Potential 3B	Shellfish to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material
255		S30 56.325 E17 37.944	Same as above	Potential 3B	Shellfish to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material
256		S30 56.320 E17 37.937	Large patch of fragmented shell –	3C	None required

			toilet pit. Lots of beach gravel		
257		S30 56.304 E17 37.943	Same as above - campers	3C	None required
259		S30 56.289 E17 37.937	Large patch of fragmented black mussel – recent.	3C	None required
260		S30 56.280 E17 37.945	Bottle, shell fragments (mainly black mussel), stone pebble/gravels – possible extension of 256	3C	None required
261		S30 56.273 E17 37.955	Same as above (black mussel) – but some dispersed shell (limpet), ash- like deposit. **silcrete flake**	Potential 3B	Shellfish to be sampled using a sampling strategy designed by Orton (2007) for ephemeral sites of this nature, which includes detailed visual recording, sub-surface sampling, and collection of shellfish (for dating), and archaeological material
262		S30 56.273 E17 37.974	Thick patch of crushed and fragmented black mussel. Some whelk and stone gravels. No cultural remains	3C	None required
263		S30 56.270 E17 37.922	Tiny bits of limpet shell	3C	None required
264		S30 56.255 E17 37.918	Patch of thick, fragmented and crushed (fresh looking) black mussel shell. A few large whole *S. argenvillei* and large whelk	3C	None required
265		S30 56.253 E17 37.905	Patch of crushed shell (mainly Black Mussel) in old sand/limestone track. Bits of soft loose limestone	3C	None required
266		S30 55.889 E17 37.840	A few limpet shell fragments and a quartz flake	3C	None required
269		S30 53.411 E17 37.348	2 quartz flakes and a few fragment of limpet shell on large dune overlooking pan in pipeline route	3C	None required
271		S30 51.005 E17 37.026	Large lump of partially flaked quartz and small piece of weathered **OES** in small dune hollow in pipeline route	3C	None required

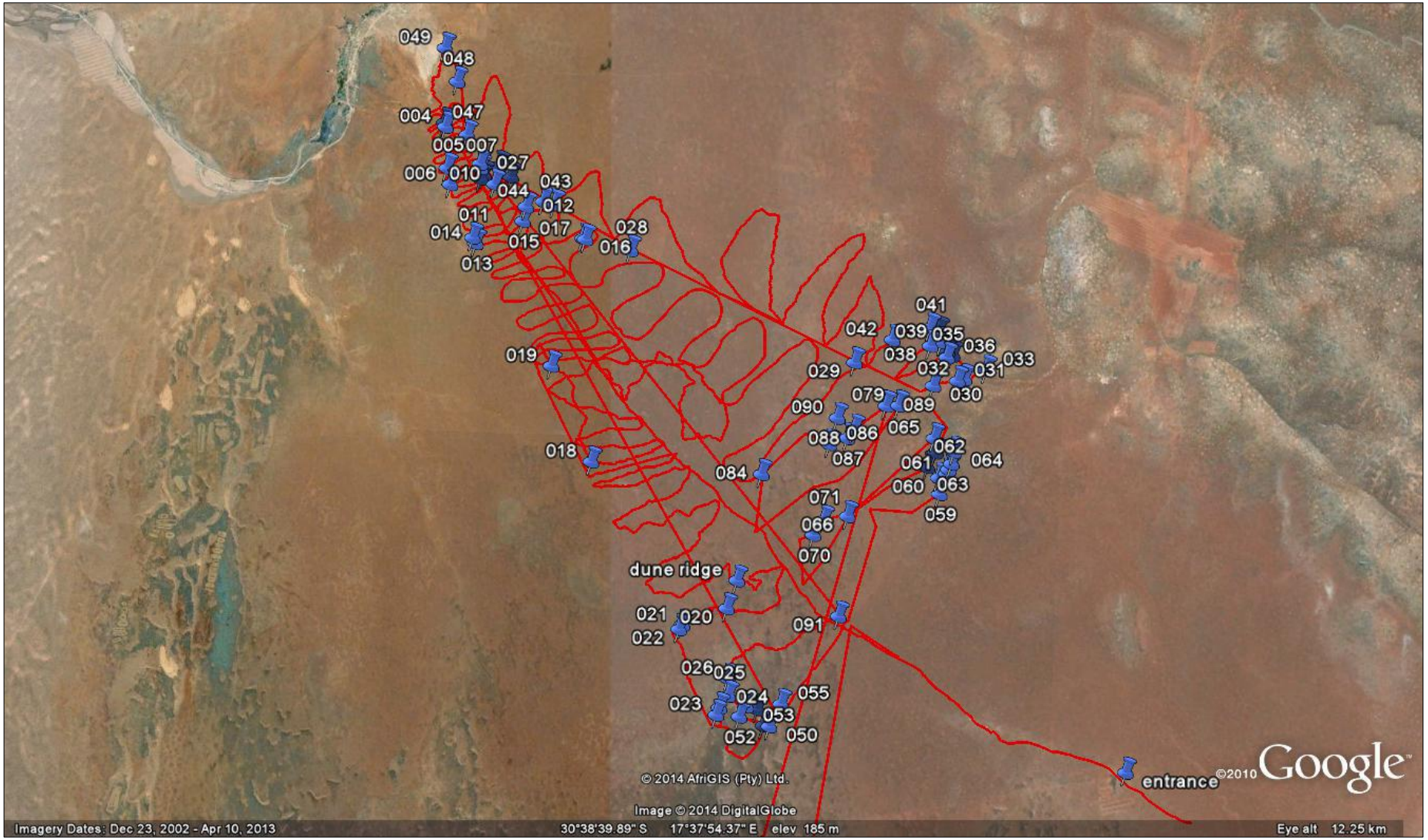

Figure 18. Leeuvlei. Track and waypoints of archaeological finds.

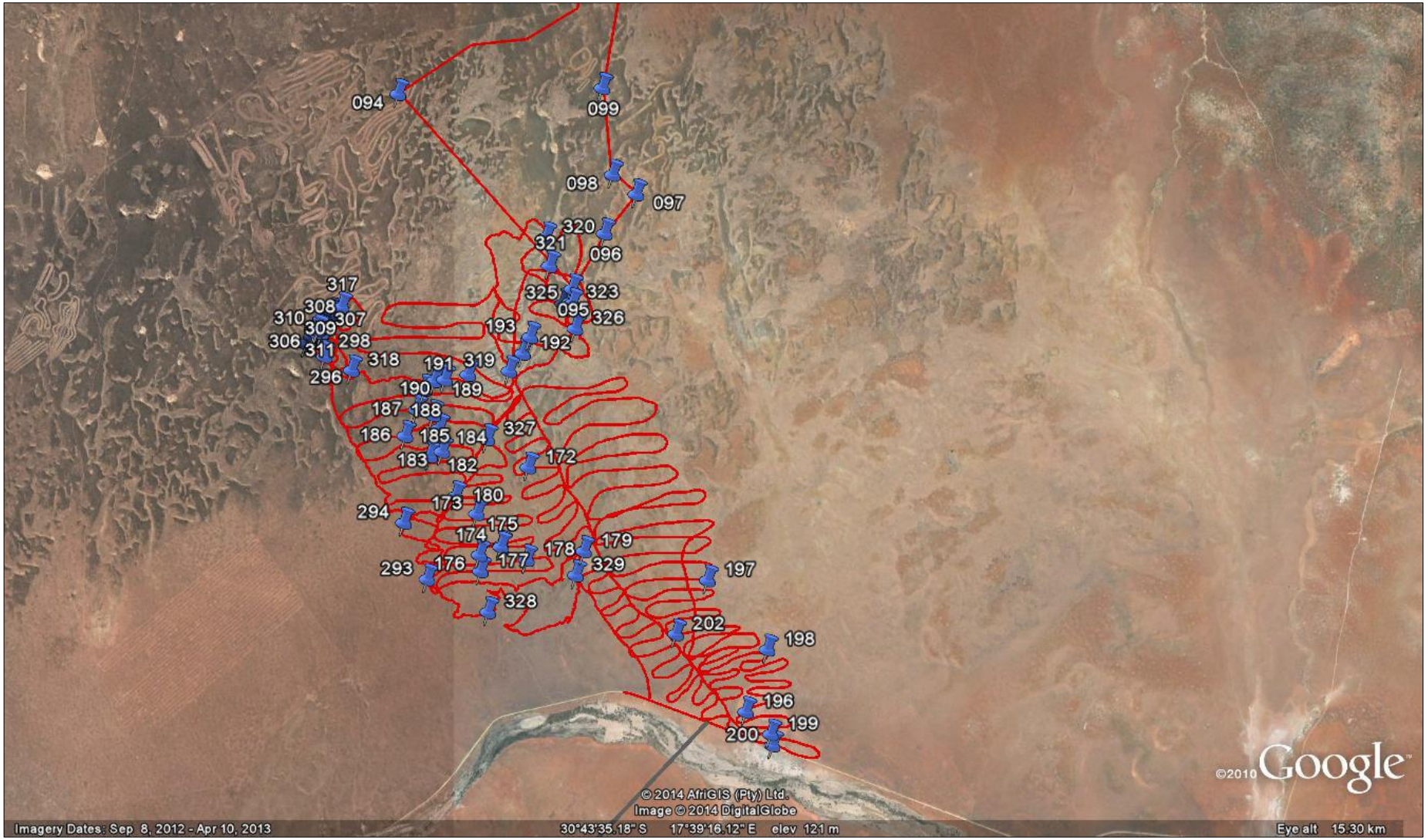

Figure 19. Roode Heuvel. Track paths and waypoints of archaeological finds.