DESKTOP HIA FOR WEST COAST PROSPECTING BY COLT RESOURCES (PTY) LTD

FOR EXIGENT ENVIRONMENTALS CC

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Abbreviations

HP	Historical Period
IIA	Indeterminate Iron Age
LIA	Late Iron Age
EIA	Early Iron Age
ISA	Indeterminate Stone Age
ESA	Early Stone Age
MSA	Middle Stone Age
LSA	Late Stone Age
HIA	Heritage Impact Assessment
PIA	Palaeontological Impact Assessment

INTRODUCTION

Colt Resources (Pty) Ltd is proposing to conduct prospecting activities on various farms along the West Coast of South Africa for Phosphate Ore. The prospecting application involves geophysical surveying, geological mapping and drilling on various farms along the West Coast of South Africa. The proposed prospecting application area will be located North and East of Elands Bay in the Cedarberg Local Municipality and South and East of Strandfontein in the Matzikama Local Municipality, Western Cape Province. The prospecting application involves geophysical surveying, geological mapping and drilling on various farms along the West Coast of South Africa. No bulk sampling to be undertaken. Due to the prospecting application being within 500 m of wetlands and 100 m of watercourses, a Water Use License Application will be required.

The phosphate distribution in the farms covering the area under prospecting will be determined following the mineral exploration methods which are outlined in the following text. These exploration methods are planned to follow the mineral exploration value chain where a systematic, phased and cost effective approach of determining the minerals distribution is followed. At the end of each phase, a decision will be taken to proceed or to abandon the project.

There will be non-invasive and invasive prospecting. Planned invasive prospecting methods entail conducting drilling to ascertain the existence of the expected minerals, its thickness and distribution. Samples will be taken and analyzed. The number of boreholes planned is 100:

- Soil Sampling:
- Auger Drilling:
- Reconnaissance drilling:
- Trenching:
- Resource drilling:
- Feasibility drilling:

The depths will vary from very shallow (approx. 2m) to nearly 100m. The exact depths of the boreholes will be determined while the drilling program is underway as influenced by the depths and dips measured in the previous boreholes.

Trenching will be conducted where deposits have been determined to occur very close to the surface. Twenty trenches are planned to be excavated and the length of the trenches will be determined by the burial depth. Trenches will not be conducted any deeper than 2m for all intents and purposes.

GENERAL HISTORICAL BACKGROUND OF THE STUDY AREA

The archaeology of the West Coast has been studied intensely since the 1960s. With the onset of mining activity in the late 1980s onwards there have been many archaeological impact assessments as well as foci for academic studies. The results have indicated a span of 1.5 million years of human history. Early and Middle Stone Age sites tend to be in the open and represented by scatters of stone tools. The Late Stone Age is also represented in these scatters however the better preserved sites occur in the shelters and overhangs that dot the landscape. There appears to be a dramatic increase in human activity between 3 000 and 4 000 years ago, where large (shellfish) megamiddens occur. These decreased slightly between 3 000 and 2 000 years ago.

Approximately 2000 years ago the first KhoeKhoe herders arrived in the Western Cape. The interactions between the hunter-gatherers and herders have resulted in many debates (and thesis) in academia. The two sides are referred to the Isolationists and Revisionists, where the former sees two distinct groups on the landscape, while the latter argues that they formed one social group. This is a broad summary of the arguments.

The arrival of European colonisers in the Cape in 1652 started another interaction. By 1680s Simon van der Stel and company was passing through this area on trips to Namaqualand. Shortly thereafter the West Coast was regularly traversed by European

settlers resulting in small pox epidemics that decimated indigenous populations and leaving open lands that were then colonised.

The history of the area thus covers a very long period and includes several socioeconomic groups interacting with each other.

FIG. 1 GENERAL LOCATION OF THE STUDY AREA

FIG. 2: TOPOGRAPHICAL MAP OF THE NORTHERN STUDY AREA

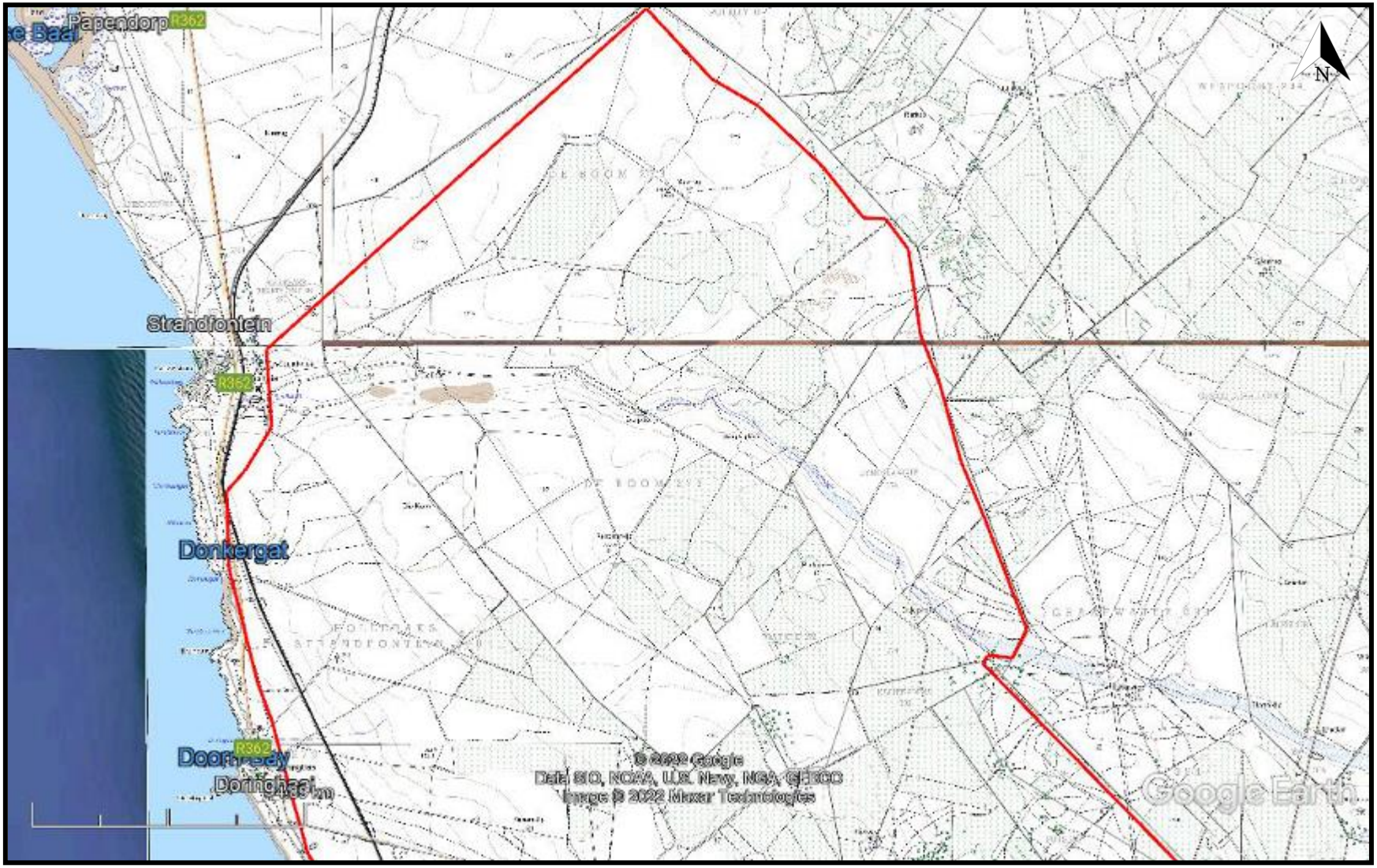


FIG. 3: TOPOGRAPHICAL MAP OF THE MIDDLE STUDY AREA

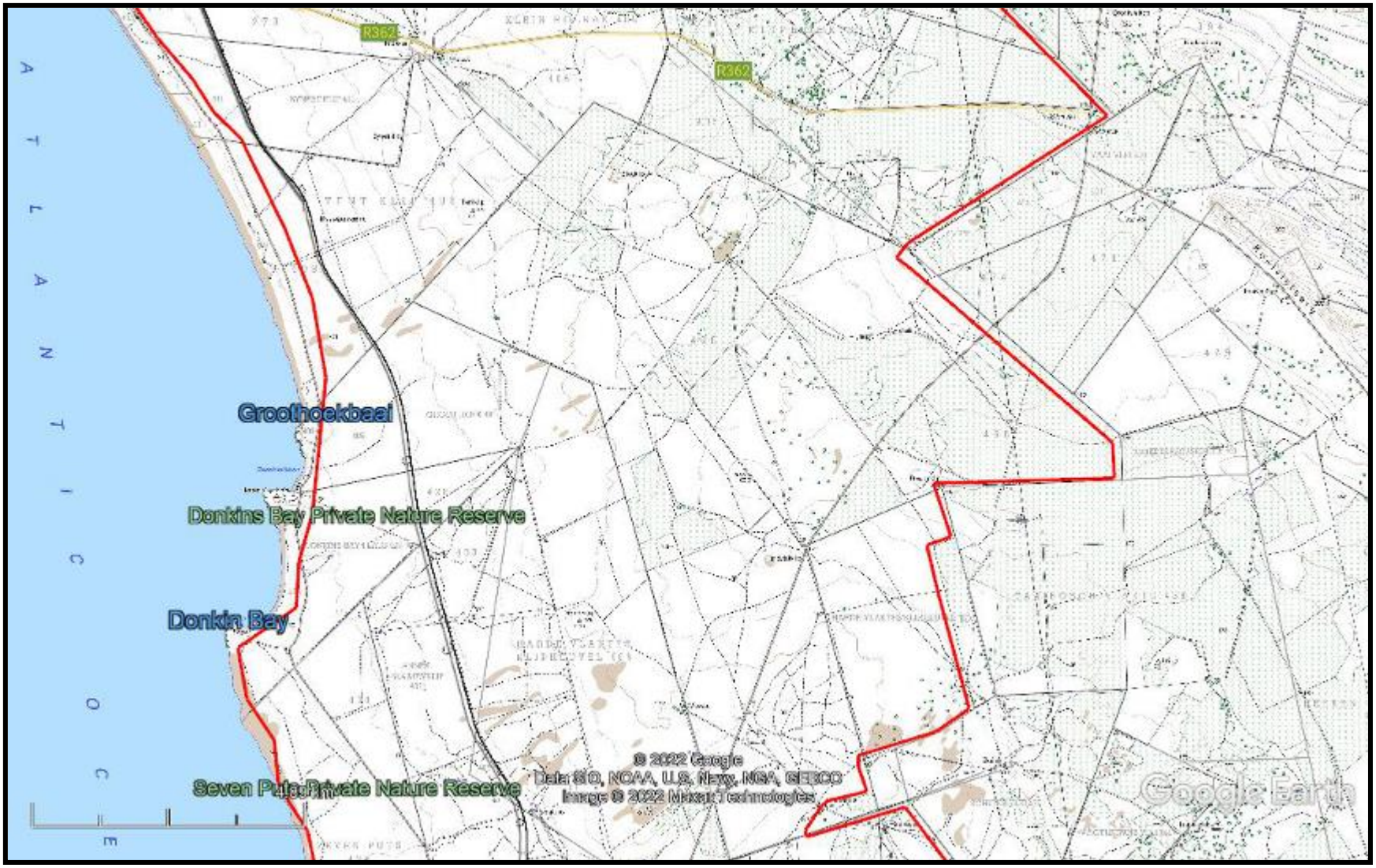


FIG. 4: TOPOGRAPHICAL MAP OF THE SOUTHERN STUDY AREA

FIG. 5: AERIAL MAP OF THE NORTHERN STUDY AREA

FIG. 6: AERIAL MAP OF THE MIDDLE STUDY AREA

FIG. 7: AERIAL MAP OF THE SOUTHERN STUDY AREA

NATIONAL HERITAGE RESOURCES ACT OF 1999

The National Heritage Resources Act of 1999 (pp 12-14) protects a variety of heritage resources. This are resources are defined as follows:

1. **"**For the purposes of this Act, those heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations must be considered part of the national estate and fall within the sphere of operations of heritage resources authorities.
2. Without limiting the generality of subsection (1), the national estate may include—
   - 2.1. Places, buildings, structures and equipment of cultural significance;
   - 2.2. Places to which oral traditions are attached or which are associated with living heritage;
   - 2.3. Historical settlements and townscapes;
   - 2.4. Landscapes and natural features of cultural significance;
   - 2.5. Geological sites of scientific or cultural importance;
   - 2.6. Archaeological and palaeontological sites;
   - 2.7. Graves and burial grounds, including—
     - 2.7.1. Ancestral graves;
     - 2.7.2. Royal graves and graves of traditional leaders;
     - 2.7.3. Graves of victims of conflict;
     - 2.7.4. Graves of individuals designated by the Minister by notice in the Gazette;
     - 2.7.5. Historical graves and cemeteries; and
     - 2.7.6. Other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);
3. Sites of significance relating to the history of slavery in South Africa;
   - 3.1. Movable objects, including—

4. Objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
   4.1. Objects to which oral traditions are attached or which are associated with living heritage;
   4.2. Ethnographic art and objects;
   4.3. Military objects;
   4.4. objects of decorative or fine art;
   4.5. Objects of scientific or technological interest; and
   4.6. books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1(xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).
5. Without limiting the generality of subsections (1) and (2), a place or object is to be considered part of the national estate if it has cultural significance or other special value because of—
   5.1. Its importance in the community, or pattern of South Africa's history;
   5.2. Its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
   5.3. Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
   5.4. Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
   5.5. Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
   5.6. Its importance in demonstrating a high degree of creative or technical achievement at a particular period;
   5.7. Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
   5.8. Its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and

5.9. sites of significance relating to the history of slavery in South Africa”

METHOD

The method for Heritage assessment consists of several steps.

The first step forms part of the desktop assessment. Here we would consult the database that has been collated by Umlando. These database contain archaeological site locations and basic information from several provinces (information from Umlando surveys and some colleagues), most of the national and provincial monuments and battlefields in Southern Africa (http://www.vuvuzela.com/googleearth/monuments.html) and cemeteries in southern Africa (information supplied by the Genealogical Society of Southern Africa). We use 1st and 2nd edition 1:50 000 topographical and 1937 aerial photographs where available, to assist in general location and dating of buildings and/or graves. The database is in Google Earth format and thus used as a quick reference when undertaking desktop studies. Where required we would consult with a local data recording centre, however these tend to be fragmented between different institutions and areas and thus difficult to access at times. We also consult with an historical architect, palaeontologist, and an historian where necessary.

The survey results will define the significance of each recorded site, as well as a management plan.

All sites are grouped according to low, medium, and high significance for the purpose of this report. Sites of low significance have no diagnostic artefacts or features. Sites of medium significance have diagnostic artefacts or features and these sites tend to be sampled. Sampling includes the collection of artefacts for future analysis. All diagnostic pottery, such as rims, lips, and decorated sherds are sampled, while bone, stone, and shell are mostly noted. Sampling usually

occurs on most sites. Sites of high significance are excavated and/or extensively sampled. Those sites that are extensively sampled have high research potential, yet poor preservation of features.

Defining significance

Heritage sites vary according to significance and several different criteria relate to each type of site. However, there are several criteria that allow for a general significance rating of archaeological sites.

These criteria are:

1. State of preservation of:

1.1. Organic remains:

1.1.1. Faunal

1.1.2. Botanical

1.2. Rock art

1.3. Walling

1.4. Presence of a cultural deposit

1.5. Features:

1.5.1. Ash Features

1.5.2. Graves

1.5.3. Middens

1.5.4. Cattle byres

1.5.5. Bedding and ash complexes

2. Spatial arrangements:

2.1. Internal housing arrangements

2.2. Intra-site settlement patterns

2.3. Inter-site settlement patterns

3. Features of the site:

3.1. Are there any unusual, unique or rare artefacts or images at the site?

3.2. Is it a type site?

3.3. Does the site have a very good example of a specific time period, feature, or artefact?

4. Research:

4.1. Providing information on current research projects

4.2. Salvaging information for potential future research projects

5. Inter- and intra-site variability

5.1. Can this particular site yield information regarding intra-site variability, i.e. spatial relationships between various features and artefacts?

5.2. Can this particular site yield information about a community's social relationships within itself, or between other communities?

6. Archaeological Experience:

6.1. The personal experience and expertise of the CRM practitioner should not be ignored. Experience can indicate sites that have potentially significant aspects, but need to be tested prior to any conclusions.

7. Educational:

7.1. Does the site have the potential to be used as an educational instrument?

7.2. Does the site have the potential to become a tourist attraction?

7.3. The educational value of a site can only be fully determined after initial test-pit excavations and/or full excavations.

8. Other Heritage Significance:

8.1. Palaeontological sites

8.2. Historical buildings

8.3. Battlefields and general Anglo-Zulu and Anglo-Boer sites

8.4. Graves and/or community cemeteries

8.5. Living Heritage Sites

8.6. Cultural Landscapes, that includes old trees, hills, mountains, rivers, etc related to cultural or historical experiences.

The more a site can fulfill the above criteria, the more significant it becomes. Test-pit excavations are used to test the full potential of an archaeological deposit. This occurs in Phase 2. These test-pit excavations may require further excavations if the site is of significance (Phase 3). Sites may also be mapped and/or have artefacts sampled as a form of mitigation. Sampling normally occurs when the artefacts may be good examples of their type, but are not in a primary archaeological context. Mapping records the spatial relationship between features and artefacts.

The above significance ratings allow one to grade the site according to SAHRA's grading scale. This is summarised in Table 1.

TABLE 1: SAHRA GRADINGS FOR HERITAGE SITES

SITE SIGNIFICANCE	FIELD RATING	GRADE	RECOMMENDED MITIGATION
High Significance	National Significance	Grade 1	Site conservation / Site development
High Significance	Provincial Significance	Grade 2	Site conservation / Site development
High Significance	Local Significance	Grade 3A / 3B	
High / Medium Significance	Generally Protected A		Site conservation or mitigation prior to development / destruction
Medium Significance	Generally Protected B		Site conservation or mitigation / test excavation / systematic sampling / monitoring prior to or during development / destruction
Low Significance	Generally Protected C		On-site sampling monitoring or no archaeological mitigation required prior to or during development / destruction

DESKTOP STUDY

The desktop study consisted of analysing various maps for evidence of prior habitation in the study area, as well as for previous archaeological surveys. I also used various sources for historical information.

PREVIOUS ACHAEOLOGICAL & HERITAGE SURVEYS

No national monuments, battlefields are known to occur in the study area. There is a cemetery within the study area on the border of Lamberts Bay.

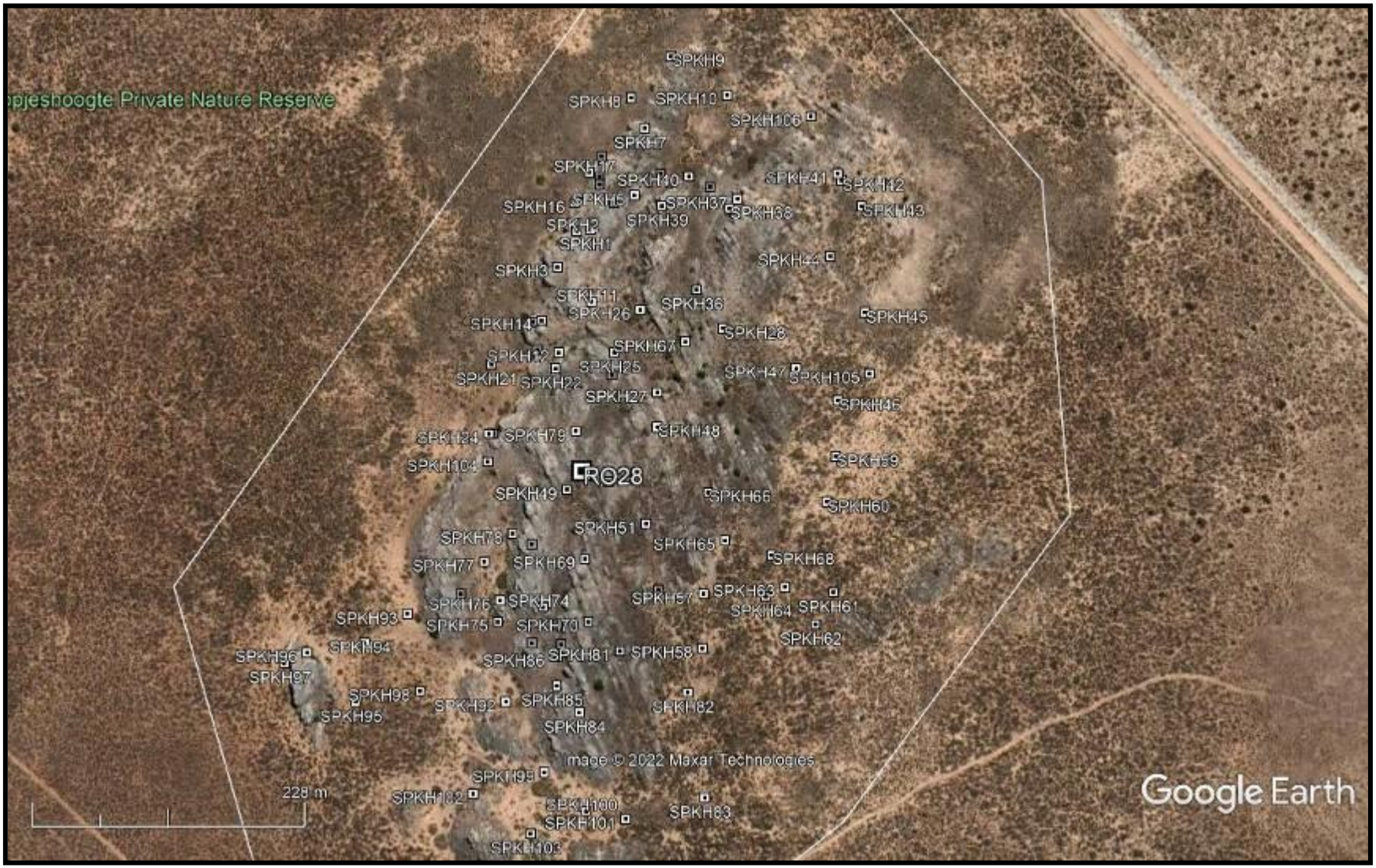
Several Archaeological and heritage impact assessments have been undertaken inside of the study (ACRM 2007; ACO 1995a, 1995b; Mannhire 1998, 2010; SARU 1982, 1988). The locations of these finds are shown in fig. 8. These surveys located Early, Middle and Late Stone Age sites of which mostly occur in the open. These sites consists of the following:

- Deflation hollows with a variety of stone tools with and without pottery
- Shell middens with and without pottery
- Rock outcrops:
    - Shelters/caves with archaeological deposit
    - Used as raw material source
    - Rock art
    - Hides/wind breaks (for hunting or domestic)
- Historical buildings
    - Farmsteads
    - Farm labourer' houses
    - Family and farm labourers' graves

Previous systematic surveys in the general area indicate that there will be a high number of archaeological sites within the study area (fig. 8). Several of these would require sampling and/or excavations. These sites would also have human graves that would be of high significance. An example of the density of sites can be seen at R028 (or Soutpansklipheuwel). Mannhire (2010) surveyed this area and recorded 103 sites and/or artefact scatters around the rock outcrop (fig. 9). The concentration of sites around these outcrops suggests that other outcrops could have a similar concentration.

FIG. 8: LOCATION OF RECORDED ARCHAEOLOGICAL SITES

FIG 9: RECORDED SITES AT R028 (SOUTPANSKLIPHEUWEL)



Rock outcrops tend to have overhangs, caves or shelters that would have archaeological deposits. The area in front of the outcrops could also be used as living areas, such as the KhoeKhoe sites in Vredendal. These could be of high significance and would require archaeological excavations. The rock outcrops are also a raw materials source for Stone Age people and they would include quarrying and manufacturing sites.

A Deeds Office search of some of the original farms indicate that the oldest farm dates to 1843; however, older farms do exist in the general area. The farm buildings and/or ruins would require sampling and/or excavations. These would be mostly of medium significance. The existing buildings would need to be assessed by an architect historian to determine their vernacular significance. Table 2 lists some of these farms and their dates of being surveyed. Leasing or buying of the land tended to occur shortly after the land was surveyed. The Surveyor General online maps has been offline since the beginning of 2022, and not all of the farms were available. The results from Table 2 are from a previous survey.

TABLE 2: SURVEYOR GENERAL DATES OF THE MAIN FARMS

ERF	SGD NUMBER[1]
KATMAKOEP 183	2951/1918
BAKLEI 277	2550/1897
GRAAFWATER 394	1529/1913
BAKLIPLAAS 182	2549/1897
POT KLEY 181	364/1843
ZANDKRAAL A 180	2548/1897
MELKBOOMSDRIFT 184	7993/1947
KLEINBEGIN 506	3642/2002
KATMAKOEP 279	2951/1918

[1] The date of the survey occurs after the forward slash

MAP WORK RESULTS

Figures 5 – 9 show the location of buildings per map. I used the following maps to note buildings and features:

1. 1942 aerial photographs
2. 1964 1st edition 1:50 000 topographical maps
3. 2003 3rd edition 1:50 000 topographical maps
4. Google Earth 2020 imagery

This allows for the identification of known buildings and/or features and gives a tentative date for some of them. This is summarised in Table 3. The map work cannot locate archaeological sites; however, it can note areas that would be of possible high sensitivity, e.g. rock outcrops and areas close to the high water mark.

The Surveyor General maps indicates that many of the farms in the general area predate the 20th century. These farms will have main house buildings, family cemeteries, labourers' houses and general farm buildings. Some are now in ruin, while others appear to be currently inhabitated. All buildings older than 60 years in age are automatically protected by the heritage legislation and would require assessment by a qualified architect historian. The vernacular architecture of the area is considered to be of medium to high significance. These buildings will also have associated middens that are protected by legislation. Thus, the building and immediate surrounding area will be of heritage significance.

Those buildings that are now in ruin are also protected by the heritage legislation and would require assessment by an archaeologist. I suggest that all buildings are assessed before operation stage in case some are considered to be of high significance.

The desktop noted seven features within the study area from the 1942 and 2020 maps. These are not buildings, but appear to be built structures. Those

features on the 1942 map are often no clear enough to ascertain if they are buildings or natural features, but caution to the wind is given. Some features on the 2020 Google Earth map appear to be circular features, and possible kraals. If these are kraals, then they will be related to KhoKhoe sites and be of high significance due to the rarity of these finds.

A total of 99 buildings occur within the study area. Most of these are historical buildings. Some of the buildings occur as clusters, e.g. at farmhouses, and these were counted as one building.

A total of 26 rock outcrops, or clusters of rock outcrops, were noted in the desktop. The rock outcrops vary in size and height, but all should be considered as having at least medium significance until assessed. The rock outcrops were used by the San and KhoKhoe for a variety of purposed. These could be for living areas, temporary shelters, kraals, windbreaks (for the smaller outcrops).

The shelters can vary in depth of deposit. Small shelters would be 0.5m deep, while large ones can be 5m+ in depth (e.g. Steenbokfontein just south of Lamberts Bay). These shelters are also known to contain rock art.

All shelters with archaeological deposit are considered to be of high significance.

The map work does not cover all types of heritage that will be found in the study area. Shell middens, and Stone Age scatters occur frequently in the general area but are not visible from a desktop level unless previously surveyed. Most of these shell middens will occur within 2km from the high water mark especially if there is a rock outcrop at the beach. Some of the middens can be mega-middens dating between 3000 – 4000 years ago.

FIG. 10: LOCATION OF HERITAGE SITES IN THE STUDY AREA IN 1942

FIG. 11: LOCATION OF HERITAGE SITES IN THE STUDY AREA IN 1961

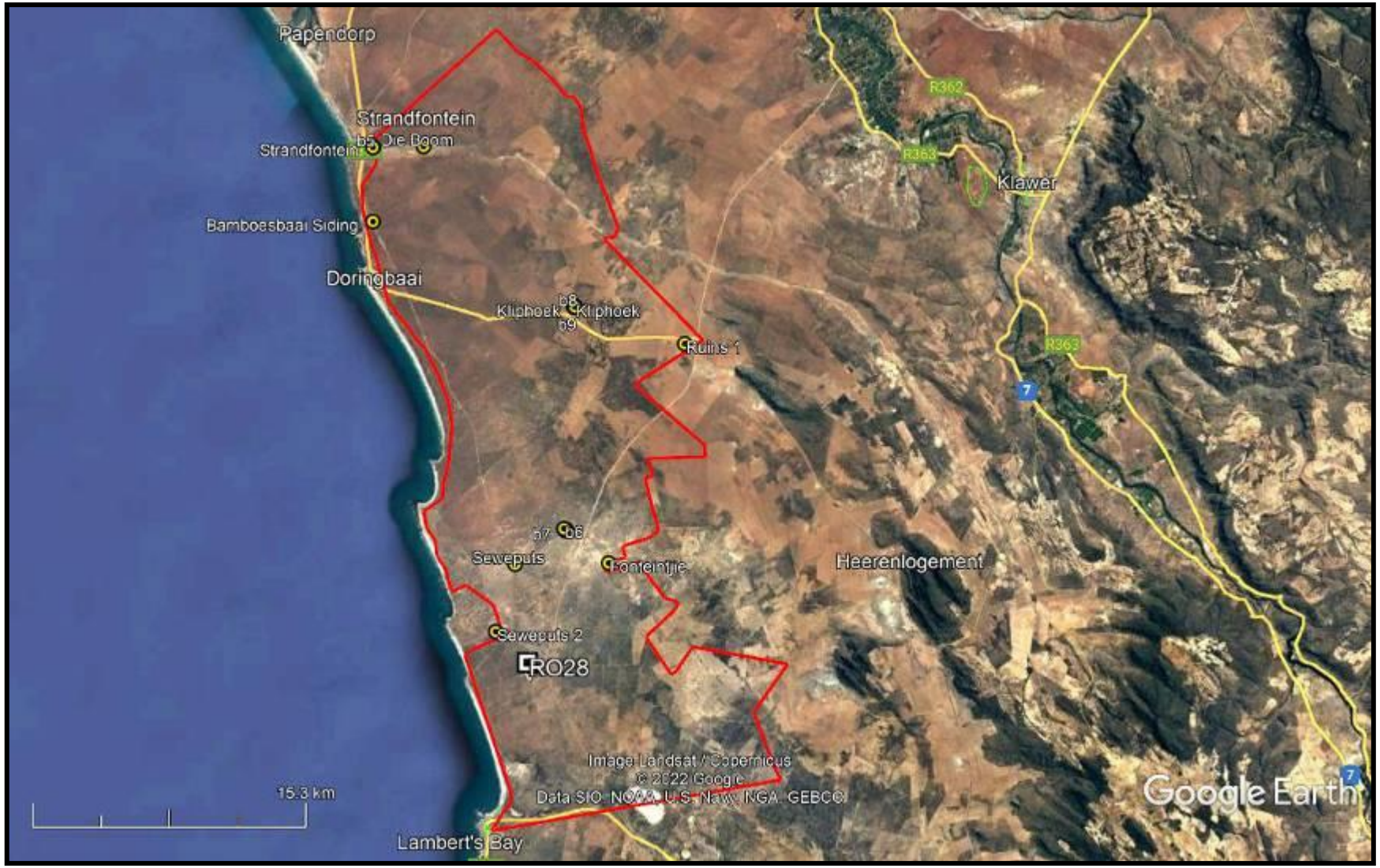


FIG. 12: LOCATION OF HERITAGE SITES IN THE STUDY AREA IN 1965

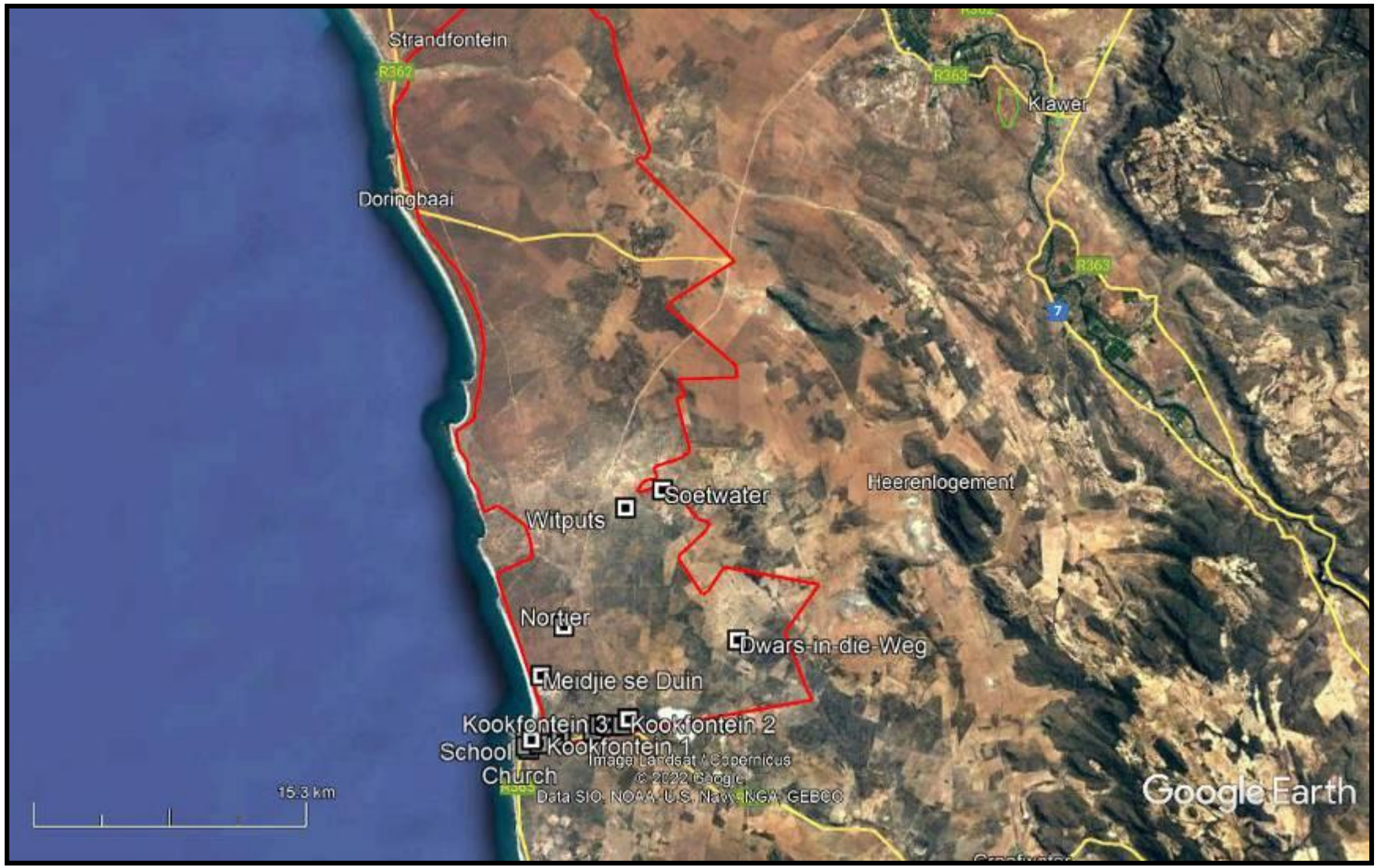


FIG. 13: LOCATION OF HERITAGE SITES IN THE STUDY AREA IN 1965

TABLE 3: DESKTOP SITES

Date	Name	Latitude	Longitude	Description
Archaeological	BKH1	-32.037703000	18.350336000	Boskopheuwel 1
	BKH2	-32.034522000	18.347839000	Boskopheuwel 2
	BPLOOP3	-31.827733000	18.258817000	Borrow Pit Loop 3 - 1
	DB1	-31.822797000	18.252875000	Doringbaai 1
	DB2	-31.825778000	18.249478000	Doringbaai 2
	DON2	-31.786722000	18.233694000	Donkergat 2
	DSS1	-32.026763000	18.298158000	Doorspring South 1
	DSS7	-32.022806000	18.297444000	Doorspring South 7
	HOLLE03	-31.836988000	18.255480000	Hollebaks 03
	HOLLE05	-31.832927000	18.249800000	Hollebaks 05
	HOLLE06	-31.833588000	18.265972000	Hollebaks 06
	HOLLE07	-31.827750000	18.244400000	Hollebaks 07
	HOLLE08	-31.834463000	18.261509000	Hollebaks 08
	HOLLE09	-31.841532000	18.302358000	Hollebaks 09
	HOLLE10	-31.841532000	18.302358000	Hollebaks 10
	HVK1	-31.997429000	18.343601000	Harde Vlakte 1
	HVK2	-31.999065000	18.354482000	Harde Vlakte 2
	HVKE1	-32.013240000	18.347354000	Harde Vlakte Klipheuvel Extension 1
	LBBP01	-32.085667000	18.343167000	Lamberts Bay Borrow Pit 01
	RO28	-32.012814112	18.330517231	Soutpansklipheuwel 103 Recorded Sites
1942	B31	-31.785248781	18.259125817	Building
	B32	-31.819048503	18.343783034	Building
	B33	-31.816979883	18.348879883	Building
	B34	-31.832445708	18.356595723	Building
	B35	-31.841286100	18.306136511	Building
	B36	-31.849879652	18.431103188	Building
	F10	-31.760431362	18.312963577	F10
	F10	-31.841997587	18.307405509	F10
	F14	-31.961280974	18.390697833	F14
	F15	-31.962401059	18.380562350	F15
	F7	-31.750672114	18.267393678	F7
	F8	-31.750325701	18.268680211	F8
	F9	-31.751690022	18.268642725	F9
	Fonteintjie	-31.963959443	18.378790859	Fonteintjie
	L10	-32.014286274	18.404430402	Building
	L11	-32.035404737	18.368301130	Building
	L12	-32.038551001	18.463356393	Building
	L13	-32.069145139	18.413330272	Building
	L14	-32.086790532	18.317710221	Building
	L15	-32.087435278	18.318267716	Building
	L16	-32.087835250	18.351151109	Building

	L17	-32.085123289	18.367166358	Building
	L18	-32.084727206	18.367698724	Building
	L19	-32.086387728	18.373219735	Building
	L4	-31.944198638	18.274284537	Building
	L5	-31.966895684	18.381760232	Building
	L6	-31.973990930	18.321622302	Building
	L7	-31.991455574	18.382442790	Building
	L8	-32.008435573	18.404623608	Building
	L9	-32.009570325	18.405323144	Building
	Witwater	-31.947533983	18.352332419	Witwater
1961	B5	-31.754879773	18.239162792	Building
	B6	-31.945886770	18.351927314	Building
	B8	-31.834783875	18.358372979	Building
	B9	-31.834091784	18.357721770	Building
	Bamboesbaai Siding	-31.791985237	18.239207137	Bamboesbaai Siding
	Die Boom	-31.754368770	18.269179304	Die Boom
	Fonteintjie	-31.963118001	18.378378646	Fonteintjie
	Kliphoek	-31.835036224	18.358514277	Kliphoek
	Ruins 1	-31.853251146	18.423280074	Ruins 1
	Seweputs	-31.963739040	18.323067204	Seweputs
	Seweputs 2	-31.997494895	18.311615871	Seweputs 2
	Strandfontein	-31.754348000	18.239443673	Strandfontein
	Witwater	-31.946942029	18.353035463	Witwater
	Witwater	-31.946588188	18.353244225	Witwater
1965	Abattoir	-32.090529207	18.331152098	Abattoir
	Albina 1	-32.084458570	18.361171801	Albina 1
	Albina 2	-32.084328681	18.361795620	Albina 2
	Cemetery	-32.093616352	18.318881845	Cemetery
	Church	-32.096405927	18.312457807	Church
	Dwars-In-Die-Weg	-32.041496256	18.436305713	Dwars-In-Die-Weg
	Kookfontein 1	-32.081747492	18.371463835	Kookfontein 1
	Kookfontein 2	-32.081286841	18.371647725	Kookfontein 2
	Kookfontein 3	-32.081096868	18.371165391	Kookfontein 3
	Meidjie Se Duin	-32.059344502	18.319711228	Meidjie Se Duin
	Nortier	-32.034691003	18.333273623	Nortier
	Panorama	-32.084261660	18.367493296	Panorama
	School	-32.094764635	18.310681190	School
	School	-32.091593204	18.314093058	School
	Shillingsplein 1	-32.087156881	18.350732485	Shillingsplein 1
	Shillingsplein 2	-32.087237851	18.351196461	Shillingsplein 2
	Shillingsplein 3	-32.087400023	18.351701679	Shillingsplein 3
	Soetwater	-31.966220797	18.391740932	Soetwater
	Van Puttensvlei 1	-32.084253836	18.357471354	Van Puttensvlei 1
	Van Puttensvlei 2	-32.084078248	18.357965665	Van Puttensvlei 2

	Van Puttensvlei 3	-32.084243393	18.358627409	Van Puttensvlei 3
	Van Puttensvlei 4	-32.084111358	18.359139566	Van Puttensvlei 4
	Van Rouwendal	-32.084080331	18.354426422	Van Rouwendal
	Witputs	-31.975231376	18.369866325	Witputs
2003	B10	-31.758140070	18.240128075	Building
	B11	-31.760911193	18.310950997	Building
	B12	-31.764893784	18.349191147	Building
	B13	-31.760148042	18.239823406	Building
	B17	-31.817529593	18.271166275	Building
	B18	-31.818936307	18.271201104	Building
	B19	-31.822144784	18.294477605	Building
	B20	-31.910915687	18.413800882	Building
	De Boom	-31.753318553	18.268224135	2020 Ruins
	De Boom 2	-31.753678748	18.268681602	2020 Ruins
	De Boom 3	-31.754044668	18.269498408	2020 Ruins
	Holbak	-31.842795191	18.307553648	Farmstead
	Holbakke	-31.838904838	18.301813964	Farmstead
	Kliphoek	-31.831293967	18.354693534	Several Buildings;
	Onderputs	-31.793494385	18.366095446	Building
	Ruins 2	-31.820310270	18.340327672	Ruins
	Skerpklip	-31.761140462	18.311434912	2020 Exists
	Strandfontein 1	-31.752954697	18.241668564	2020 Exists
	Strandfontein 2	-31.753554662	18.240884763	2020 Exists
	Strandfontein 3	-31.753713762	18.239714542	2020 Exists
	Strandfontein 4	-31.753200462	18.238676865	Building. Original Standfotnein Is 150m West
	Strandfontein 5	-31.752805734	18.238550322	Building
	Vaalvlei	-31.852600470	18.423242471	Building
	Vaalvlei 2	-31.854594745	18.431581542	Building
2022	B38	-31.934940575	18.294530818	Building
	B39	-31.770409269	18.358711388	Building
	B40	-31.764642779	18.368432847	Building
	B41	-31.763534271	18.363352478	Building
	B42	-31.769702067	18.369592810	Building
	B43	-31.774173562	18.373123327	Building
	B44	-31.786027006	18.360098613	Building
	B46	-31.786190428	18.349014145	Building
	B47	-31.762548000	18.362857000	Ruins
	B48	-31.762426000	18.363731000	Ruins
	B49	-31.763112000	18.364435000	Ruins>
	B50	-31.766011000	18.367946000	Ruins
	B51	-31.793418000	18.376958000	Ruins
	B53	-31.787166000	18.336735000	Ruins
	RO023	-32.079758720	18.335312053	Rock Outcrop
	RO029	-31.911813598	18.402158210	Bergopklip
	RO10	-31.855151932	18.297039770	Rock Outcrop

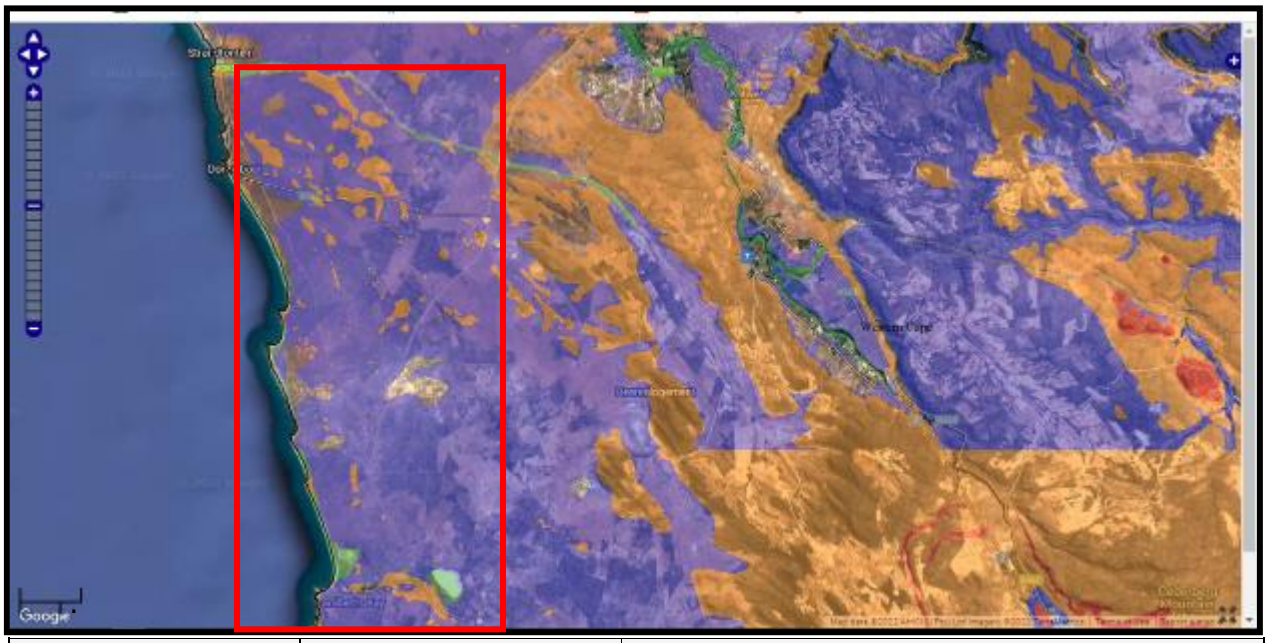
	RO11	-31.853639343	18.291239042	Rock Outcrop
	RO12	-31.861965976	18.339925441	Rock Outcrop
	RO13	-31.764624240	18.331645123	Rock Outcrop
	RO17	-31.780908831	18.303678729	Rock Outcrop
	RO18	-31.758748459	18.296745234	Rock Outcrop
	RO19	-31.790591229	18.316553960	Rock Outcrop
	RO20	-31.791597180	18.316125100	Rock Outcrop
	RO21	-31.796031786	18.327470371	Rock Outcrop
	RO22	-31.923751036	18.368939585	Rock Outcrop
	RO24	-32.088434706	18.346264261	Rock Outcrop
	RO25	-32.074636183	18.333570637	Rock Outcrop
	RO26	-32.074364872	18.335426389	Rock Outcrop
	RO27	-32.074794544	18.334822953	Rock Outcrop
	RO28	-32.012814112	18.330517231	Soutpansklipheuwel 103 Recorded Sites
	RO3	-31.821080564	18.340073371	Rock Outcrop
	RO30	-31.867242641	18.312786554	Rock Outcrop : Tentklip
	RO4	-31.818738699	18.345418804	Rock Outcrop
	RO5	-31.818336526	18.335920202	Rock Outcrop
	RO6	-31.817074208	18.323449567	Rock Outcrop
	RO8	-31.829577370	18.285878619	Rock Outcrop
	RO9	-31.838398539	18.297823807	Rock Outcrop
	Rock Outcrop 1	-31.833132594	18.355839713	Rock Outcrop
	Rock Outcrop 2	-31.841253485	18.303235071	Holle 9-10

PALAENTOLOGICAL SENSITIVITY

The palaeontology of the area is mostly of no or very low significance (fig. 14). Dr Alan Smith undertook a desktop survey of the proposed prospecting area (Appendix A). He states:

> "The bulk of this prospect is blue with scattered small patches of yellow. These sensitive palaeontological yellow inliers are rocks of the Graafwater and Peninsula Formations of the Table Mountain Group, which are not significantly fossiliferous.
>
> What lies below the loose sand (coded blue) is largely unknown; consequently a "Chance Find Protocol" (see Section 7) has been inserted into this report. Supratidal stromatolites may be found. These are not individually palaeontologically significant, however their coordinates are. Supratidal stromatolites are part of an internationally ongoing research project which includes the universities of: KwaZulu-Natal; Nelson Mandela Bay; Essex and Ulster (UK). It is a recommendation of this report that the locations and coordinates (x,y,z) of any shell or stromatolite layers be logged as part of the "Chance Find Protocol". It is recommended that any stromatolite occurrence be communicated directly to Dr Alan Smith (the author of this report), who is currently researching these stromatolites (see Section 9). Similarly the coordinates of shelly layers should be recorded as this will give data on raised beaches.
>
> The results of prospecting and the "Chance Find Protocol" will dictate whether or not further palaeontological work is required. In this case a suitably qualified palaeontologist must be consulted. The "Chance Find Protocol" must form part of the Environmental Management Programme (EMPr) for the site."

FIG. 14: PALAEONTOLOGICAL SENSITIVITY OF THE STUDY AREA



COLOUR	SENSITIVITY	REQUIRED ACTION
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

MANAGEMENT PLAN FOR EXPLORATION

The desktop study is limited in that it can only note general sensitive areas, and not pinpoint them. A 100m buffer should be placed around the edge of all sites. This buffer should ensure that middens from houses are not affected by drilling. The buffer around the base of the rock outcrops will ensure that talus slopes, living areas and potential features are not affected by drilling and its equipment.

A base line heritage study should be undertaken as part of a feasibility study to determine if there are any red flag rock outcrops. It should also assess some of the houses, shell middens and Stone Age scatters.

During the exploration and planning phase, a heritage consultant must be involved in identifying the appropriate drilling locations within the general areas of concern. Should a point of heritage concern be identified during this stage, the measures presented in the heritage impact assessment must be implemented/ the point must be relocated. After the initial airborne geophysical survey has been completed and target areas for drilling defined, a heritage specialist and ecologist will overlay these areas on the sensitivity map in order to identify areas that would need to be validated on site prior to commencing drilling.

All drilling cores must note the occurrence of shell in the core sample and at what depth. This can be used to identify the location of subsurface archaeological and palaeontological sites. It is highly unlikely that drilling activity will significantly damage archaeological sites: rather it can be used to plot the location of these sites. The exact type of drilling to be used needs to be verified by a suitably qualified archaeologist prior to drilling activity commencing.

All trenching needs to be assessed at a desktop level first by a suitably qualified archaeologist. This assessment must be initially in relation to the

desktop study results. The area of trenches need to be physically assessed before trenching begins. These trenches may require archaeological excavations and/or monitoring during trenching itself. Permits to excavate/sample and to damage archaeological sites will be needed if any sites are affected. This must be initiated at least 6 months in advance of any prospecting activity.

If the areas for trenching have been sampled by drilling activity, then this can also determine if heritage sites occur. An alternative would be to drill several cores along the trench line to determine the location of archaeological and palaeontological sites. If no heritage material occurs, then no further activity is required. If potential heritage material occurs then that trench must be excavated/monitored.

Table 4 lists the general impacts for heritage sites.

TABLE 4: HERITAGE IMPACTS

Aspect	Activity	Nature	Project phase	Type	Severity			Incidence		Risk class		
					Extent	Duration	Intensity	Frequency	Probability	Before mitigation		After mitigation
Heritage impacts -Impacts on archaeological artefacts												
No national monuments, battlefields, or historical cemeteries are known to occur in the study area. There were significant sites observed on the various maps maps..Extant buildings need to be assessed for the vernacular architectural value.	All activities	Negative	Prospecting	Direct	Local	Immediate	Low	Rare	Probable	15	**LOW**	**LOW**
	Comments/Mitigation: • 100m buffer should be placed around all noted sites, rock outcrops • A suitably qualified archaeologist and palaeontologist should attend the marking of borehole positions with the Colt Resources team after approval has been obtained for the project. Should any potential areas of significance be identified, these areas will be excluded from future drilling. • All drilling results must include the occurrence of marine shell (depth below surface and depth of deposit) to assist the location of subsurface shell middens and palaenotlogical beach levels. • After the initial airborne geophysical survey has been completed and target areas for drilling defined, a heritage specialist and ecologist will overlay these areas on the sensitivity map in order to identify areas that would need to be validated on site prior to commencing drilling. • All trenching areas need to be assessed by a field trip prior to trenching activity. This will be to ascertain whether archaeological sites occur within the trench. This may result in excavations and/or monitoring. • Any activity that will damage/disturb a heritage site will need a permit from SAHRA. This does not include small drilling cores.											

CONCLUSION

A desktop HIA was undertaken for a proposed mining lease that will be preceded by exploration drilling. The desktop consisted of analysing historical maps and researching the SAHRIS database for previous surveys. The results were that the general area is very sensitive to archaeological sites covering the last 1.5 million years. Hardly any archaeological work has been undertaken within the study area. The more significant sites would be concentrated around the rock outcrops; however, shell middens are very likely to occur closer to the sea.

The desktop study indicated that there are many buildings older than 60 years, and several may date to the 19th century. These buildings will have historical middens as well as cemeteries.

I suggested a 100m buffer around these sites/areas so that subsurface deposits are not affected.

The palaeontological significance for most of this area is mostly of low significance. However, Palaeontological beaches may occur. This will only be exposed by drilling activity initially. Thus all core samples with marine shell should be noted as these can be used to plot archaeological and palaeontological sites.

A general site survey should be undertaken to ground truth certain areas noted in the HIA, especially the “area of interest”. This can form the baseline HIA study as required by Rio Tinto.

REFERENCES

Maps

3118CC_CD Doringbaa 1964, 2003

3118CB Lutzville 1964, 2003

3118CA Papendorp 1964, 2003

10_001_00701 - 10_001_00703

10_001_00695 - 10_001_00699

10_001_00627 - 10_001_00628

11_021_00590 - 11_021_00595

11_022_00559 - 11_022_00565

11_023_00541 - 11_023_00551

11_024_00492 - 11_024_00506

11_025_00478 - 11_025_00490

11_026_00429 - 11_026_00438

11_027_00418 - 11_027_00428

11_028_00366 - 11_028_00374

11_029_00357 - 11_029_00365

11_030_00312 - 11_030_00320

11_031_00305 - 11_031_00309

11_032_00265 - 11_032_00257

11_033_00248 - 11_033_00256

Database

SAHRIS

ACRM 2007 Archaeological investigation of a Proposed Borrow Pit Alongside The Transnet Sishen-Saldanah Raiulway Line – Loop 3.

ACO 1995a Phase One Archaeological Investigation Of A Portion Of The Farm Hollebaks Strandfontein, Doringbaai For Kind David Estates

ACO 1995b Phase 1 Archaeological Investigation: Doorspring South. For Van Der Merwe Duxbury & Kirkwood Town And Regional Planners

ACO 2003. Phase 1 Archaeological Assessment Of 4 Proposed Borrow Pits Situated On The Lamberts Bay Trunk Road (Lamberts Bay – Wagendrift)

Mannhire, A.H. 1998 Site record forms

Mannhire, A.H. 2010; Site record forms

SARU 1982 Site record forms

SARU 1988 Site record forms

EXPERIENCE OF THE HERITAGE CONSULTANT

Gavin Anderson has a M. Phil (in archaeology and social psychology) degree from the University of Cape Town. Gavin has been working as a professional archaeology*ist and heritage impact assessor since 1995. He joined the Association of Professional Archaeologists of Southern Africa in 1998 when it was formed. Gavin is rated as a Principle Investigator with expertise status in Rock Art, Stone Age and Iron Age studies. In addition to this, he was worked on both West and East Coast shell middens, Anglo-Boer War sites, and Historical Period sites.

DECLARATION OF INDEPENDENCE

I, Gavin Anderson, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.

Gavin Anderson
Archaeologist/Heritage Impact Assessor

APPENDIX A

PIA DESKTOP

DESKTOP PALEONTOLOGICAL ASSESSMENT FOR DOORING BAAI DIAMOND PROSPECT, WESTERN CAPE

FOR

UMLANDO: Archaeological Surveys & Heritage Management
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by

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15 February 2022

Declaration of Independence

This report has been compiled by Dr Alan Smith (Pr. Sc. Nat.) of Alan Smith Consulting, Durban. The views expressed in this report are entirely those of the author, if not then the source has been duly acknowledged. No other interest was displayed during the decision making process for the Project.

Specialist: Dr Alan Smith

Signature: 

EXECUTIVE SUMMARY

Alan Smith Consulting was appointed by **UMLANDO: Archaeological Surveys & Heritage Management** to conduct a Desk-Top field assessment of the potential impacts to **Palaeontology Resources** that might occur through the activities of the proposed Dooringbaai Diamond Prospect Area, Western Cape.

Section 38 of the National Resources Act No 25 of 1999 (Heritage Resources Management), requires a Palaeontological Impact Assessment (PIA) to assess any potential impacts to palaeontological heritage.

The chances of encountering fossils in the Doringbaai-Lamberts Bay Prospect are probably **Low,** but it is not known for certain as what lies below the dune sand is largely unknown The Table Mountain Group rocks are not likely to contain any significant fossil material. Further, they are unlikely to be a target of this operation. They would only be impacted by roadways.

It is a recommendation of this report that the coordinates of shell layers or stromatolites encountered during coring are recorded. Further a **"Chance Find Protocol"** (see Section 7) has been inserted into this report. The results of these two processes will dictate whether further palaeontological work is required.

ACRONYMS

BA:	Basic Assessment
EDTEA:	(Department of) Economic Development, Tourism and Environmental Affairs
HIA:	Heritage Impact Assessment
PIA;	Palaeontological Impact Assessment
SAHRA:	South African Heritage Resource Agency
SAHRIS:	South African Heritage Resources Information System

1. TERMS OF REFERENCE

Alan Smith Consulting was requested by **UMLANDO: Archaeological Surveys & Heritage Management** to provide a Desk-Top Palaeo Impact Assessment for the proposed Dooringbaai Prospect (Figure 1). As this is a prospect, only coring and trial hole digging will take place. This report is to meet the requirements of the National Environmental Management Act (Act 107 of 1998) [as amended] Environmental Impact Assessment (EIA) regulations, Appendix 6.

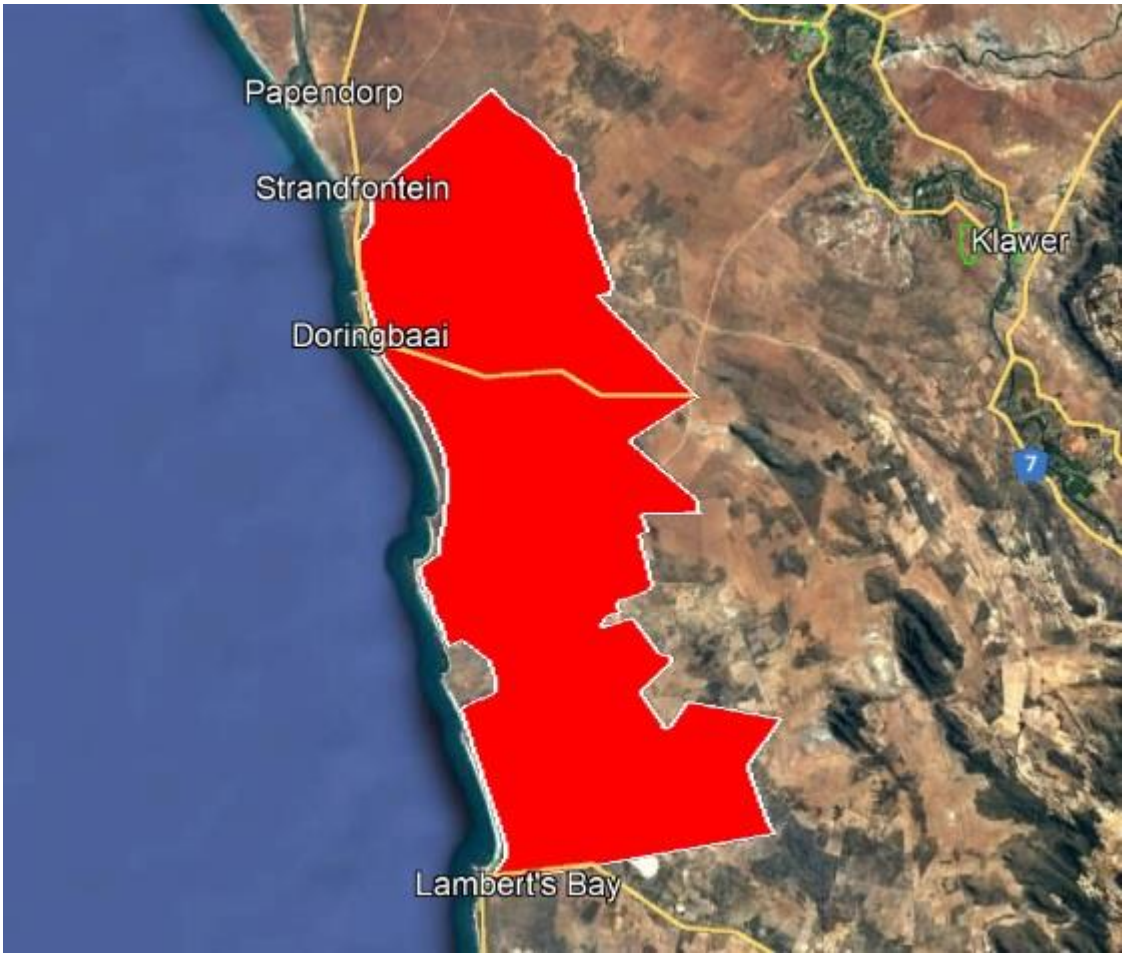

Figure 1: Location of Dooringbaai Diamond Prospect.

2. SCOPE AND PURPOSE OF REPORT

A Palaeontological Impact Assessment (PIA) is a means of identifying any significant palaeontological material before development begins, so that these can be managed in such a way as to allow the development to proceed (if appropriate) without undue impacts to the fragile heritage of South Africa. This Desk-Top investigation fulfills the requirements of the heritage authorities (SAHRA), such that a comment can be issued by them for consideration by the competent authority (EDTEA), who will review the Basic Assessment (BA) and grant or refuse authorisation. The PIA report will outline any management and/or mitigation requirements that will need to be complied with from a heritage point of view and that should be included in the conditions of authorisation, should this be granted.

3. METHODOLOGY

Geological maps, a literature review and personal experience (see Section 10) were used in this research.

4. GEOLOGY

4.1 Surficial Sediment (Q1)

The area is dominated by Q1, described as sandy soil (Clan William (3218) 1: 250 000 geological map (Figure 2). It is not known what underlies this sandy soil, but it will certainly be underlain in many places by rocks of the Table Mountain Group.

Figure 2: Extract from the Clan William (3218) geological map showing the Lambertsbaai map portion.

4.2 Q5 Calcareous Dunes (Figure 2)

Small pockets of calcareous dune sand are present near the coast, especially just north of Lambertsbaai (Figure 2).

4.3 Sealevel Highstands (not on geological map)

Several sea level high stands are present on the Westcoast. These are represented by beach and shallow water deposits. They are characterized by shell debris. Coralline algae and stromatolites have also been noted. The stromatolites are of the supratidal stromatolite type (Smith et al., 2018; Rishworth et al., 2020).

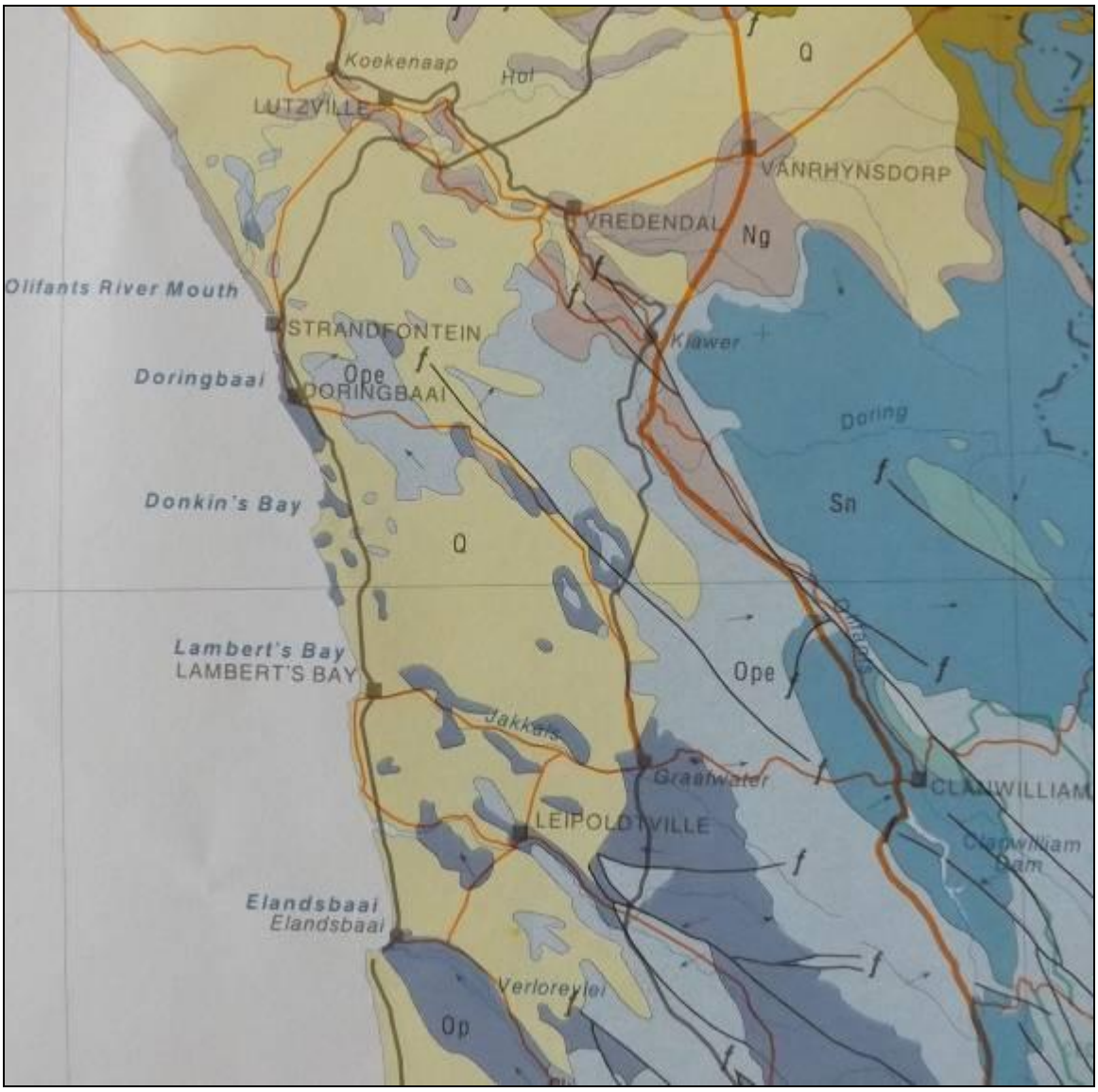

Figure 3: Extract from the 1:1000 000 geological map of South Africa.

4.4 Sediments underlying the Q1 and Q5 Sand & Calcareous Dunes (not on geological map)

It is not known what may underly this material besides rocks of the Table Mountain Group. Little information is available, however, a desk-top PIA was undertaken in the Vredendal area to the north (Almond, 2011). The following data is from this source.

Most of the area is covered by fine-grained aeolian sands (Qs) which can be underlain by older calcareous or loamy soils. These sands are derived from alluvial sands which were brought to the coast by the palaeo-Olifants River, Subsequently these sands were blown inland by the prevailing southwesterly wind to form sief dunes of Pleistocene to Recent age.

Older alluvial deposits (gravel, sand, silt) associated with the Holrivier are also found in the Vredendal region (Almond, 2011) and may well underlie aeolian sands elsewhere, These alluvial sediments may be representative of the Pliocene – Pleistocene age Quagga's Kop Formation. This comprises gravel, sand and silt, which is partially cemented. These sediments are interpreted as braided fluvial to alluvial plain sediments. The Quagga's Kop gravels are locally diamondiferous.

4.5 Graafwater Formation (Op)

This is the basal unit of the Table Mountain Group. The Calvinia (3118) geological map was not available. Op is described in the Clan William (3218) geological map as reddish brown shale, sandy shale and siltstone.

4.6 Peninsula Group sandstone (Ope)

This is a quartz arenite (highly quartzitic sandstone).

4.7 Origin of the Cape Supergroup,

The Graafwater and overlying Peninsula Formations mark the base of the Table Mountain Group, which is itself the base of the Cape Supergroup. The sediments which became lithified to form the Cape Supergroup rocks were deposited in a rift valley located in southern Gondwana, just south of Southern Africa. This took place during the Cambrian-Ordovician Periods (from about 510 Ma and ending at about 330-350 Ma (Compton, 2004). The sediment deposited within this rift valley lithified to form an 8 km thick unit. Starting at about 330 Ma the Falkland Plateau moved back towards Africa, during the Carboniferous and Early Permian periods. This process caused folding

of the Cape Supergroup into dominantly east-west parallel folds, however a north-south component was present, due to collision with eastward moving Patagonia and what would become southern Africa. Subduction of the paleo-Pacific Plate beneath the Falkland Plateau resulted in further compression and built a mountain range of Himalayan proportions (McCarthy & Rubidge, 2005).

5. PALAEONTOLOGY

The palaeosensitivity of the prospect is illustrated in Figure 3. The colour coding used in the SAHRIS Palaeosensitivity Map are shown in Table 1.

Figure 3: Palaeosensitivity of the Dooringbaai Prospect. Extract from Sahris Palaeosensitivity Map).

Table 1: Summary of SAHRIS categories

Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required

5.1 Q1 and Q5 Sand & Calcareous Dunes (Blue in Figure 3)

These are not known to be fossiliferous however there is no reason why they should not be. A “Chance Find Protocol” has been included for this eventuality.

5.2 Sealevel Highstand Sediments (Not shown on maps)

Shell debris is common along these beachlines but this is common and not palaeontological significant. Similarly, coralline algae is common, but not palaeontologically significant. Lacustrine and marine stromatolites may also occur. Supratidal stromatolites are known from the Atlantic Ocean stormbeach (Smith et al., 2018; Rishworth et al., 2020). Supratidal stromatolites have also been recorded from raised beaches, which together with modern supratidal stromatolites is part of ongoing new research (Smith et al., 2018; Rishworth et al., 2020; Cooper et al., 2022). Stromatolite research provides significant information on the “story of life” and astrobiology. Stromatolites have been observed by this author on a raised beach (about 8m amsl) just south of Lambertsbaai (Figure 4). These may occur elsewhere.

Figure 4: Example of stromatolites (below the pen) growing on a palaeo-storm beach (shelly layer) 8km south of Lambertsbaai. This example is about 8m amsl.

5.3 Sediments underlying the Q1 and Q5 Sand & Calcareous Dunes

Fossil termite mounds are known (De Beer et al., 2002). These may reflect pluvial episodes (high rainfall). Carbon 14 analysis gives dates in the range of 30-40 000 years BP for these fossil termite mounds (Midgley et al. 2002, Potts et al. 2009). Almond (2011) states that there are reports of Late Tertiary skeletal remains of terrestrial mammals within the diamondiferous deposits of the Quagga's Kop Formation (Hendy 1984). Lamont (1947) apparently recorded sharks teeth. The Late Tertiary Olifants River Gravels at Vredendal have yielded a range of Miocene silicified woods of tropical angiosperms (Bamford 1999). According to Visser and Toerien (1971) the Quagga;s Kop can be underlain by marine deposits (Almond, 2011). Such deposits may be found within the Dooringbaai proposed prospect.

Calcretised rhizoliths (fossil roots), invertebrate burrows, termite mounds, ostrich egg shells (Struthio) and shells of land snails such as Trigonephrus (Partridge et al. 2006, Almond 2008a, Almond & Pether 2008) are likely to be found. Fossil freshwater bivalves and gastropods (such as. *Corbula*, *Unio*), ostracods, charophytes (stonewort algae), diatoms and stromatolites (laminated microbial limestones) are associated with local watercourses and pans. Microfossils such as diatoms may be blown by wind into nearby dune sands.

Late Cenozoic deposits in this area are likely to have a LOW overall palaeontological sensitivity (De Beer et al. 2002, Almond & Pether 2008, Almond 2008a, b). Sparse mammalian bones, teeth and horn cores as well as remains of fish, amphibians, tortoises (or even crocodiles), petrified wood, freshwater molluscs and trace fossils may occasionally be expected in association with older alluvial sediments buried subsurface within the proposed development area.

5.4 Graafwater Formation (Yellow)

Trace fossils, may be locally abundant, but are of low diversity, in the Graafwater Formation (Almond 2008).

The following trace fossil taxa are known from the Graafwater Formation:

- dense assemblages of vertical tubular burrows (*Skolithos*, *Trichichnus*)
- U-shaped burrows (*Arenicolites, Diplocraterion*)
- bilobed vertical and horizontal burrows (*Rusophycus*, *Cruziana*)
- arthropod scratch marks (*Monomorphichnus*) and trackways attributed to trilobites, eurypterids (water scorpions) and possibly crustaceans (*Petalichnus, Palmichnium, Merostomichnites*) (Braddy & Almond 1999)
- complex annulated spreiten burrows of the ichnogenus *Arthrophycus*
- large conical to subcylindrical burrows of the problematic ichnogenus *Metaichna*

5.5 Peninsula Formation (Yellow)

Body fossils have never been recorded from the Peninsula Formation, but trace fossils are present. Most of these are also present in the Graafwater Formation (Rust 1967). The trace fossil assemblage is of low diversity sparse. The following trace fossils are recorded (Almond, 2008):

- trilobite scratch burrows (*Cruziana*, *Rusophycus*),
- arthropod trackways,
- *Arthrophycus*,
- *Skolithos.*

6. CONCLUSIONS

The bulk of this prospect is blue with scattered small patches of yellow. These sensitive palaeontological yellow inliers are rocks of the Graafwater and Peninsula Formations of the Table Mountain Group, which are not significantly fossiliferous.

What lies below the loose sand (coded blue) is largely unknown, consequently a "Chance Find Protocol" (see Section 7) has been inserted into this report. Supratidal stromatolites may be found. These are not individually palaeontologically significant, however their coordinates are. Supratidal stromatolites are part of an internationally ongoing research project which includes the universities of: KwaZulu-Natal; Nelson Mandela Bay; Essex and Ulster (UK). It is a recommendation of this report that the locations and coordinates (x,y,z) of any shell or stromatolite layers be logged as part of the "Chance Find Protocol". It is recommended that any stromatolite occurrence be communicated directly to Dr Alan Smith (the author of this report), who is currently researching these stromatolites (see Section 9). Similarly the coordinates of shelly layers should be recorded as this will give data on raised beaches.

The results of prospecting and the "Chance Find Protocol" will dictate whether or not further palaeontological work is required. In this case a suitably qualified palaeontologist must be consulted. The "Chance Find Protocol" must form part of the Environmental Management Programme (EMPr) for the site.

7. CHANCE FIND PROTOCOL

This Chance Find Protocol must be included in the site EMPr.

If any fossils are found, a Palaeontologist must be notified immediately by the ECO and/or EAP and a site visit must be arranged at the earliest possible time with the Palaeontologist.

In the case of the ECO or the Site Manager becoming aware of suspicious looking palaeo-material:

- The construction must be halted in that specific area and the Palaeontologist must be given enough time to reach the site and remove the material before excavation continues.

- Mitigation will involve the attempt to capture all rare fossils and systematic collection of all fossils discovered. This will take place in conjunction with descriptive, diagrammatic and photographic recording of exposures, also involving sediment samples and samples of both representative and unusual sedimentary or biogenic features. The fossils and contextual samples will be processed (sorted, sub-sampled, labeled, and boxed) and documentation consolidated, to create an archive collection from the excavated sites for future researchers.

Functional responsibilities of the Developer

1. At full cost to the project, and guided by the appointed Palaeontological Specialist, ensure that a representative archive of palaeontological samples and other records is assembled to characterize the palaeontological occurrences affected by the excavation operation.

2. Provide field aid, if necessary, in the supply of materials, labour and machinery to excavate, load and transport sampled material from the excavation areas to the sorting areas, removal of overburden if necessary, and the return of discarded material to the disposal areas.

3. Facilitate systematic recording of the stratigraphic and palaeo-environmental features in exposures in the fossil-bearing excavations, by described and measured geological sections, and by providing aid in the surveying of positions where significant fossils are found.

4. Provide safe storage for fossil material found routinely during excavation operations by construction personnel. In this context, isolated fossil finds in disturbed material qualify as “normal” fossil finds.

5. Provide covered, dry storage for samples and facilities for a work area for sorting, labeling and boxing/bagging samples.

6. Costs of basic curation and storage until collected. Documentary record of palaeontological occurrences must be done.

7. The contractor will, in collaboration with the Palaeontologist, make the excavation plan available to the appointed specialist, in which appropriate information regarding plans for excavations and work schedules must be indicated on the plan of the excavation sites. This must be done in conjunction with the appointed specialist.

8. Initially, all known specific palaeontological information will be indicated on the plan. This will be updated throughout the excavation period.

9. Locations of samples and measured sections are to be pegged, and routinely and accurately surveyed. Sample locations, measured sections, etc., must be recorded three-dimensionally if any “significant fossils” are recorded during the time of excavation.

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9. DETAILS OF SPECIALIST

Dr Alan Smith
Private Consultant: ***Alan Smith Consulting, 29 Brown's Grove, Sherwood, Durban, 4091***

&

Honorary Research Fellow: ***Discipline of Geology, School of Agriculture, Earth and Environmental Sciences, University of KwaZulu-Natal, Durban***.

Role: Specialist Palaeontological Report production

Expertise of the specialist:

- PhD in Geology (University of KwaZulu-Natal), Pr. Sc. Nat., I.A.H.S.
- Msc in Stromatolite research (9 refereed journal articles)
- Expert in Vryheid Formation (Ecca Group) in northern KZN, this having been the subject of PhD.
- Scientific Research experience includes: Fluvial geomorphology, palaeoflood hydrology, Cretaceous deposits.
- Experience includes understanding Earth Surface Processes in both fluvial and coastal environments (modern & ancient).
- Alan has published in both national and international, peer-reviewed journals. He has published + 50 journal articles with 497 citations (detailed CV available on request).
- Attended and presented scientific papers and posters at numerous international and local conferences (UK, Canada, South Africa) and is actively involved in research.

Selected recent palaeo-related work includes:

- Desktop PIA: Proposed middle income housing units on Portion 23 of Farm Lot H Weston 13026, Bruntville, Mpofana Local Municipality. Client: UMLANDO.
- Desktop PIA: Proposed ByPass Pipeline for Ulundi bulk water pipeline upgrade. Client: UMLANDO.
- Fieldwork PIA: Bhekuzulu Epangweni KZN water reticulation project, Cathkin Park. Client: Mike Webster, HSG Attorneys.
- Fieldwork PIA: Mpungoze water supply scheme, Empangeni. Client: Enviropro.
- Fieldwork PIA: Helpmekaar Dam. Client: Afzelia environmental consultants.
- Desktop PIA: Zuka valley, Ballito. Client: Mike Webster, HSG Attorneys.

- Mevamhlope proposed quarry palaeontology report. Client: Enviropro.
- Desktop PIA: Proposed Lovu Desalination site. Client: eThembeni Cultural Heritage.
- Desktop PIA: Tinley Manor phase 2 North & South banks: eThembeni Cultural Heritage
- Desktop PIA: Tongaat. Client: eThembeni Cultural Heritage.
- Palaeontological Assessment Reports (3) to Scatec Solar SA (Pty) Ltd on an Appraisal of Inferred Palaeontological Sensitivity for a Potential Photo Voltaic Park at (1) Farm Rooilyf near Groblershoop, N Cape; (2) Farm Riet Fountain No. Portions 1 and 6, 18km SE of De Aar, N Cape; and (3) Dreunberg, near Burgersdorp, Eastern Cape. Client: Sustainable Development Projects.