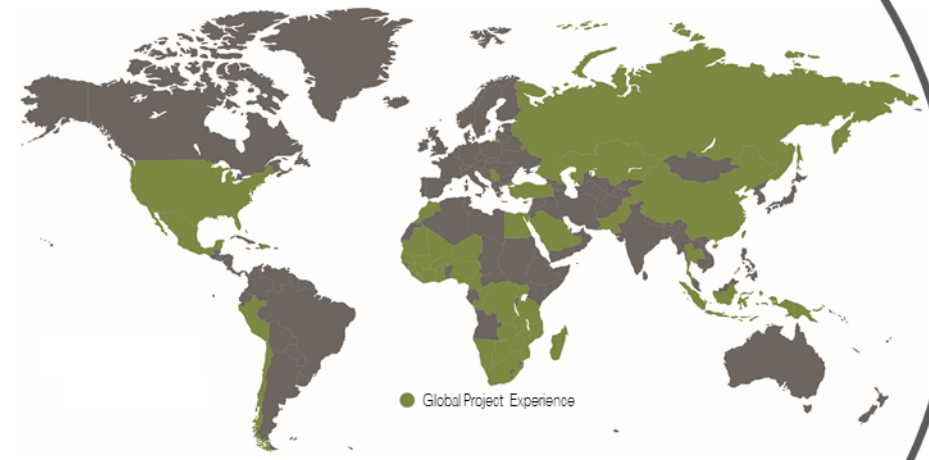

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Square Kilometre Array Project - SKA1_MID Heritage Resources Management Training

Facilitator Guide

Prepared for:
South African Radio Astronomy Observatory

Project Number:
SAR6105

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Project Name:	Square Kilometre Array Project - SKA1_MID Heritage Resources Management Training
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NOTES ON FACILITATION

Facilitation is the process of making learning easy. Your role as the facilitator is to:

- Give direction to the group;
- Create a comfortable and friendly environment for the group;
- Identify the main needs of the group and address these; and
- Adjust to the level of the group's needs.

The DO's	The DON'T's
Plan and prepare in advance	Create long dialogue with on participant
Show interest when listening	Criticise on a personal basis
Use simple language	Dominate the group
Act responsibly	Be biased
Be patient	Be insensitive
Allow participants to discover	Allow domination
Encourage active participation	Go beyond allocated time
Ask for suggestions in answering questions	Exaggerate enthusiasm or be false

CRITICAL SKILLS OF FACILITATION

1. LISTENING – Pay attention to what is being said, demonstrate interest, and allow participant to finish;
2. PARAPHRASING – Repeat what the person has said in your own words to demonstrate you understand;
3. SUMMARISING – Sum up lessons by reiterating the main points to help participants gain a better understanding of the subject;
4. CREATIVITY – Make sessions fun and informative. Identify different ways of achieving the objectives without compromising the quality of the session;
5. AWARENESS – Pay attention to the group, what is not being said, or group dynamics that require attention. Read the energy and level of the group and adjust your programme accordingly.

SOME TIPS

- Ensure you give accurate information;
- Understand your target audience;
- Strive to keep time;
- Keep your mind open;
- Be flexible.

DEFINITIONS

Alter	Any action affecting the structure, appearance or physical properties of a *place* whether by way of structural or other works, or any other means.
Amphibian	Animal capable of living in water or land. An example would be a frog.
Anapsids	No extra fenestra behind the eye; diapsids have two rather than one opening behind each eye.
Archaeological (as per NHRA Section 2(ii))	Any material remains that were produced or created by humans or that resulted from any human activity and that are unused and older than 100 years. This includes artefacts, human and hominid remains and artificial features and structures. Archaeology also refers to Rock Art that is defined as any form of painting, engraving or other graphic representation on fixed rock surfaces or loose rocks or stones that was made by humans and that are older than 100 years, including a 10 m area surrounding such site. Archaeology also includes: • Any wrecks or parts thereof that was wrecked in South Africa more than 60 years ago, including any cargo, debris or artefacts found or associated with it; and • Any features, structures and artefacts older than 75 years that are associated with military history, including the sites on which they are found.
Archaeologist	A trained professional who uses scientific methods to excavate record and study archaeological sites and deposits.
CCS	Crypto-Crystalline Silicates broadly refers to sedimentary rock that has been altered through metamorphic processes resulting extremely fine-grained or microscopic crystals built with a silicon and oxygen structure.
Conservation	The protection, maintenance, preservation and sustainable use of "*places*" to safeguard their "*cultural significance*".

Cultural Significance (CS)	The aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance. A heritage may have cultural significance or other special value because of its: • Importance in the community, or pattern of South Africa's history; • Possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage; • Potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage; • Importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects; • Importance in exhibiting particular aesthetic characteristics valued by a community or cultural group; • Importance in demonstrating a high degree of creative or technical achievement at a particular period; • Strong or special association with a particular community or cultural group for social, cultural or spiritual reasons; • Strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and • Significance relating to the history of slavery in South Africa.
Development	Any physical intervention, excavation, or action that could cause changes to the nature, appearance, fabric of a place. In addition, development might also influence the stability or future well-being of a place. Development could include: • Construction, alteration, demolition, removal or change of use of a place or a structure at a place; • Carrying out any works on or over or under a place; • Any change to the natural or existing condition or topography of land; and • Any removal or destruction of trees, or removal of vegetation or topsoil.
Excavation	The scientific excavation, recording and retrieval of archaeological deposit and objects through the use of accepted archaeological procedures and methods, and excavate has a corresponding meaning.

Field Rating	SAHRA requires heritage resources to be provisionally rated in accordance with Section 7 of the NHRA that provides a three-tier grading system of resources that form part of the national estate. The rating system distinguishes between four categories: • Grade I: Heritage resources with qualities so exceptional that they are of special national significance (*E.g. Robben Island*); • Grade II: Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region (*E.g. Corbelled house Complex, Konka*); • Grade III: Other heritage resources worthy of conservation (*E.g. Rock Art Sites, Buildings, Burial Grounds and Graves*); and • General Protected: i.e. generally protected in terms of Sections 33 to 37 of the NHRA.
General Protection	General protections are afforded to: • Objects protected in terms of laws of foreign states; • Structures older than 60 years; • Archaeological and palaeontological sites and material and meteorites; • Burial grounds and graves; and • Public monuments and memorials.
Grave	The place of interment (burial ground) and includes the contents, headstone or other marker of such a place, and any other structure on or associated with such *place*.
Heritage Resource	Any place of cultural significance.
Heritage Resources Authority	Established government entity at a national or provincial level responsible for the management of heritage resources in accordance with the provisions of the national legislative framework. The South African Heritage Resources Agency (SAHRA), established in terms of Section 11, or, insofar as the NHRA is applicable in or in respect of a province, a provincial heritage resources authority, in this instance the Northern Cape Provincial Heritage Resources Authority (NC-PHRA).
Heritage Site	Any place declared to be a national heritage site by SAHRA or a place declared to be a provincial heritage site by a provincial heritage resources authority.
Living/Intangible Heritage	The intangible aspects of inherited culture that could include cultural tradition, oral history, performance, ritual, popular memory, skills and techniques, indigenous knowledge systems, the holistic approach to nature, society and social relationships.

Major Find	If the resource cannot feasibly be rescued in a specified timeframe without compromising the detailed material recovery and contextual observations, the resource is considered a Major Find.
Object	Any movable property of cultural significance that are protected in terms of the NHRA, including: • All archaeological artefacts; • All palaeontological and rare geological specimens; • All meteorites; and • Any other object referred to in section 3 of the Act.
Owner	Includes the owner's (National Research Foundation [NRF] or other owners of the land on which a heritage *object* or *place* is located) authorised agent and any person with a real interest in the property.
Palaeontological	Any fossil remains or traces of animals or plants that were alive in the geological past, and any site that contains such fossils. Fossil fuels such as coal, and fossiliferous rock intended for industrial use are, however, excluded.
Palaeontologist	A trained professional who uses scientific methods to excavate, record and study fossils and palaeontological sites.
Parareptile	A group of extinct vertebrates very similar to reptiles
Place	A place may include: • (a) The site; • (b) A structure such as a stonewall or historic building; • (c) A group of structures such as a werf; and • (d) In relation to the management of a place, includes the immediate surroundings of a place.
Site	Any area of land, including land covered by water, and including any *structures* thereon.
Structure	Any works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith.
Synapsid	Vertebrate with one fenestra (hole) behind each eye orbit on the lower part of the skull. It allows better attachment sites for jaw muscles than the original anapsid condition.
Tetrapod	Animal with four legs.
Therapsid	Mammal-like reptile, i.e. a reptile that has evolved some mammal-like features. These are synapsids.
Vertebrate	Animal with a backbone, includes fish, reptiles, mammals, dinosaurs, birds

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1 Purpose and Outcomes of the Training

The purpose of the training is to enable participants to manage heritage resources within the context of both intangible and tangible heritage during construction and operation of the SKA1_MID Project.

The desired learning outcomes through this training is to:

- Garner an understanding of what heritage, heritage management and heritage resources are;
- Understand what mechanisms are in place to safeguard heritage;
- Sensitise trainees to the cultural landscape within which the SKA1_MID Project is situated; and
- Promote the preservation and conservation of heritage resources within the SKA1_MID Project development footprint and surrounds.

The intention is for trainees to develop an appreciation and awareness of the cultural heritage within the SKA1_MID Project area. Through this training, an understanding of the worth or value of the associated cultural heritage should be promoted.

On a broader level, the proper management of the cultural heritage can contribute to sustainable economic growth within the region.

Through completing this training, trainees should be capable of:

- Relating heritage resource management practice to national and international frameworks;
- Implementing heritage resource management procedures for specific operational aspects / components;
- Planning day-to-day operations as relevant to heritage resource management; and
- Communicating heritage resource management information to all relevant stakeholders.

2 Lesson 1: What is Heritage

It is required to orientate the trainee as to what "heritage" and "heritage management" is. This will form the basis for the remaining sections of the Training Module.

This section will provide the facilitator with a detailed explanation of the concepts of "heritage", and where these definitions originate.

2.1 Definitions

Oxford Dictionaries

Property that is or may be inherited; an inheritance:

valued objects and qualities such as historic buildings and cultural traditions that have been passed down from previous generations

[as modifier] denoting or relating to things of special architectural, historical, or natural **value** that are preserved for the nation.

The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)

Section 2: Definitions

"heritage resource" means any place or object of cultural **significance**;

"cultural significance" means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological **value** or **significance**;

"living heritage" means the intangible aspects of inherited culture, and may include -

(a) cultural tradition;

(b) oral history;

(c) performance;

(d) ritual;

(e) popular memory;

(f) skills and techniques;

(g) indigenous knowledge systems; and

(h) the holistic approach to nature, society and social relationships;

From these two definitions, there are several key words that assist in developing a framework of what "heritage" is. Notable repetition includes "value" and "significance". But these are subjective. What is of value or significance to one individual or group, may not be for another.

What we can gather is that heritage is a wide concept encompassing both natural and cultural aspects, where:

- Natural heritage refers to the sum total of elements of biodiversity, including flora and fauna, ecosystems and geological structures.
- Cultural heritage is an expression of the ways of living developed by a community and passed on from generation to generation, including customs, practices, places, objects, artistic expressions and values.

In its broadest sense:

HERITAGE IS THAT WHICH IS INHERITED FROM PAST GENERATIONS, MAINTAINED IN THE PRESENT, AND BESTOWED TO FUTURE GENERATIONS.

2.2 Heritage Resources Management

Heritage Resources Management (HRM) is founded on the principle that heritage resources are finite, non-renewable and irreplaceable. It acknowledges that heritage has lasting value as evidence of the origins of life, humanity and society.

HRM involves the conservation, presentation and improvement of protected heritage resources, as well as the protection, maintenance, preservation and sustainable use of heritage resources to protect their cultural meaning. This process can be conceptualised in terms of a Heritage Cycle.

Adapted from Thurley (2005) the Heritage Cycle can be visualised as follows:

Figure 2-1: The Heritage Cycle

3 Lesson 2: What Mechanisms Protect Heritage in the context of the SKA1_MID Project

The Council for Scientific and Industrial Research (CSIR), on behalf of the South African Radio Astronomy Observatory (SARAO) developed an Integrated Environmental Management Plan (IEMP) to detail environmental management principals and measures aimed to avoid, minimise, rectify, reduce or offset potential environmental and social risks of the Project.

In March 2019, the Minister of Environmental Affairs adopted the IEMP for the Project (SKA1_MID) as an environmental management instrument in terms of Section 24(2)(e) of the National Environmental Management Act, 1998 (Act No. 107 of 1998). As such, the NRF is excluded from the requirement to obtain environmental authorisation for activities contemplated in Chapter 2: Part IV of the IEMP.

Table 3-1: Legislation

Legislation	Description
National Environmental Management Act, 1998 (Act No. 107 of 1998)	The NEMA, as amended, was set in place in accordance with Section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making on issues affecting the environment. Section 24 (1)(a), (b) and (c) of NEMA state that: *The potential impact on the environment, socio-economic conditions and cultural heritage of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.* Section 24(4) provides for procedures for investigation, assessment and communication of potential consequences or impacts of activities on the environment and (b) must include, with respect of every application for an environmental authorisation and where applicable (iii) investigation, assessment and evaluation of the impact of any proposed listed or specified activity on any national estate referred to in Section 3(2) of the NHRA, excluding the national estate contemplated Section 3(2)(i)(vi) and (vii) of the Act; Section 24(2)(e) makes provision for the Minister, or an MEC, to identify activities contemplated in paragraphs (a) and (b) that, based on an environmental management instrument adopted in the prescribed manner by the Minister or an MEC, with the concurrence

Legislation	Description
	of the Minster, may be excluded from the requirement to obtain an environmental authorisation from the competent authority. The Environmental Impact Assessment (EIA) Regulations, Government Notice Regulation (GN) R.982 were published on 04 December 2014 and promulgated on 08 December 2014 (as amended by GN R 326 of 7 April 2017). Together with the EIA Regulations, the Minister also published GN R.983 (amended by GN R 327) (Listing Notice No. 1), GN R.984 (as amended by GN R 325) (Listing Notice No. 2) and GN R.985 (as amended by GN R 324) (Listing Notice No. 3) in terms of Sections 24(2) and 24D of the NEMA, as amended.
Environmental Impact Assessment (EIA) Regulations, 2014 (Government Notice Regulations [GN R] 982 of 4 December 2014 as amended by GN R 326 of 7 April 2017) **EIA Regulations, 2014 (as amended)**	These three listing notices set out a list of identified activities which may not commence without an Environmental Authorisation from the relevant Competent Authority through one of the following processes: • Regulation GN R. 983 - Listing Notice 1: This listing notice provides a list of various activities that require environmental authorisation and that must follow a basic assessment process. • Regulation GN R. 984 – Listing Notice 2: This listing notice provides a list of various activities that require environmental authorisation and that must follow an environmental impact assessment process. • Regulation GN R. 985 – Listing Notice 3: This notice provides a list of various environmental activities that have been identified by provincial governmental bodies that if undertaken within the stipulated provincial boundaries will require environmental authorisation. The basic assessment process will need to be followed.
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)	The NHRA is the overarching legislation that protects and regulates the management of heritage resources in South Africa, with specific reference to the following Sections: • 5. General principles for HRM; • 6. Principles for management of heritage resources; • 7. Heritage assessment criteria and grading; and • 38. Heritage resources management. The Act requires that Heritage Resources Authorities (HRAs), in this case the SAHRA and NC-PHRA, be notified as early as possible of any developments that may exceed certain minimum thresholds in terms of Section 38(1), or when assessments of impacts on heritage resources are required by other legislation in terms of Section 38(8) of the Act.

Legislation	Description
	Section 49 provides for a system whereby any person may appeal to the SAHRA Council against any decision taken by a committee or other delegated representative of SAHRA or a provincial heritage resources authority. In the case of the SKA Phase 1 Project, this may include appeals against the issuing of permits in respect of Section 34, 35 or 36 of the NHRA, or approval of the final Conservation Management Plan (CMP).
GN R 548: NHRA Regulations, 2000	The document regulates the general provisions and permit application process in respect of heritage resources forming part of the national estate. Applications must be made, as relevant, in accordance with the requirements of the following: • Chapter II: Permit Applications and General Provisions for Permit; • Chapter III: Application for Permit: National Heritage Site, Provincial Heritage Site, Provisionally Protected Place, or Structure older than 60 Years; • Chapter IV: Application for Permit: Archaeological or Palaeontological or Meteorite; • Chapter V: Application for Permit to Reproduce a National Heritage Site; • Chapter VI: Application for Permit: Heritage Objects; • Chapter VII: Application for Permit to Export a Heritage Object; • Chapter VIII: Application for Permit: Wrecks • Chapter IX: Application for Permit: Burial Grounds and Graves; and • Chapter X: Procedure for Consultation Regarding Protected Area; • Chapter XI: Procedure for Consultation Regarding Burial Grounds and Graves; and • Chapter XII: Discovery of Previously Unknown Graves.
National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEM: PAA)	The NEM: PPA provides for South Africa's system of protected areas. It establishes the mechanisms for the protection, conservation and management of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes. It makes further provisions for intergovernmental co-operation and public consultation in matters concerning protected areas to promote the continued existence, governance and functions of the National Parks.
World Heritage Convention Act, 1999	The WHCA makes provision for the inclusion of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) Convention concerning the Protection of the World Cultural and

Legislation	Description
(Act No. 49 of 1999) (WHCA)	Natural Heritage (*i.e. World Heritage Convention [WHC]*) of 1972, into South African law. The Act makes provision for the principles and requirements in the development of Integrated Management Plans (IMPs) under Chapter IV. These include: • Section 21: Preparation and implementation of IMPs; • Section 22: Harmonisation of IMPs; • Section 23: Objects of IMPs; • Section 24: Contents of IMPs; • Section 26: Duration of IMPs; and • Section 28: Model IMP.
Astronomy Geographic Advantage Act, 2007 (Act No. 21 of 2007) (AGA) and Karoo Central Astronomy Advantage Areas Spectrum Regulations, 2015 (GN R 1166)	The AGA Act provides for the preservation and protection of areas uniquely suited for optical and radio astronomy and to provide for matters connected with astronomy advantage areas (AAAs). The Karoo Core AAA and Karoo Central AAAs have been declared as per Sections 7 and 9 of the Act. The Regulations outline restrictions that must be observed within the relevant Karoo Central AAAs. These regulations refer to the prohibition and/or restriction of certain radio frequencies (RFI) and electromagnetic interference (EMI), administrative matters and financial compensation.

Table 3-2: Guidelines

Guideline	Description
South African Heritage Resources Agency (SAHRA) Archaeology, Palaeontology and Meteorites (APM) Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports (2007)	The guidelines provide the minimum standards that must be adhered to for the compilation of a Heritage Impact Assessment (HIA) Report. Chapter II Section 7 outlines the minimum requirements for inclusion in the heritage assessment as follows: • Background information on the Project; • Background information on the cultural baseline; • Description of the properties or affected environs; • Description of identified sites or resources; • Recommended field rating of the identified sites to comply with Section 38 of the NHRA; • A statement of Cultural Significance in terms of Section 3(3) of the NHRA; and

Guideline	Description
	• Recommendations for mitigation or management of identified heritage resources.
South African Heritage Resources Agency (SAHRA) Site Management Plans: Guidelines for the Development of Plans for Management of Heritage Sites or Places	The guidelines provide the minimum framework for the development of a management plan as the as the overarching policy document in support of the conservation and/or management of heritage resources. The guideline outlines the logical sequence of management planning and actions and covers: • Definitions; • Why we require a management plan; • The requisite contents of a management plan; • Steps in the development of a management plan; • Basic Principles; • Statement of Significance Approach; and • Approval Systems for Change.
GN 1356: NEM: PAA Cultural Heritage Survey Guidelines and Assessment Tools for Protected Areas in South Africa promulgated on 8 December 2017	The guidelines enable managers of Protected Areas to work within the ambit of the national HRM system in a quest of continuous improvement and sustainable management of heritage resources. It establishes best practice standards to effectively: • Support the implementation of the NHRA in the identification and protection of places of CS in Protected Areas; • Provide the basic means of ensuring those who manage Protected areas: i. Are aware of the heritage resources within their Protected Area; ii. Have knowledge of the CS of these identified heritage resources within the Protected Area; iii. Have the knowledge to conduct basic recording of heritage resources in the Protected Area; and • Fulfil the basic requirements of the NHRA and other applicable legislation.

Guideline	Description
United Nations Educational, Scientific and Cultural Organisation (UNESCO) Convention concerning the Protection of the World Cultural and Natural Heritage of 1972 (World Heritage Convention [WHC])	While fully respecting the sovereignty of the States, the Convention formalises requirements for the national and international protection of cultural and natural heritage in respect of the collective interest of the international community. Article 5 requires each State Party to this Convention to: a. Adopt a general policy which aims to give cultural and natural heritage a function in the life of the community and integrate the protection of that heritage into comprehensive planning programmes; b. Set up services for the protection, conservation and presentation of the cultural and natural heritage with appropriate staff; c. Develop scientific and technical studies and research and to work out such operating methods as will make the State capable of counteracting the dangers that threaten its cultural and natural heritage; d. Take the appropriate measures necessary for the identification, protection, conservation, presentation and rehabilitation of this heritage; and Establish or development for training in the protection, conservation and presentation of the cultural and natural heritage and to encourage scientific research in the field.
Operational Guidelines for the Implementation of the World Heritage Convention, 12 July 2017	The guidelines aim to facilitate the implementation of the WHC. It further provides for: • Chapter II D: Criteria for the assessment of Outstanding Universal Value • Chapter II E: Integrity and/or Authenticity; and • Chapter II F: Protection and Management.
United Nations Educational, Scientific and Cultural Organisation (UNESCO) Convention for the Safeguarding of the Intangible Cultural Heritage, 2003	The purpose of the Convention is to safeguard and respect the intangible cultural heritage of the communities, groups and individuals concerned that concurrently raises awareness at local, national and international level of its importance. Chapter III advises to the safeguarding of the intangible cultural heritage at a national level through, amongst other, the following: • Article 12 – Inventories; • Article 14 – Education, awareness-raising and capacity building; and • Article 15 – Participation of communities, groups and individuals.

Guideline	Description
International Council on Monuments and Sites (ICOMOS): International Charter for the Conservation and Restoration of Monuments and Sites, 1964 (*Venice Charter*)	The Charter establishes the importance of architectural work, as well as the urban and rural setting in which it is found to which CS is attributed. It acknowledges the importance in maintaining the integrity and meaning of heritage resources through conservation and restoration interventions. Articles 4 through 8 provide a set of guidelines for the conservation of such heritage resources, which underlay many of the principles of subsequent ICOMOS doctrinal texts.
International Council on Monuments and Sites (ICOMOS): Charter for the Protection and Management of the Archaeological Heritage, 1990	The Charter provides for the protection and proper management of archaeological heritage to enable archaeologists and other scholars an opportunity to study and interpret these resources on behalf of and for the benefit of present and future generations, through effective collaboration between professionals from several disciplines and local cultural groups. The Charter reflects the basic principles and guidelines for global validity as follows: • Article 2: Integrated Protection Policies; • Article 3: Legislation and Economy; • Article 4: Survey; • Article 5: Investigation; • Article 6: Maintenance and Conservation; • Article 7: Presentation, Information and Reconstruction; and • Article 8: Professional Qualifications.

4 Lesson 3: The SKA1_MID Project and the Cultural Landscape

4.1 What is the SKA1_MID Project?

The SKA1_MID Project is an international effort to build the world's largest radio telescope, with a square kilometre of data collecting area. It will comprise the deployment of thousands of radio telescopes, in three unique configurations, to enable astronomers to monitor the sky in unprecedented detail and survey the entire sky thousands of times faster than any system currently in existence. The scale of the Project represents a huge leap forward in engineering, research and development. Furthermore, the Project will deliver a correspondingly transformational increase in science capability when operational.

The Project is managed through the International SKA Organisation (SKAO), consisting of eleven member nations - Australia, Canada, China, Germany, India (associate member), Italy, New Zealand, South Africa, Sweden, the Netherlands and the United Kingdom.

The International SKAO is currently a Pty (Ltd) company registered in the United Kingdom. Work is underway to establish it as an international Treaty Organization. Ultimately, the international SKAO is responsible for the design, construction and operation of the SKA radio telescope in South Africa and Australia.

In South Africa, the international SKAO proposes to establish an additional 133 antennas to the operational 64-dish MeerKAT telescope. Of these, 112 antennas will be established in the 'core' and the remaining 21 will be installed in three spiral arms (seven in each arm). This installation will include the establishment and development of several ancillary infrastructures.

4.2 Project Location

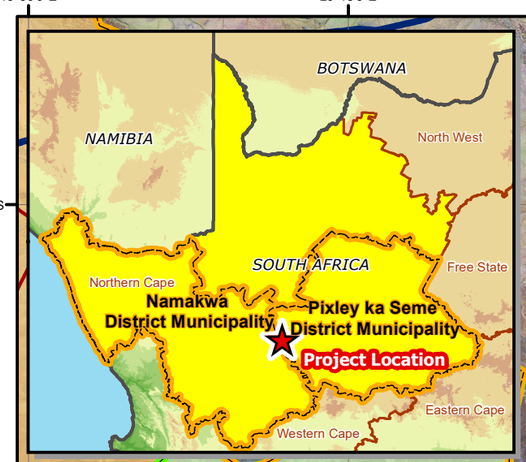
The South African contingent of the SKA1_MID Project is in the Karoo Region of the Northern Cape. The development footprint is situated within two district municipalities, namely the Namakwa and Pixley ka Seme District Municipality, which comprise the following local affected municipalities:

- Karoo Hoogland Local Municipality;
- Hantam Local Municipality; and
- Kareeberg Local Municipality.

Plan 1

SKA Project

Locality Plan



Legend

- SKA Phase 1 Spiral Arms
- SKA Phase 1 Core
- Major Town
- Secondary Town
- Other Town
- National Route
- Main Road
- Provincial Boundary
- District Municipality
- Local Municipality

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Central Meridian: 21°E	Date: 02/06/2020

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4.3 The Cultural Landscape

The Project is in a region known for its heritage sites and living heritage ranging from palaeontological through to the historical period. These resources do not occur in isolation from one another, but rather as interacting to reinforce a specific sense-of-place. The cultural landscape consists of several layers that contribute to the “spirit of place”. These include:

- The natural landscape comprising flat plains and mountainous features;
- The palaeontological record associated with various fossil remains;
- The archaeological record associated with Earlier (ESA) and Middle Stone Age (MSA) artefacts;
- The archaeological record associated with Later Stone Age (LSA) artefacts attributed to the /Xam group;
- The archaeological record associated with Rock Art engravings attributed to various San groups, and the /Xam in particular;
- The archaeological record associated with LSA artefacts and pottery attributed to Khoekhoe groups;
- The archaeological record associated with Rock Art paintings attributed to Khoekhoe groups;
- 18th and 19th century settlement of Xhosa groups in the Northern Cape, and their interactions with the /Xam, Korana and Griqua;
- Migrations of the frontier farmers from the Cape Colony into the region;
- The present-day farming and rural landscape; and
- A limited 21st century scientific environment with the introduction of the MeerKAT and KAT-7 radio-telescopes (colloquially referenced as the ‘techno-eco’ environment).

These categories summarised the significance and other values described in Section 3(3) of the NHRA. The resources' importance or contributions to these values were considered in terms of associative (qualitative) and / or rarity (quantitative) attributes, based on data collected through the HRM process. The integrity or condition of resources further influenced the significance. Integrity is largely determined based on resources' current, observed state of conservation, as well as notable changes made to it over the years. Criteria include:

Importance in aesthetic characteristics; Degree of technical / creative skill at a particular period; Importance to community or pattern in country's history; Site of significance relating to history of slavery; Association with life or work of a person, group or organisation of importance in the history of the country; Possession of uncommon, rare or endangered natural or cultural aspects; Information potential; Importance in demonstrating principle characteristics; Association to community or cultural group for social, cultural or spiritual reasons

To determine the value or significance of these "cultural layers", specialists assessed the contribution of each layer to four broad value categories: aesthetic, historical, scientific and social values.

Table 4-1: Significance / Value of Cultural Layers in the Context of the Project

Resource ID	Resource Period	Description	Designation
Abrahamskraal Formation	Precambrian (1,2 billion years ago [bya]) to late Pleistocene (20,000 years ago [kya])	Sandstone, mudstone lithology with diverse terrestrial and freshwater tetrapods of Tapinocephalus to Lystrosaurus Biozones, palaeoniscoid fish, freshwater bivalves, trace fossils and sparse vascular plants	Very High
White Hill Formation	Precambrian (1,2 bya) to late Pleistocene (20 kya)	Mesosaurid reptiles, rare cephalochordates, variety of palaeoniscoid fish, small eocarid crustaceans, insects, low diversity of trace fossils	Very High
ESA Occurrences	Earlier Stone Age (3 million years ago [mya] to 300 kya) (ESA)	Long blades, cores and low incidences of formal tools moderate to heavily weathered	Low

Resource ID	Resource Period	Description	Designation
MSA	Middle Stone Age (c. 300 kya to 30 kya) (MSA)	High proportion of minimally modified blades and points produced from good quality raw material, including hornfels (which is highly patinated) and quartz. Occur widely over the landscape mostly through geological action rather than human.	Negligible
LSA Occurrences	Later Stone Age (c. 30 kya to 2 000 years ago [ya]) (LSA)	Assemblage characterised by un-patinated hornfels.	Low
LSA		Microlithic scrapers and segments. Assemblages characterised by many blades and backed blades on Crypto-Crystalline Silicates (CCS) characteristic of Swartkop assemblages.	High
Rock Engravings	Later Stone Age (c. 30 kya to 2 000 ya) (LSA)	Images produced by incising, chipping, or pecking to depict imagery of realistic and proportionally correct animals, human figures and shamanistic concepts	Very High
LSA	LSA Herder period (after 2 000 ya to c. 1000 common era [CE])	Lithics dominated by coarse irregular flakes commonly on quarts, with small or absent retouched component. Associated with thin walled ceramics	Medium
Rock Paintings	LSA Herder period (after 2 000 ya to c. 1000 CE)	Limited and distinctive set of geometric forms, such as circular outlines, crosses, lines, concentric circles, oblong forms and finger-applied dots	High
Burial grounds and graves	Later Stone Age (c. 30 kya to 2 000 ya) (LSA)	Unidentified burials associated with the /Xam	Very High

Resource ID	Resource Period	Description	Designation
Burial grounds and graves	British Colony and First Boer Republics (1814 to 1880)	Burial grounds and graves affiliated with historic farmsteads and associated labourer homesteads - i.e. Xhosa, Korana and Griqua	Very High
Burial grounds and graves	Union of South Africa (1910 to 1961)	Burial grounds and graves affiliated with historic farmsteads and associated labourer homesteads	Very High
Burial grounds and graves	Apartheid Republic of South Africa (1961 to 1994)	Burial grounds and graves affiliated with historic farmsteads and associated labourer homesteads	Very High
Historic Built Environment	British Colony and First Boer Republics (1814 to 1880)	Corbelled houses - vernacular architecture in the context of setting	High
Historic Built Environment	Union of South Africa (1910 to 1961)	Farmstead ruins and complexes as tangible markers of a historically layered cultural landscape	Low

Plan 2

SKA Project

Sensitivity Plan - Palaeontology

Legend

- SKA Phase 1 Spiral Arms
- SKA Phase 1 Core
- Secondary Town
- Other Town
- Settlement
- Main Road
- Railway Line
- Perennial River
- Provincial Boundary

Palaeo-Sensitivity

- Very High
- High
- Moderate
- Low
- Negligible

DIGBY WELLS ENVIRONMENTAL

• Sustainability • Service • Positive Change • Professionalism • Future Focused • Integrity

Projection: Geographic	Ref #: SAR6105_H_02_AMT
Datum: WGS 1984	Revision Number: 1
Central Meridian: 21°E	Date: 02/06/2020

N

0 10 20 40

Kilometres

1:750 000

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Plan 3

SKA Project

Sensitivity Plan - Heritage (Archaeology)

Legend

- SKA Phase 1 Spiral Arms
- SKA Phase 1 Core
- Secondary Town
- Other Town
- Settlement
- Main Road
- Railway Line
- River
- Provincial Boundary

Heritage Sensitivity

- Very High
- High
- Moderate
- Low
- Very Low
- Negligible

DIGBY WELLS ENVIRONMENTAL

• Sustainability • Service • Positive Change • Professionalism • Future Focused • Integrity

Projection: Geographic	Ref #: SAR6105_H_03_AMT
Datum: WGS 1984	Revision Number: 1
Central Meridian: 21°E	Date: 02/06/2020

N

0 10 20 40

Kilometres

1:750 000

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4.4 Heritage Resource Types

Palaeontology Context

The Karoo is world famous for its almost complete record of fossil vertebrates and plants, spanning from the Late Carboniferous to Jurassic time periods. During the Carboniferous the huge continent of Gondwana (comprising Africa, South America, India, Antarctica and Australia all joined together) was positioned over the South Pole and so was covered by ice sheets. As Gondwana moved northwards the ice sheets melted and the water filled the huge inland basin of the Karoo (and other basins in South America). Plants became more abundant but animals were rare, except for fish. Over time the retiles evolved, then mammal-like reptiles, other groups, mammals, dinosaurs and birds.

Because the fossil mammal-like reptiles and other vertebrates were common and the groups existed for relatively short times (few million years), they are useful for biostratigraphy. In each country we now use the broad time periods, the local geological terms and the vertebrate biozones to form a framework of time for the history of the past.

The figure below shows the distribution of the biozones in South Africa.

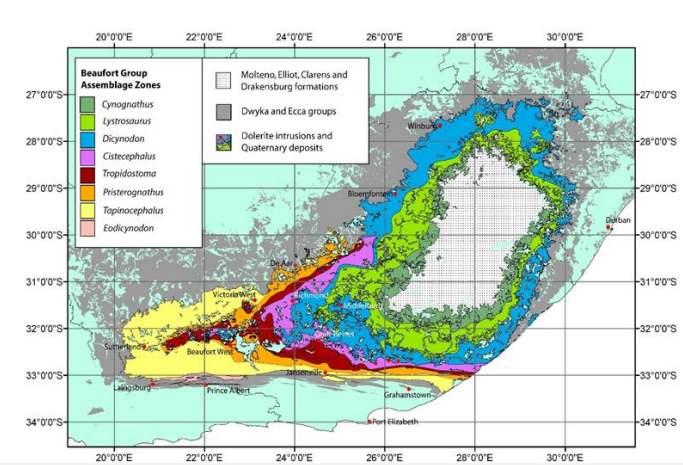
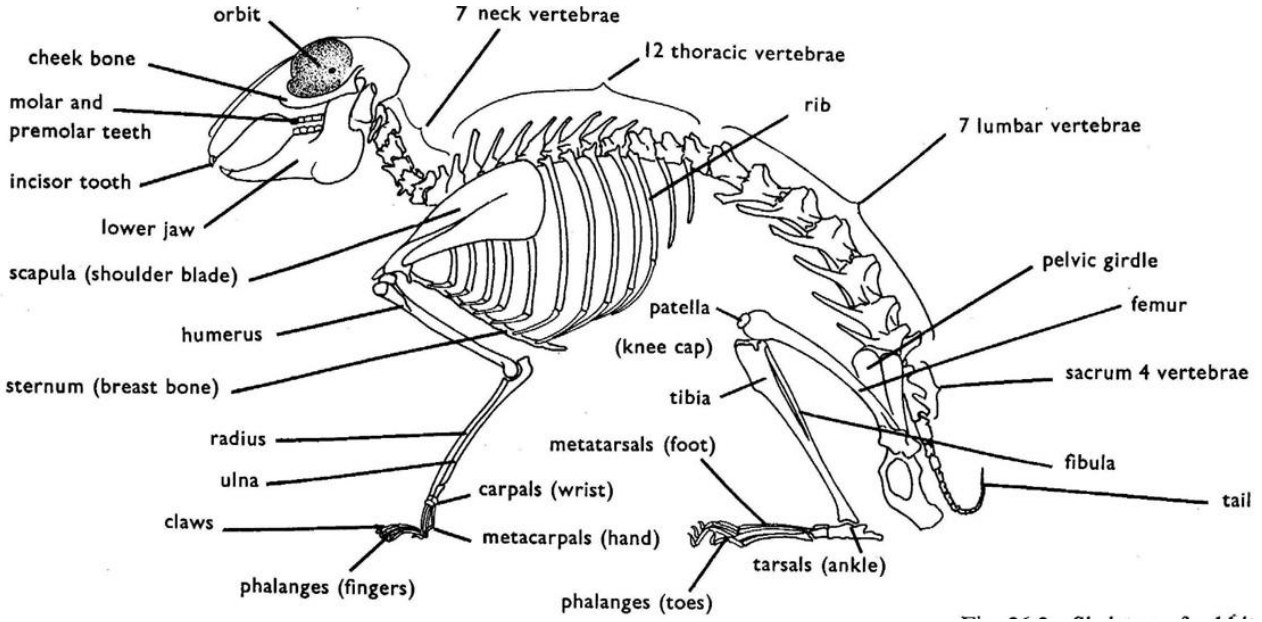
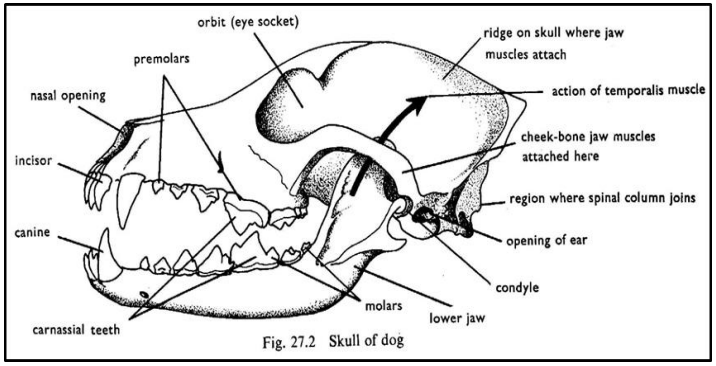
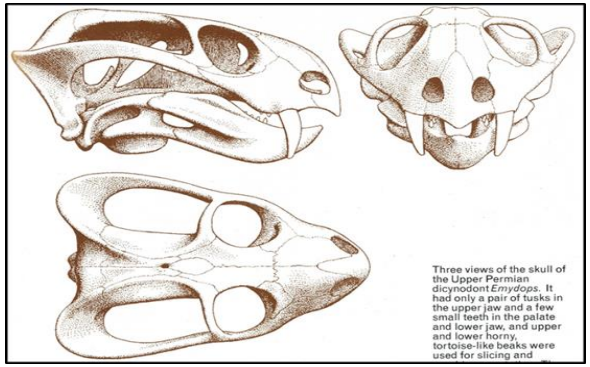
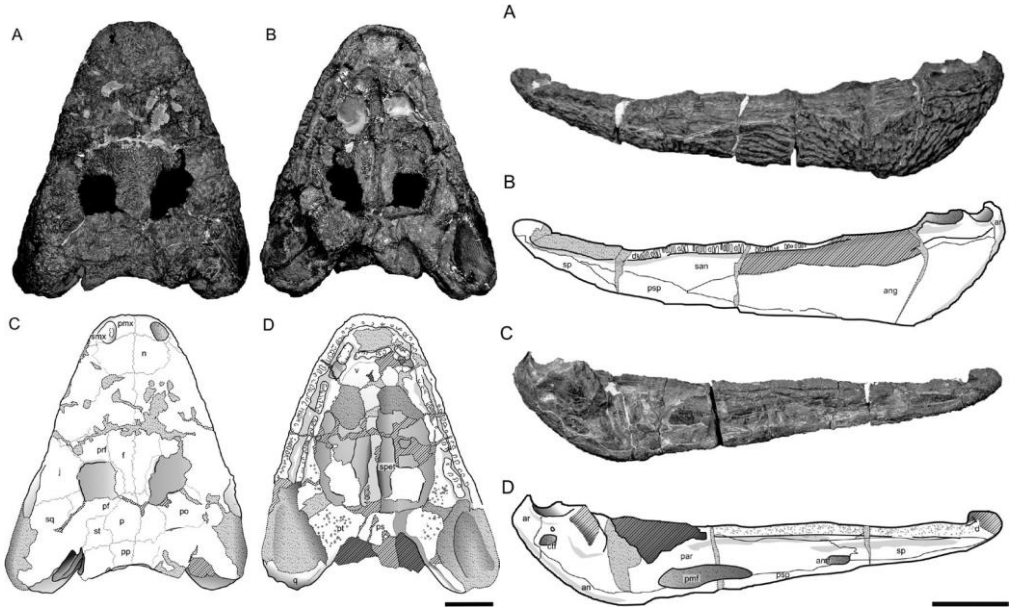


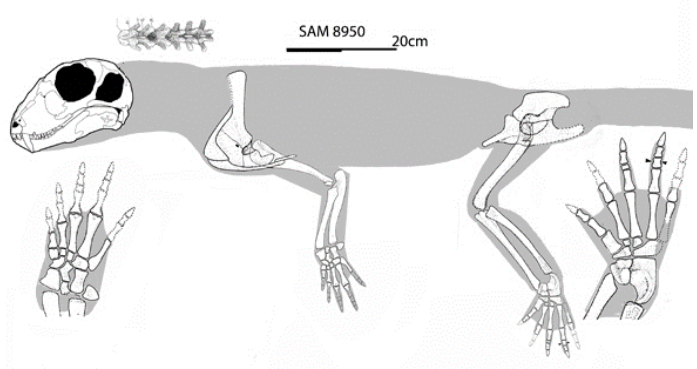
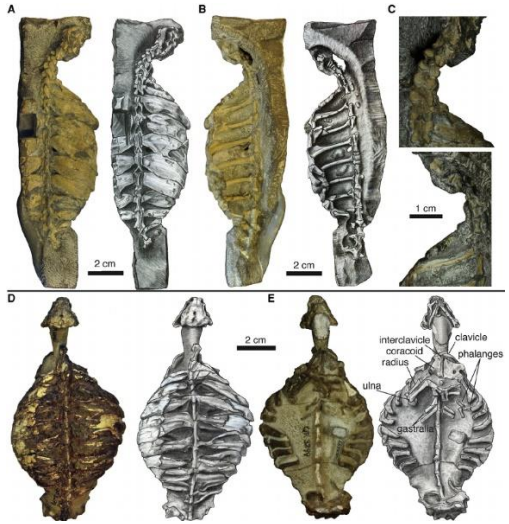
Table 4-2: Common Heritage Types

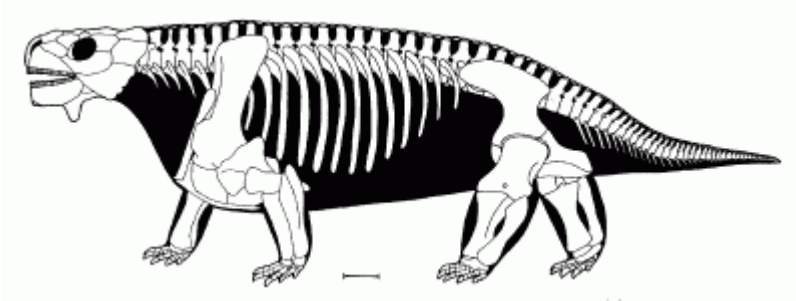
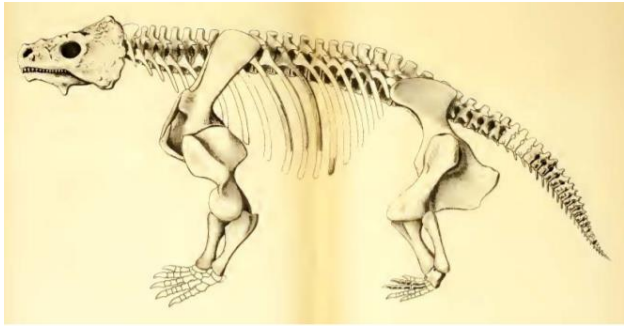
Heritage Type	Image / Figure	Description
Palaeontological Fossil Record		
Vertebrate Palaeontology		
Skeletal Structure / Components		Vertebrates, including mammals, reptiles, amphibians, mammal-like reptiles and dinosaurs, have a similar body plan: - Skull; - Vertebrae & Ribs; - Forelimbs & hind limbs.

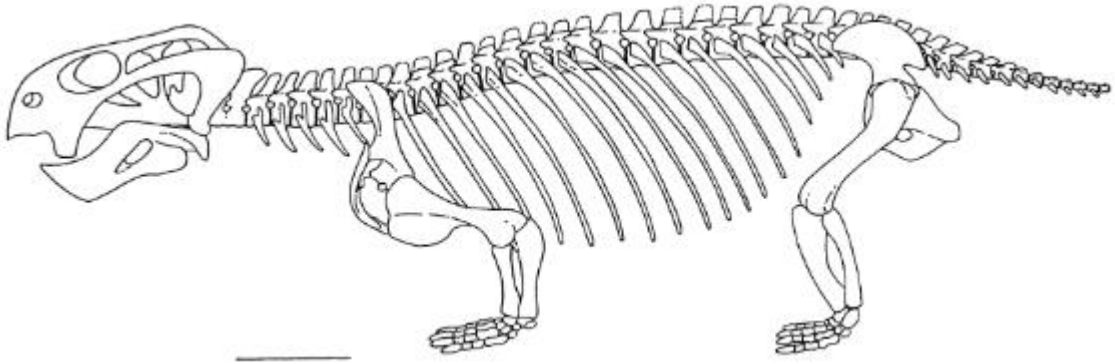
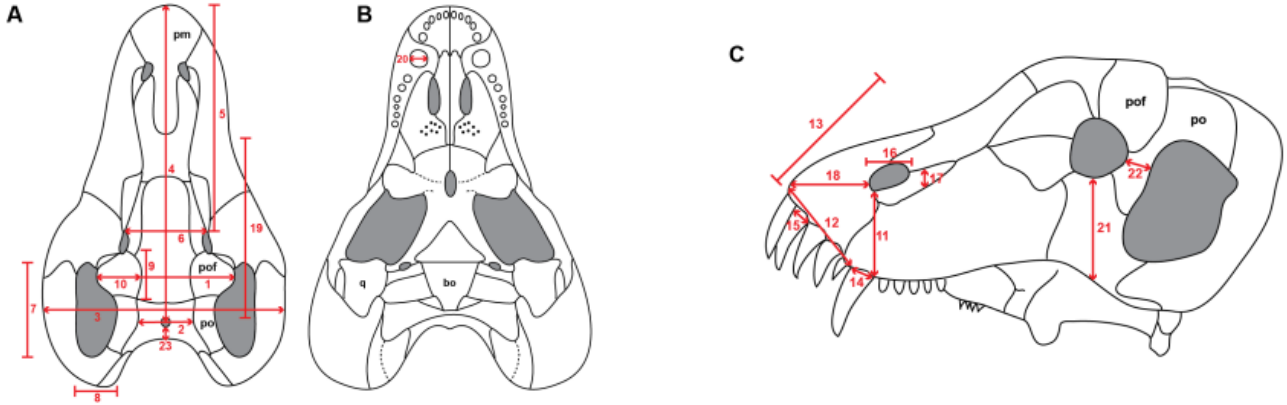
Heritage Type	Image / Figure	Description
Skull	 Fig. 27.2 Skull of dog 	Note the various skulls all have 2 holes for nostrils and 2 holes for eyes. Some skulls have another pair of holes (temporal fenestrae). Teeth can be quite different too and are important for recognising the animal – as well as diet (herbivore, carnivore, omnivore).

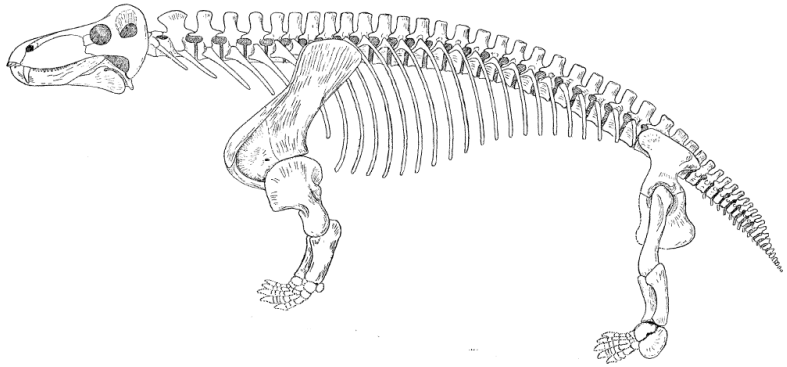
Heritage Type	Image / Figure	Description
Vertebrate Fossils	 A fossil *in situ*  A fossil in a 'jacket' of plaster of paris to protect it during transport to the lab.  Fossils that are in the process of being prepared  A fossil with the the bones partially exposed  Fossil bones in a tray, after being removed from the matrix  Prepared fossils. These are foot bones.	Fossils found *in situ* (i.e. 'in place') look very different from fossils which have been prepared and are photographed in the laboratory. Fossils found *in situ* are found in a matrix of sediment that has become rock as the organic matter has fossilised. These photos show what the fossils look like at different stages of the process. All photographs were taken by Marion Bamford.

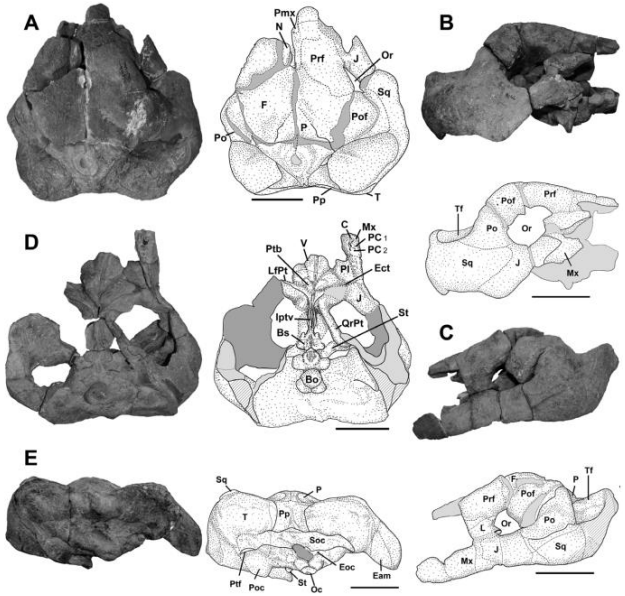
Heritage Type	Image / Figure	Description
Aquatic Fauna and Vertebrates		
Rhinesuchus	 (Marsicano et al, 2017)	Rhinesuchus is a large temnospondyl amphibian. Occur in the South African Karoo Basin's Tapinocephalus and Cistecephalus assemblage zones, both belonging to the Beaufort Group.

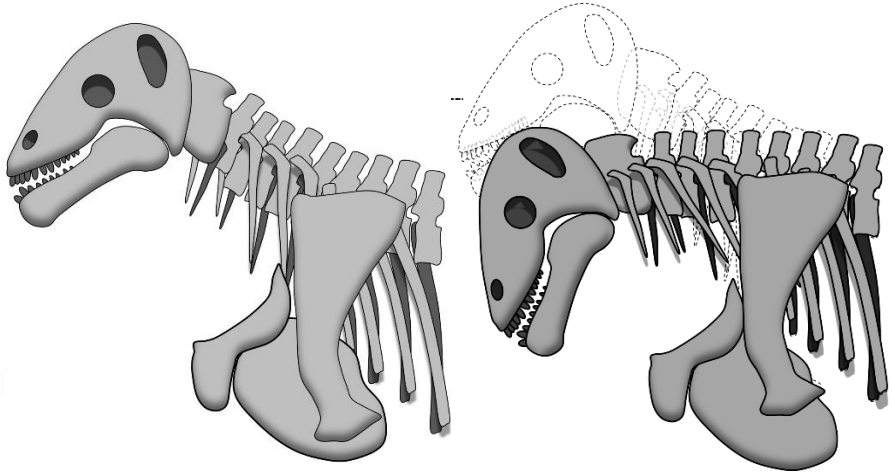
Heritage Type	Image / Figure	Description
Hipposaurus		An extinct genus of basal therapsids known from the Tapinocephalus Assemblage Zone of the Main Karoo Basin, South Africa
Eunotosaurus	 (Lyson et al, 2013)	An extinct genus of reptile, possibly a close relative of turtles, from the late Middle Permian (Capitanian stage) Karoo Supergroup of South Africa.

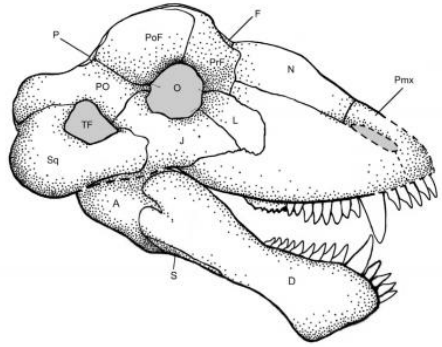
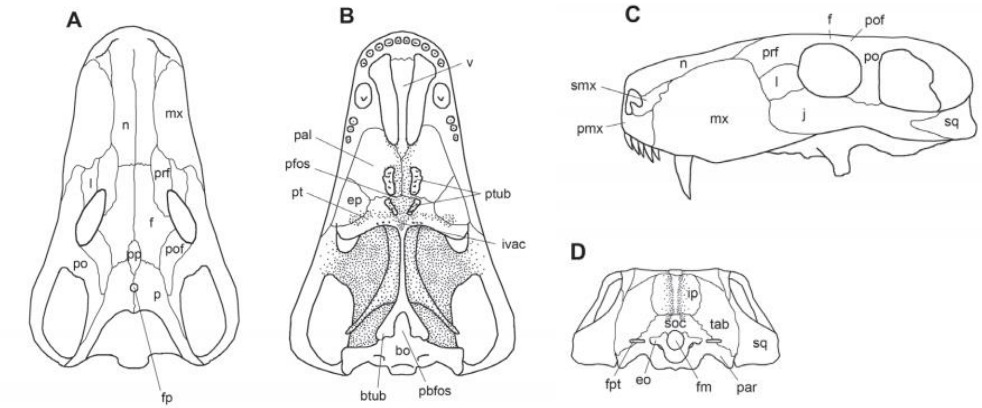
Heritage Type	Image / Figure	Description
Bradysaurus	 (Lee 1997, accessed from http://palaeos.com/)	Bradysaurs were herbivorous megafauna of the late Middle Permian Period and fossils are known from the Tapinocephalids Assemblage Zone (Capitanian stage). Karoo Basin of South Africa.
Embrithosaurus	 (Van den Brandt 2016)	Herbivorous parareptiles of the Middle to Late Permian Period (Capitanian stage). Karoo Basin of South Africa.

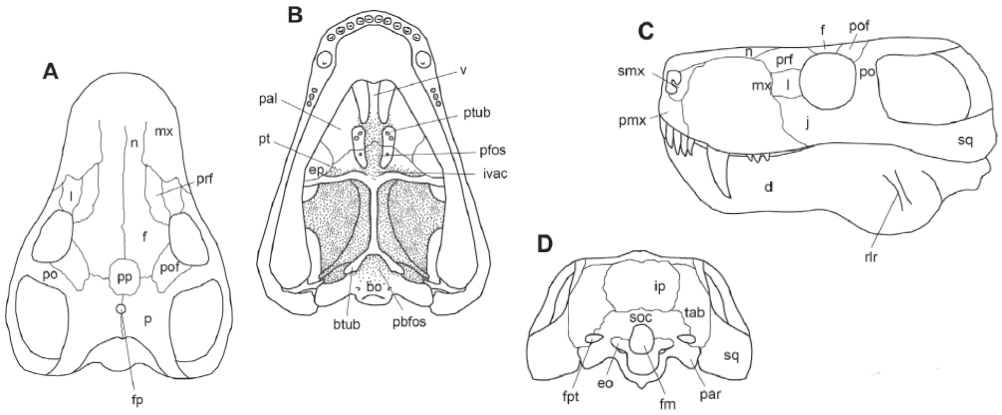
Heritage Type	Image / Figure	Description
Diictodon	 (Ray & Chinsamy 2003)	A mammal-like synapsid which existing during the Late Permian period. Fossils can be found in the Teekloof, Abrahamskraal and Balfour Formations.
Anteosaurus	 (Kruger 2014)	Large carnivorous synapsids which lived during the Capitanian epoch (late Middle Permian) which resembles a crocodile in posture and hunting strategies. Karoo Basin of South Africa.

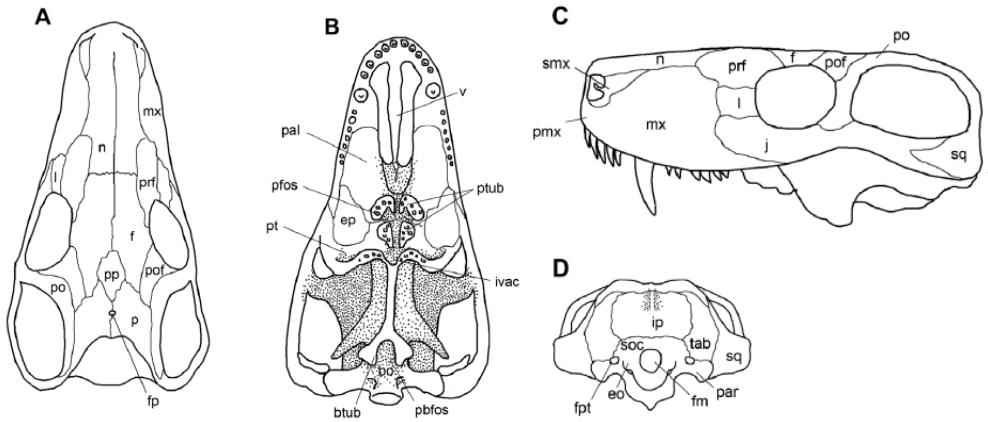
Heritage Type	Image / Figure	Description
Titanosuchus	 (Cloudsley-Thompson 2005)	Carnivorous species of dinocephalian therapsid. Lived during the mid-Permian epoch.
Jonkeria	 (Broom 1929)	Species of omnivorous dinocephalians from the Tapinocephalus assemblage zone, of the Lower Beaufort Group, Karoo Supergroup.

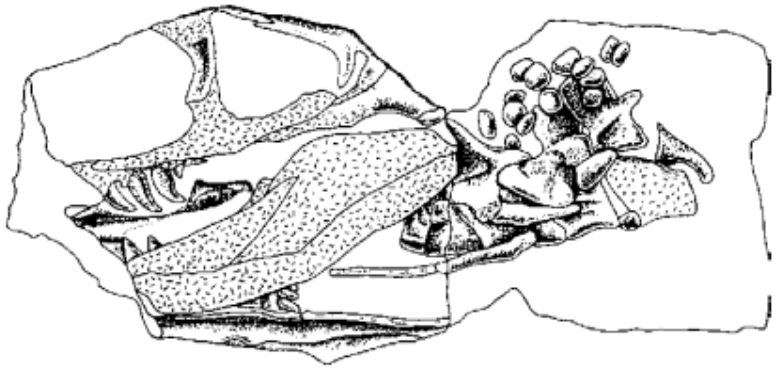
Heritage Type	Image / Figure	Description
Avenantia	 (Güven *et al* 2013)	Herbivorous terrestrial tetrapod which existed during the Middle Permian. Fossils are found in the Lower Beaufort Group, Karoo Basin.

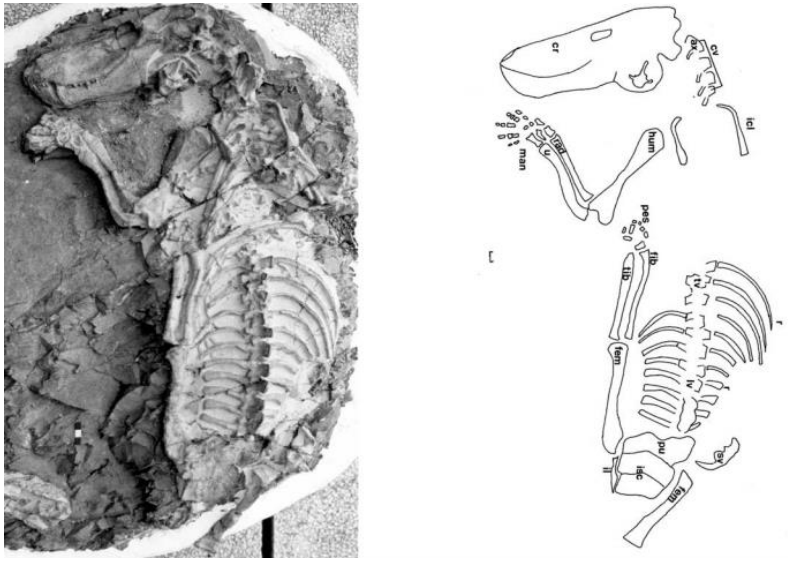
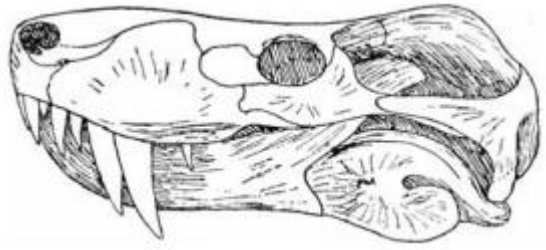
Heritage Type	Image / Figure	Description
Moschops	 (Benoit *et al* 2017)	Species of dinocephalian therapsid (tapinocephalid dinocephalian) which occurred during the Middle and Late Permian. Fossils occur in the Tapinocephalus Assemblage Zone of the Beaufort Group (Karoo Supergroup).

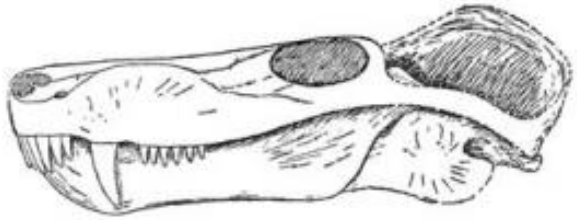
Heritage Type	Image / Figure	Description
Styracocephalus	 (Fraser-King *et al* 2019)	Species of tapinocephalian therapsids. These species existed within the Guadalupian Epoch within the Capitanian.
Scylacognathus	 (Gebauer 2007)	Species of gorgonopsian therapsids known from the Middle Capitanian Stage of the Middle Permian. Fossils occur in the Tapinocephalus Assemblage Zone of the Karoo Supergroup.

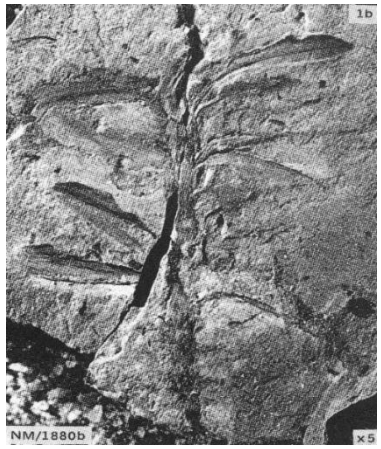
Heritage Type	Image / Figure	Description
Eoarctops	 (Gebauer 2007)	Species of gorgonopsian therapsids known from the Middle Capitanian Stage of the Middle Permian. Fossils occur in the Tapinocephalus Assemblage Zone of the Karoo Supergroup.

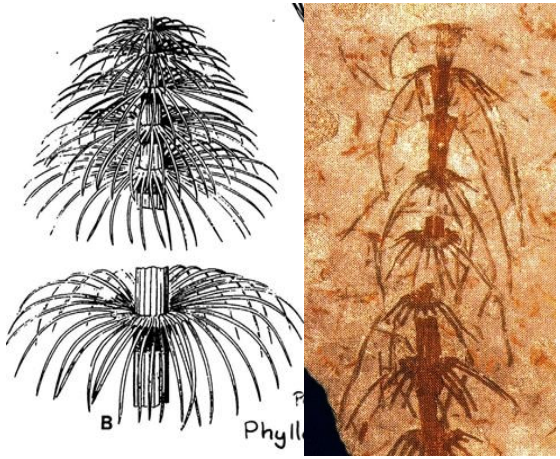
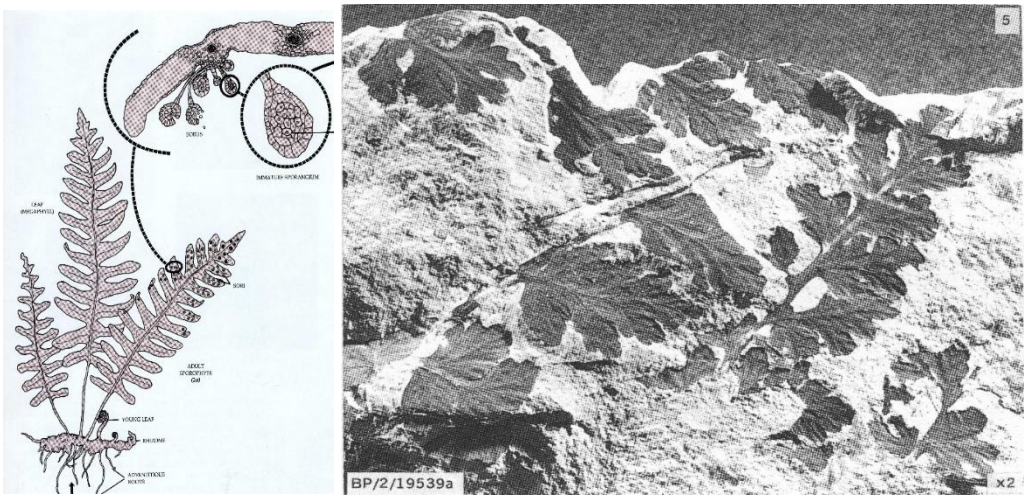
Heritage Type	Image / Figure	Description
Aelurosaurus	 (Gebauer 2007)	A small carnivorous gorgonopsian therapsid which occurred in the Mid to Late Permian. Fossils are found in the Tapinocephalus and Pristerognathus Assemblage Zones which occur in the Beaufort Group of the Karoo Basin.

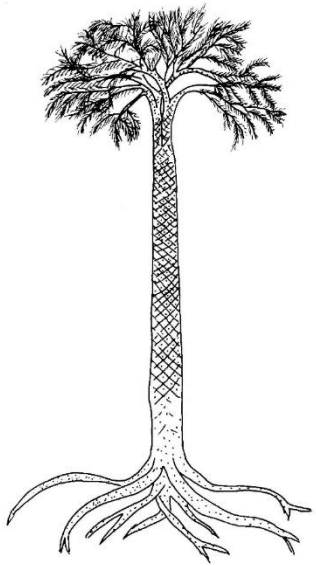
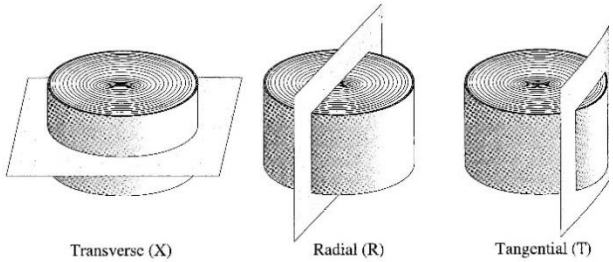
Heritage Type	Image / Figure	Description
Elliotsmithia	 Elliotsmithia skull preserved in rock (Kemp 2005)	Species of small varanopseid synapsid which existed in the late Middle Permian. Fossils occur in the Abrahamskraal Formation and within the boundaries of the Tapinocephalus Assemblage Zone.

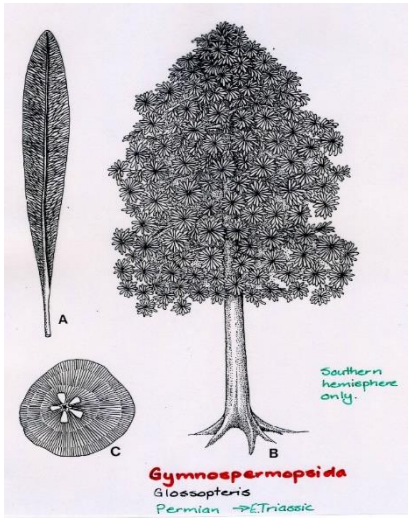
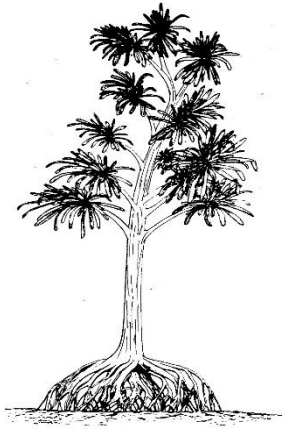
Heritage Type	Image / Figure	Description
Glanosuchus	 (Fourie & Rubidge 2009)	Species of scylacosaurid therocephalian from the Late Permian. Fossils occur in the Pristerognathus Assemblage Zone within the Beaufort Group.
Lycosuchus	 (Kemp 2005)	Species of carnivorous therocephalians from the Middle Permian and which is present in the Tapinocephalus Assemblage Zone.

Heritage Type	Image / Figure	Description
Pristerognathus	 (Kemp 2005)	Species of therocephalian. These species date to the Capitanian Stage of the late Middle Permian. These species lend their name to the Pristerognathus Assemblage Zone.

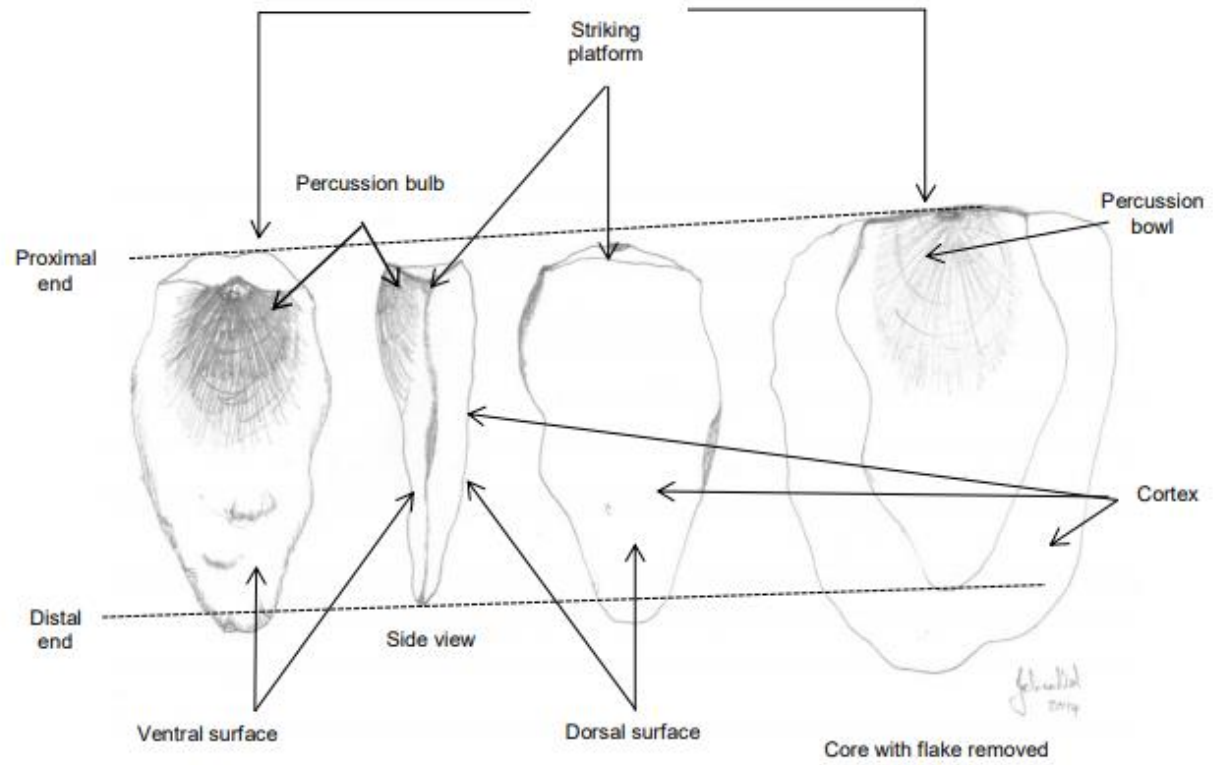
Heritage Type	Image / Figure	Description
Flora		
Buthelezia Bryophytes (mosses)	 (Anderson, 1985)	Informal group consisting of three divisions of non-vascular land plants: the liverworts, hornworts and mosses. They are characteristically limited in size and prefer moist habitats although they can survive in drier environments

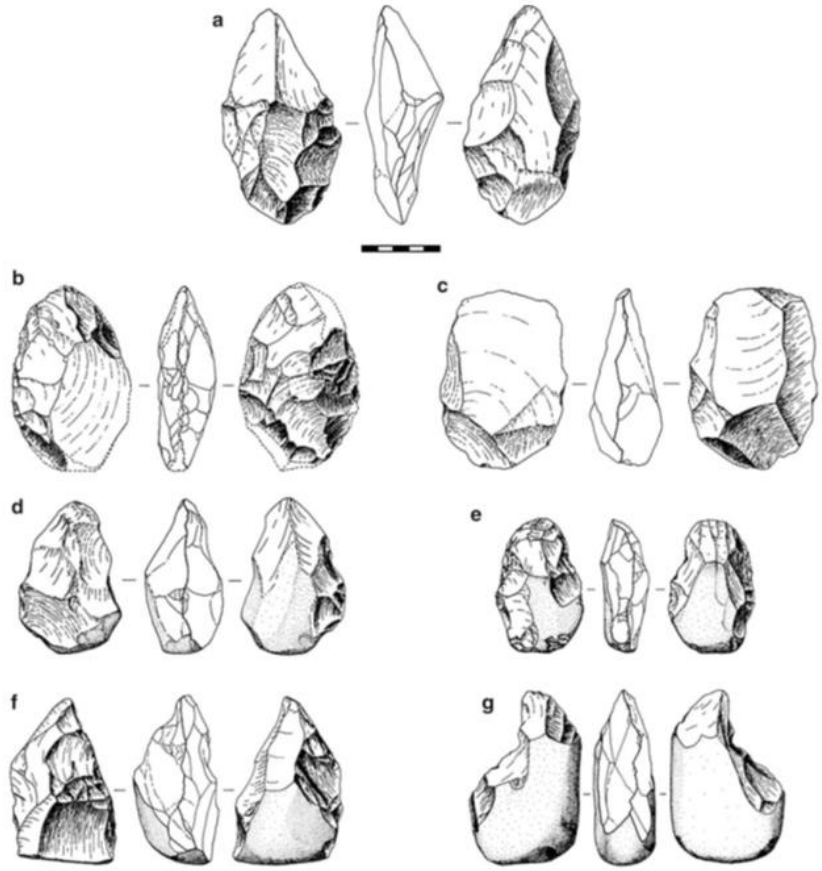
Heritage Type	Image / Figure	Description
Sphenophyllum Sphenophytes Sphenopsida Equisetales Calamitales		A genus of articulate land plants which occurred within the Devonian to the Triassic.
Sphenopteris lobatifolia	 (Anderson, 1985)	Genus of Paleozoic fossil plants (order Cycadofilicales) based primarily on leaf blades with cuneate pinnules.

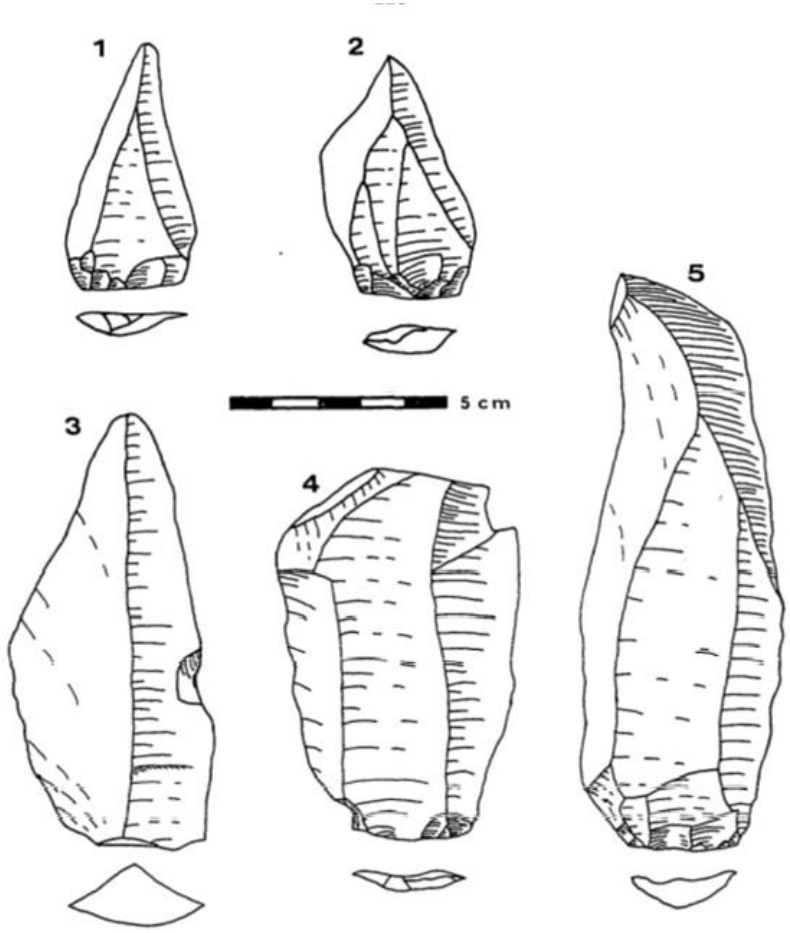
Heritage Type	Image / Figure	Description
Lycopods	 	More common in the Ecca sediments. Most were small plants but some grew to large trees and looked a bit like palm trees
Fossilised Wood	 FIGURE 10.22 Wood sections: transverse (X), radial (R), and tangential (T). 	Some very large trees occurred and looked like the conifer trees of today with growth rings and branches sometimes visible

Heritage Type	Image / Figure	Description
Glossopteris	 	Largest and best-known genus of the extinct Permian order of seed ferns known as Glossopteridales . The genus Glossopteris refers only to leaves
Cordaitales	 	Trees grew in swampy areas. Leaves have parallel veins.

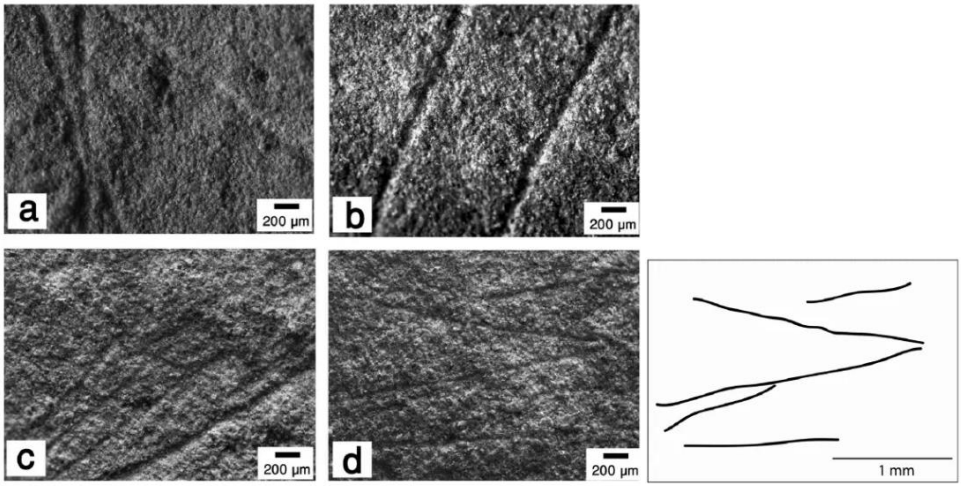
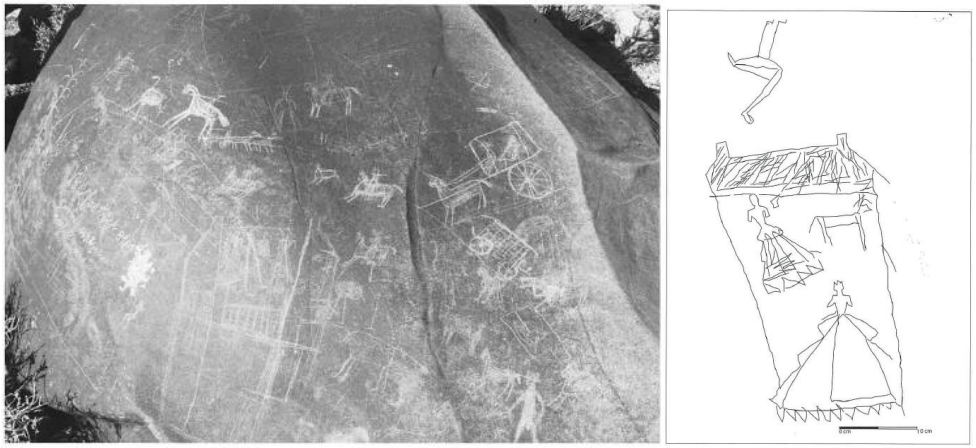
Heritage Type	Image / Figure	Description
Trace Fossils		
Invertebrate Tracks	  	These fossils consist of fossilised evidence of the movement of invertebrates. Each of these blocks are about 12 cm wide. From the Cape Supergroup. Photographs taken by Marion Bamford.
Zoophycus (also called Spirophyton)		Fossilised spiral burrows and connecting structures. This fossil was made by an unknown organism. From the Cape Supergroup. Photographs taken by Marion Bamford.

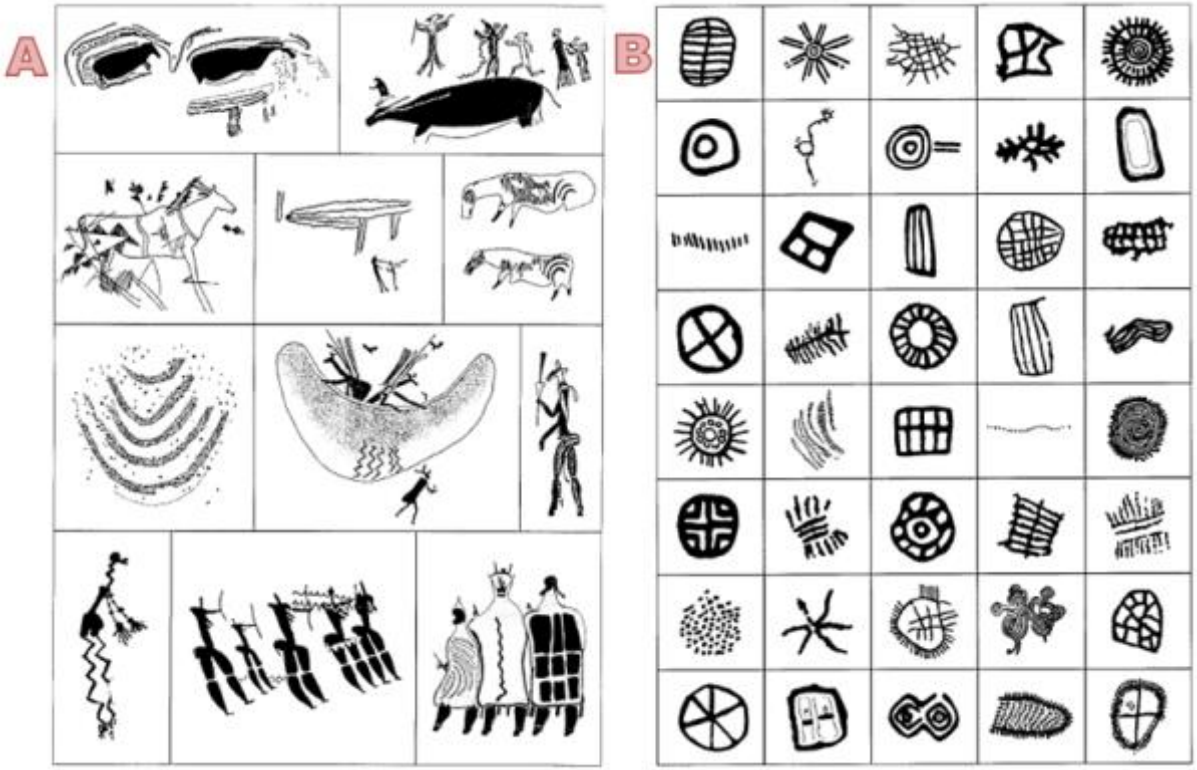
Heritage Type	Image / Figure	Description
Archaeological Record		
Stone Tool Identifying Features	 (Adapted from Nel, 2014)	Almost all stone tools have a striking platform on the proximal end, i.e. the small surface area where the flake is struck from the core / "parent material". Immediately below the striking platform is the bulb of percussion, i.e. the result of the striking force. The percussion bulb is always positive on the stone flake, with the consequent negative bowl on the core.

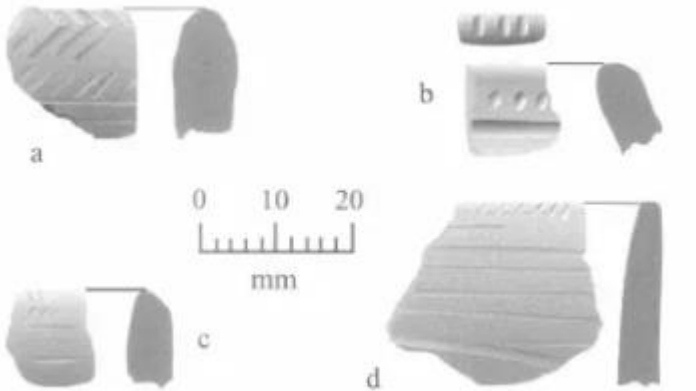
Heritage Type	Image / Figure	Description
Earlier Stone Age (ESA)	 (Adapted from Gibbon, Granger, Kuman & Partridge, 2009)	**Age:** ~200 kya – >2 Mya **Description:** Oldowan Industry flakes struck from cobbles, and later Achuelean core tools characterised by straighter and sharper edges. May include long blades, cores and low incidence of formal tools such as handaxes and cleavers.

Heritage Type	Image / Figure	Description
Middle Stone Age (MSA)	 (Adapted from Volman, 1980)	**Age:** 20 – 300 kya **Description:** High proportions of minimally modified blades, represented by the Levallois technique characterise the early MSA. Broadly defined by blades and points produced from good quality raw material.

Heritage Type	Image / Figure	Description
Later Stone Age (LSA)	 (Adapted from Parsons, 2006)	**Age:** 1840 - ~40 kya **Description:** Lithics associated with the LSA are specialised: specific tools being created for specific purposes, and the inclusion of bone tools into the assemblages. Characterised by many blades / bladelets and backed blades.

Heritage Type	Image / Figure	Description
Rock Art Engravings	 (Adapted from Bradfield, Thackeray & Morris, 2014)  (Adapted from Lupuwana & Hall, 2019)	Produced by incising, chipping or pecking of the rock surface to remove the outer surface of the rock. These are commonly situated in the open, on boulders or exposed glaciated pavements within the central plateau of the interior.

Heritage Type	Image / Figure	Description
Rock Art Paintings	 (Adapted from Smith & Ouzman, 2004)	Paintings are produced using fine brushes, quills, sticks or fingers predominantly done in red, white and black, and more rarely bichrome and polychrome. The art of the San depict imagery of realistic and proportionally correct. Geometric art is commonly accepted to be affiliated with the Khoekhoe.

Heritage Type	Image / Figure	Description
Khoekhoe Pottery		
Historical Period		
Farmsteads	 (Adapted from Frescura & Myeza, 2016)	Typical, 1880's Karoo dwelling, rectangular in shape with concave corrigated sheeting roof.

Heritage Type	Image / Figure	Description
Vernacular Architecture	 (Adapted from Frescura & Myeza, 2016)	Buildings are constructed from stone and are circular, with few square or rectangular exceptions. The walls curve inwards to an apex, reaching heights between 2 – 5 m, giving it a beehive shape

5 Lesson 4: The SKA1_MID Project Impacts and Problems

The Project is in a culturally sensitive landscape. There are several heritage resource types known to occur that may be at risk of damage or destruction from Project related activities, primarily during construction and operation.

To gauge the potential impacts, SARAO appointed the several specialists to complete an HIA that considered the identified potential impacts in pre- and post-mitigation scenarios. In other words, how severe is the impact if SARAO does nothing to lessen them, what is recommended to avoid or reduce the identified potential impact, and what is the severity of the impact if those recommendations are implemented?

The impact ratings considered the assigned cultural sensitivity of the resource against the following impact criteria; Duration; Extent; Intensity; and Probability.

5.1 Identified Impacts

Impacts to heritage resources are generally placed into three categories:

- Direct Impact – affects the physical integrity of the heritage resource;
- Indirect Impacts – can occur later in time or a different place from the causal activity;
- Cumulative Impacts – in-combination effect of a host of insignificant processes that collectively have a significant effect.

DIRECT	INDIRECT	CUMULATIVE
Most immediate and noticeable. E.g. Damage or destruction	Not always immediate or noticeable. E.g. Loss of access eroding living heritage.	Considers scale at landscape level. E.g. Additional dishes erode the "sense-of-place"

Table 5-1: Identified Potential Impacts

Impact	Pre-Mitigation	Post-Mitigations
	Significance	Significance
Direct impacts to palaeontological resources through the development of new roads or existing road upgrades	Negligible - negative	Negligible - positive

Impact	Pre-Mitigation	Post-Mitigations
	Significance	Significance
Direct impact to identified fossil heritage on the Farm Son Tuin (Die Tuin)	Minor - negative	Negligible - positive
Potential direct impacts to palaeontological resources - good integrity	Minor - negative	Minor - positive
Potential direct impacts to palaeontological resources - poor integrity	Minor - negative	Minor - positive
Direct impacts to multi-layered archaeological sites with medium CS	Negligible - negative	Negligible - positive
Direct impacts to Stone Age scatters and isolated findspots with low CS	Minor - negative	Negligible - positive
Direct impacts to Stone Age sites with high CS (SA-016)	Moderate - negative	Negligible - positive
Indirect impacts to burial grounds and graves with very-high CS	Negligible - negative	Negligible - negative
Indirect impacts to Rock Art with medium to medium-high CS	Minor - negative	Negligible - negative
Potential direct impacts to unidentified archaeological resources with good integrity	Minor - negative	Minor - positive
Potential direct impacts to unidentified archaeological resources with poor integrity	Minor - negative	Minor - positive
Demolition of historic built environment resources older than 60 years	Moderate - negative	Moderate - positive
Indirect impacts on Corbelled House structures within the site-specific area resulting in damage or destruction (BHS-1 & BHS-7)	Minor - negative	Minor - positive
Indirect impacts on the Groot Paardekloof Farmstead (BHS-5) and School (BHS-6)	Minor - negative	Minor - positive

Impact	Pre-Mitigation	Post-Mitigations
	Significance	Significance
Indirect Impacts on graded heritage resources (BHS-2, BHS-3; BHS-4 and BHS-8)	Minor - negative	Minor - positive

5.2 Required Management and Mitigations

To rectify pre-mitigation scenarios, the outcomes of the assessment included recommended management and mitigation measures to avoid, minimise, rectify, reduce or offset the potential impacts and risks.

Table 5-2: Primary Recommendations to Mitigate Identified Potential Impacts

Recommendation	Description
Develop a Conservation Management Plan (CMP) and Chance Find Protocol (CFP) for implementation	A project specific CMP including CFPs must be developed and implemented as part of this Project that considers the project related activities in relation to the specified infrastructures. The CMP and CFPs must consider the sensitivity of the landscape in terms of palaeontology and archaeology. **This has been completed and approved. Refer to Lessons 5 and 6.**
Declaration of Built Heritage resources	Built Heritage resources with a recommended field rating of Grade II be formally declared or Grade III included in the national inventory.
Establish buffers around Built Heritage resources within the site-specific study area as per Section 6.4 of the specialist Built Environment Assessment	The significance of these resources will inform the size of the recommended buffer to be implemented around the structures intended for retention. Grade II resources will require a 1 km buffer, retained Grade III A resources will require a 150 m buffer zone and retained Grade III B and III C resources require a 50 m buffer. These buffer zones must be implemented during construction and operation phases. **This has been completed and implemented.**
Structures older than 60 years are subject to permitting requirements	Structures older than 60 years are afforded general protection and subject to permitting requirements stipulated under Sections 27 & 34 of the NHRA and regulated by Chapter IV of GN R 548. Individual permit applications must therefore be submitted for each protected building proposed for demolition. The affected structures must be recorded in detail prior to their alteration or destruction. This will include *inter alia* photographs and measured drawings. **This has been completed for select structures and planned for select medium-term use structures.**

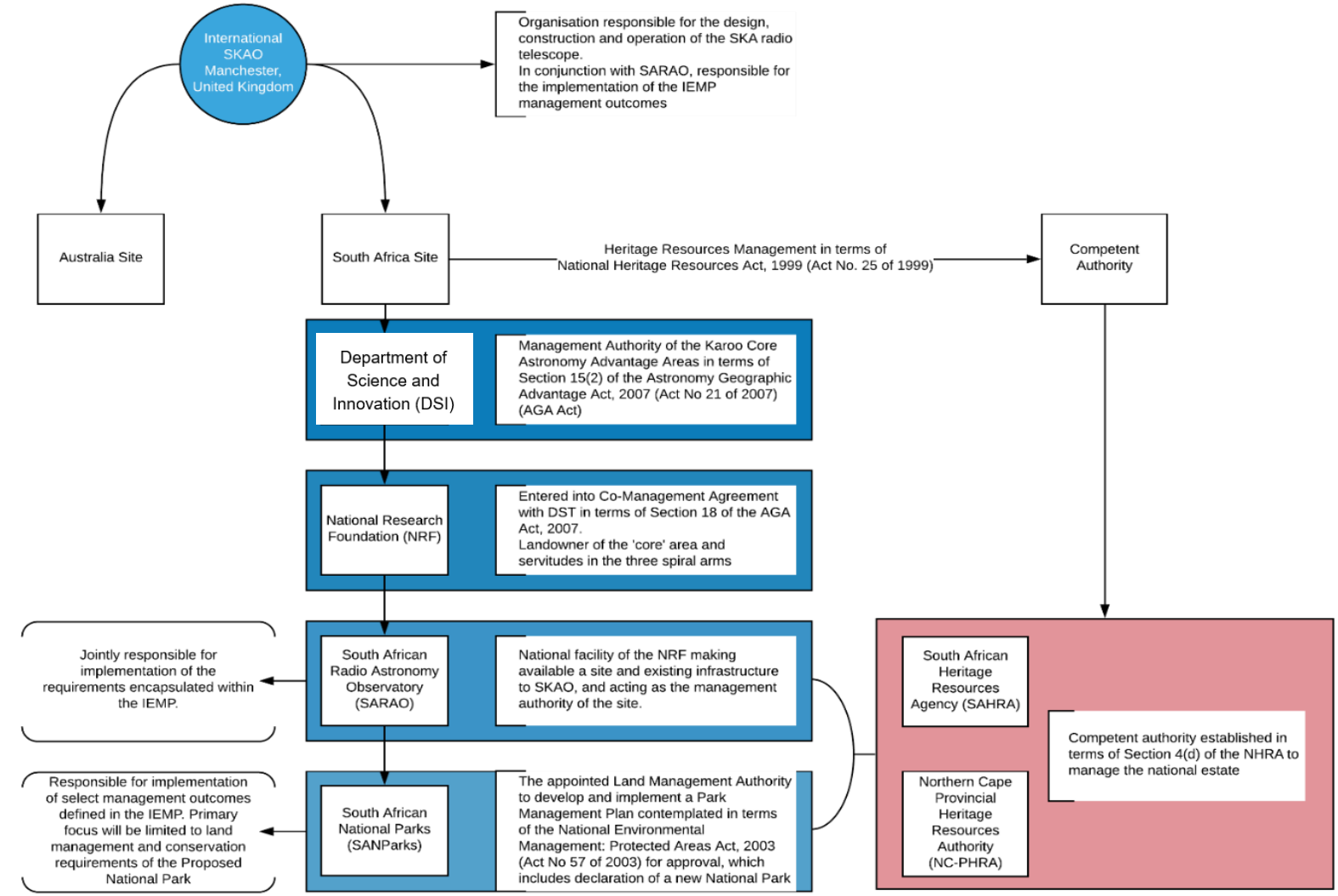
Recommendation	Description
Rehabilitate after construction	The development footprint must be rehabilitated as far as possible to reduce the intensity of the visual disturbance. This may include the following activities: • Limiting heights of any topsoil spoils that may be created; • Trenched areas must be re-contoured; • Borrow pits and quarries must be profiled to a natural topography; and • Disturbed areas must be revegetated with indigenous species in accordance with the requirements contained within the Ecological Assessment.
Reduce visual disturbance during construction	Dust suppression techniques should be employed as far as possible to limit dust pollution during construction activities.
	Construction during the night must be avoided as far as possible. Where unavoidable, areas where these activities are taking place should be lit and the number of lights and brightness must not exceed the minimum requirements for safety and security. Down lighting and low-pressure lighting mediums such as sodium light sources must be implemented to minimise light pollution. Lights should be directed inwards towards the Project area and not outwards from the Project area.

6 Lesson 5: The SKA1_MID Project Conservation Management Plan

6.1 The SKA1_MID Project Entity Organogram

The SKA1_MID Project is managed by 5 operating entities, which include:

- The International SKAO;
- The Department of Science and Innovation (DSI);
- The NRF;
- SARAO; and
- South African National Parks (SANParks).


International SKAO Manchester, United Kingdom
Organisation responsible for the design, construction and operation of the SKA radio telescope.
In conjunction with SARAO, responsible for the implementation of the IEMP management outcomes
Australia Site
South Africa Site
Heritage Resources Management in terms of National Heritage Resources Act, 1999 (Act No. 25 of 1999)
Competent Authority
Department of Science and Innovation (DSI)
Management Authority of the Karoo Core Astronomy Advantage Areas in terms of Section 15(2) of the Astronomy Geographic Advantage Act, 2007 (Act No 21 of 2007) (AGA Act)
National Research Foundation (NRF)
Entered into Co-Management Agreement with DST in terms of Section 18 of the AGA Act, 2007.
Landowner of the 'core' area and servitudes in the three spiral arms
Jointly responsible for implementation of the requirements encapsulated within the IEMP.
South African Radio Astronomy Observatory (SARAO)
National facility of the NRF making available a site and existing infrastructure to SKAO, and acting as the management authority of the site.
Responsible for implementation of select management outcomes defined in the IEMP. Primary focus will be limited to land management and conservation requirements of the Proposed National Park
South African National Parks (SANParks)
The appointed Land Management Authority to develop and implement a Park Management Plan contemplated in terms of the National Environmental Management: Protected Areas Act, 2003 (Act No 57 of 2003) for approval, which includes declaration of a new National Park
South African Heritage Resources Agency (SAHRA)
Northern Cape Provincial Heritage Resources Authority (NC-PHRA)
Competent authority established in terms of Section 4(d) of the NHRA to manage the national estate

6.2 Roles and Responsibilities

It is every person's responsibility to complete training and implement the Project CMP and CFP. Table 6-1 details the specific roles of the various individual positions involved in the implementation of the Project.

Table 6-1: Primary Positions and Responsibilities

Position	Responsibility
Archaeologist	On-site monitoring of earth moving activities during construction and/or operational phases in areas with high to very high archaeological sensitivity. The SKAO / contractors must provide a detailed programme for construction works to plan the physical presence of the contractor-appointed archaeologist. Outcomes of monitoring must be collated into a Watching Brief Report for submission to SAHRA and NC-PHRA via SAHRIS. Ensure all newly identified archaeological resources are to be recorded in the Recording Document
Palaeontologist	On-site monitoring of earth moving activities during construction and/or operational phases in areas with very high palaeontological sensitivity. The SKAO / contractors must provide a detailed programme for construction works to plan the physical presence of the contractor-appointed palaeontologist. Cursory monitoring of earth moving activities during construction and/or operational phases in areas with moderate palaeontological sensitivity. Outcomes of monitoring must be collated into a Watching Brief Report for submission to SAHRA and NC-PHRA via SAHRIS. Ensure all newly identified palaeontological resources are to be recorded in the Recording Document.
South African Construction Site Director	Accountable for all aspects of the SKA1_MID Project and its associated activities, including ensuring that the construction and operational activities comply with all relevant legislation, regulations, minimum requirements, constitution and international conventions / protocols and other requirements to which the SKAO and SARAO subscribes.
SKAO Site Manager or SKA Construction and SARAO Site Manager	Responsible for ensuring the CFP is implemented. Bring to the attention of the Environmental Control Officer (ECO) the requirements encapsulated within the CMP and the CFP. Work directly with the ECO to ensure the necessary assessment and requirements are implemented. Ensure all relevant staff receive the necessary training to implement the CFP and other requirements encapsulated within the CMP.

Position	Responsibility
SKAO & SARAO Environmental Control Officer/s	Responsible for ensuring all activities and the potential risks to cultural heritage are considered by thorough implementation of the CMP and CFP. This includes the allocation of appropriate resources to undertake such assessments. These can include, but are not limited to: • External specialist consultants; and • Internal specialists. On-site inspection of earth moving activities during construction and/or operational phases in areas with very low to moderate archaeological sensitivity, and low palaeontological sensitivity. Ensure all newly identified heritage resources are to be recorded in the Recording Document.
SANParks Park Manager	Accountable for all aspects of the Proposed National Park and its associated activities, including ensuring that all activities comply with all relevant legislation, regulations, minimum requirements, constitution and international conventions / protocols and other requirements to which SANParks subscribes.
SANParks Senior Ranger	Responsible for bringing to the attention of the Ecological and Cultural Conservation Officers the requirements encapsulated within the CMP and CFP. Ensure all relevant staff receive the necessary training to implement the CFP and other requirements encapsulated within the CMP. Ensure all newly identified heritage resources are to be recorded in the Recording Document.
SANParks Conservation / Outreach Officer	Responsible for ensuring all activities and the potential risks to cultural heritage are considered by thorough implementation of CMP and CFP. This includes the allocation of appropriate resources to undertake such assessments. These can include, but are not limited to: • External specialist consultants; and • Internal specialists. Ensure all newly identified heritage resources are to be recorded in the Recording Document.
Contractors	Responsible for ensuring the CFP is implemented. Responsible for ensuring all activities and the potential risks to cultural heritage are considered by thorough implementation of the CMP. Ensure all newly identified heritage resources are to be recorded in the Recording Document.

6.3 Management Requirements

Management requirements are based on the principles of avoid, minimise, rectify, reduce or offset. These include:

- Project-related mitigation measures, i.e. Project design amendments to avoid or minimise risk to heritage resources; — COMPLETED BY SARAO
- Heritage-related mitigation measures, i.e. Mitigation measures authorised in terms of Section 34 or 35 Permits to reduce the intensity of identified impacts to heritage resources; and — UNDERTAKEN BY SPECIALISTS
- Preventative protection measures, i.e. Implementation of protocols, including establishing buffers, monitoring by specialists in areas of high-sensitivity, and implementation of specific CFPs. — TO BE IMPLEMENTED DURING CONSTRUCTION AND OPERATION

6.3.1 Construction Monitoring Requirements

Construction activities pose the greatest threat to physical heritage resources within the cultural landscape. To manage the identified risk during construction, monitoring is required.

Table 6-2 and Table 6-3 detail the applicable palaeontological and archaeological monitoring requirements respectively.

Table 6-2:Palaeontological Monitoring Requirements during Construction of the SKA1_MID Project

Activity	Sensitivity[1]	Responsible	Requirements
Construction activities in relation paleontological sensitivities	Very high	Palaeontologist	• On-site inspection2; • Guide construction to avoid possible impacts to chance finds • Record and assess identified chance finds • Implement requirements of NHRA and NHRA Regulations • Compile Watching Brief Report for submission to SAHRA
	High	SARAO Site Supervisor	Implement CFP (See Lesson 6)
	Moderate		
	Low		
	Negligible	N/A	No requirements

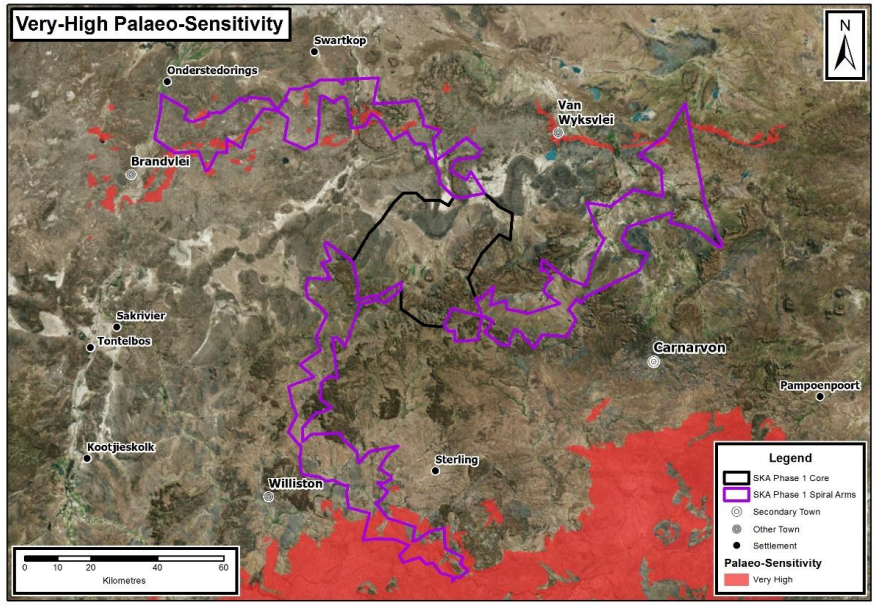


Figure 6-1: High – Very High Palaeo-Sensitivity Areas to be Monitored by Palaeontologist

[1] Refer to interactive map for detailed delineations of palaeontological/archaeological sensitivities within the Proposed National Park

[2] Infield inspection of development footprint prior to commencement of earth moving activities. Monitoring of earth moving activities.

Table 6-3: Archaeological Monitoring Requirements during Construction of the SKA1_MID Project

Activity	Sensitivity12F[3]	Responsible	Requirements
Construction activities in relation to defined archaeological sensitivities	Very high	Archaeologist	• On-site inspection; • Guide construction to avoid possible impacts to chance finds • Record and assess identified chance finds • Implement requirements of NHRA and NHRA Regulations • Compile Watching Brief Report for submission to SAHRA
	High		
	Moderate	SARAO Site Supervisor	Implement CFP (See Lesson 6)
	Low		
	Very low		
	Negligible		

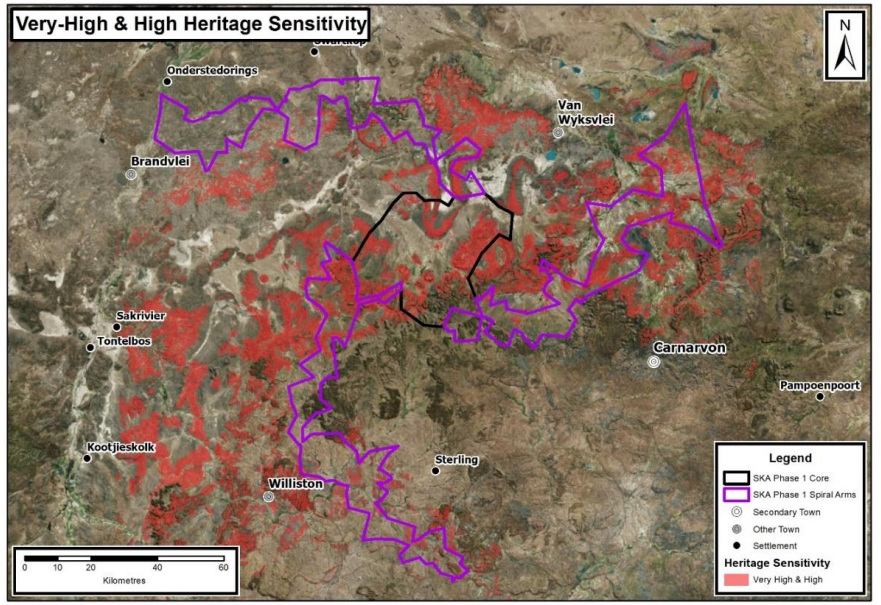


Figure 6-2: High – Very High Archaeological Sensitivity Areas to be Monitored by Archaeologist

[3] Refer to interactive map for detailed delineations of palaeontological/archaeological sensitivities within the Proposed National Park

6.3.2 Operational Monitoring Requirements

Known heritage resources within the boundaries of the 'core' Project area must be monitored against the baseline, i.e. the first records of integrity of the heritage resource, to measure changes through time or in response to specific events.

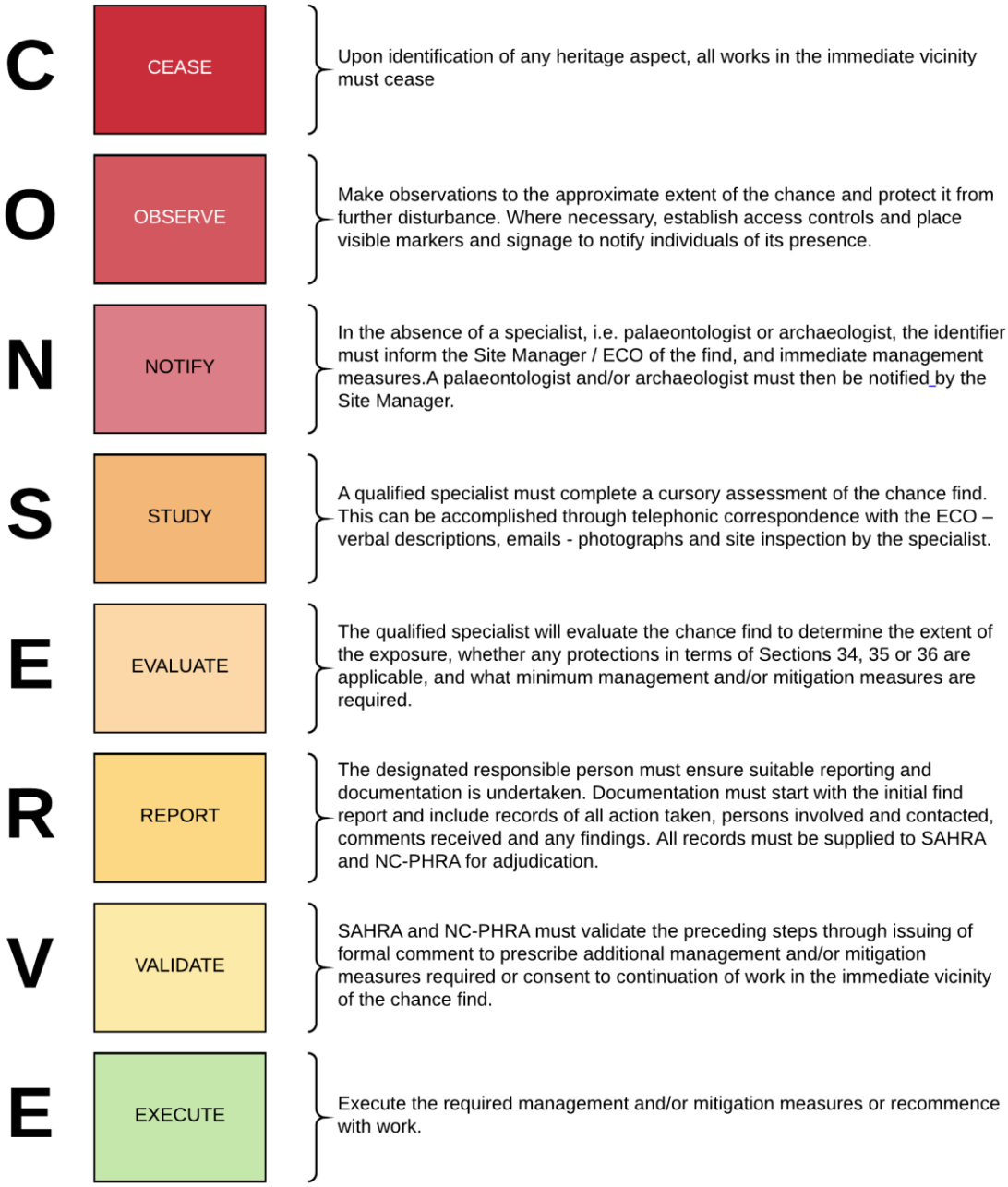
These monitoring requirements are specifically for built structures protected in terms of Section 34 of the NHRA.

Table 6-4: Monitoring Requirements during Operation of the Proposed National Park

Responsible	Frequency	Pro / Reactive	Method
SANParks Cultural Conservation Officer	Quarterly	Proactive	• Record status quo through photographs; • Maintain records; • Report on monitoring results as required
Conservation Architect	Annually	Proactive	• Visually assess the status quo; • Review monitoring results against baseline conditions; • Review and update management measures

7 Lesson 6: The CONSERVE Protocol

SARAO developed a procedure to reduce the intensity of potential impacts to unidentified palaeontological and archaeological resources. This procedure is applicable throughout construction and operation of the Project.


C
CEASE
Upon identification of any heritage aspect, all works in the immediate vicinity must cease
O
OBSERVE
Make observations to the approximate extent of the chance and protect it from further disturbance. Where necessary, establish access controls and place visible markers and signage to notify individuals of its presence.
N
NOTIFY
In the absence of a specialist, i.e. palaeontologist or archaeologist, the identifier must inform the Site Manager / ECO of the find, and immediate management measures.A palaeontologist and/or archaeologist must then be notified by the Site Manager.
S
STUDY
A qualified specialist must complete a cursory assessment of the chance find. This can be accomplished through telephonic correspondence with the ECO – verbal descriptions, emails - photographs and site inspection by the specialist.
E
EVALUATE
The qualified specialist will evaluate the chance find to determine the extent of the exposure, whether any protections in terms of Sections 34, 35 or 36 are applicable, and what minimum management and/or mitigation measures are required.
R
REPORT
The designated responsible person must ensure suitable reporting and documentation is undertaken. Documentation must start with the initial find report and include records of all action taken, persons involved and contacted, comments received and any findings. All records must be supplied to SAHRA and NC-PHRA for adjudication.
V
VALIDATE
SAHRA and NC-PHRA must validate the preceding steps through issuing of formal comment to prescribe additional management and/or mitigation measures required or consent to continuation of work in the immediate vicinity of the chance find.
E
EXECUTE
Execute the required management and/or mitigation measures or recommence with work.

Complete the training

30 days before construction, look in the area for archaeology

Select the Scenario

C Cease | Stop

O Observe | Look

N Notify | Tell

S Study | Assess

E Evaluate | Judge

R Report | Write

V Validate | Submit

E Execute | Do



Archaeology:
Can be considered both a social science and a branch of the humanities.

Scenario 1	Scenario 2	Scenario 3
Accidentally discover something during your work	A discovery is made before you start working, but you can't avoid it	A discovery is made before you start working, but you can avoid it
Stop all work and follow the CONSERVE Protocol		Amend the infrastructure to avoid
Look at how big the area is where you made the find, and work outside of this area		
Immediately tell the ECO and Archaeologist about the find. Send photographs and the location information.		Tell the ECO about the find. Write down your find on the recording form
The ECO and Archaeologist will complete an assessment.		
The ECO and Archeologist will say if the find is protected and how to continue		
The find must be reported to the Heritage Authority known as SAHRA by the ECO and Archaeologist		
The Heritage Authority will determine and tell you if work can continue or if you will need to do more steps before working again		
Complete the steps that the Heritage Authority gave you to do. Continue with the work.		Continue with the work.

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SKA SQUARE KILOMETRE ARRAY

Palaeontology :
The branch of science concerned with fossil animals and plants.

		Scenario 1	Scenario 2	Scenario 3
Complete the training				
30 days before construction, look in the area for palaeontology				
Select the Scenario		Accidentally discover something during your work	A discovery is made before you start working, but you can't avoid it	A discovery is made before you start working, but you can avoid it
C	Cease | Stop	Stop all work and follow the CONSERVE Protocol		Amend the infrastructure to avoid
O	Observe | Look	Look at how big the area is where you made the find, and work outside of this area		
N	Notify | Tell	Immediately tell the ECO and Palaeontologist about the find. Send photographs and the location information.		Tell the ECO about the find. Write down your find on the recording form
S	Study | Assess	The ECO and Palaeontologist will complete an assessment.		
E	Evaluate | Judge	The ECO and Palaeontologist will say if the find is protected and how to continue		
R	Report | Write	The find must be reported to the Heritage Authority known as SAHRA by the ECO and Palaeontologist		
V	Validate | Submit	The Heritage Authority will determine and tell you if work can continue or if you will need to do more steps before working again		
E	Execute | Do	Complete the steps that the Heritage Authority gave you to do. Continue with the work.		Continue with the work.

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SKA SQUARE KILOMETRE ARRAY

DIGBY WELLS
ENVIRONMENTAL

Appendix A: Recording Document

SITE RECORDING AND PRELIMINARY CONDITIONAL ASSESSMENT FORM

DIGBY WELLS ENVIRONMENTAL

Recorder:		**Date:**	
Classification:	Immovable	Movable	Intangible
Location:		**Photograph Numbers:**	
Ref No: Site name/number or other reference		**Co-ordinates** Decimal degrees using the WGS84 datum	

1. Immovable Heritage Resources

SAHRIS ID Reference: where applicable			
Type of resource:	See footer	**Age / Industry / Period:**	Cultural period / style / associated persons / history
Resource Description Summary:	See footer		
Functional Type:		**Current Function:**	Original / changed from past / current function

Please proceed to Section 4

2. Movable Heritage Resources

SAHRIS ID Reference:			
Type of resource:	Artefacts, artworks, books, documents machines, clothing	**Age / Industry / Period:**	
Resource Description Summary:			
Quantity recorded:			

Please proceed to Section 4

3. Intangible Heritage Resources

SAHRIS ID Reference:			
Type of resource:		To whom is the resource significant?	
Describe the resource or summarise provided information:			
Informant / source of information:			Wishes to remain anonymous

Please proceed to Section 4

Type of Resource: Archaeological: Artefacts, Rock Art, Deposit, Shell Midden, Ruin > 100 years, Stone walling, Settlement; Living heritage / sacred site; Battlefield; Burial Grounds and Graves; Conservation Area; Cultural Landscape; Geological; Meteorites; Monuments & Memorials; Natural, Palaeontological; Place; Structure: bridge, building, transport infrastructure; Underwater: Shipwreck, Submerged (intertidal, partially submerged, fully submerged).
Summary Description: Artefact: Isolated surface, Artefact: Low density surface scatter, <10:1 sq m, Artefact: medium density surface scatter, <20:1 sq m, Artefact: high density surface scatter, >20:1 sq m, Artefact: embedded in rock matrix, Burial ground: Undetermined, Single grave , ≤10 graves, ≤20 graves, ≤50 graves, >100 graves; ≤100 graves; Deposit: ash, ≤1 cm , ~5 cm, ~10 cm, ~20 cm, >20 cm; Deposit: charcoal; Deposit: Faunal; Deposit: Kraal; Fossil, hominin: embedded in rock matrix; Fossil, hominin: isolated surface; Fossil, hominin: tracks; Fossil, invertebrate: embedded in rock matrix; Fossil, invertebrate: isolated surface; Fossil, invertebrate: tracks; Fossil, plant: embedded in rock matrix; Fossil, plant: isolated surface; Fossil, vertebrate: embedded in rock matrix; Fossil, vertebrate: isolated surface; Fossil, vertebrate: tracks; Fossil: breccia with visible remains; Fossil: breccia without visible remains; Rock art: combination; Rock art: engraving; Rock art: painting; Shelter: including artefact/s;
Shelter: including artefact/s + deposit; Shelter: including artefact/s + deposit + structures; Shelter: rock art + artefacts / deposit / structures; Shelter: rock art combination; Shelter: rock art engraving; Shelter: rock art painting; Site: high complexity, multiple components >2500 sq m / 50 x 50 m; Site: low complexity, multiple components <25 sq m / 5 x 5 m; Site: medium complexity, multiple components >25 sq m / 5 x 5 m to <2500 sq m / 50 x 50 m; Structural: complex, e.g. werf; Structural: functional, e.g. fences, wind pumps, troughs; Structural: industrial, e.g. warehouse, headgear; Structural: remains, e.g. daga, hut floor, foundations, bricks; Structural: stonewall; Other

SITE RECORDING AND PRELIMINARY CONDITIONAL ASSESSMENT FORM

DIGBY WELLS ENVIRONMENTAL

4. Description and Notes						
Restrictions/sensitivities: *Please note any restrictions with regard to this heritage resource and/or information obtained by an informant*	None		No photographs		Do not publish	
	Other:					
	Reason for Restrictions:		*E.g. Conservation, economic, spiritual, immovable heritage, other (please describe)*			
Please provide a brief description of the resource:						
Condition of the resource:	Damaged		Poor		Fair	Good
Quality of the resource: (Scales of damage)	Poor		Fair		Good	Excellent
Please describe: *(including scale of damage or neglect and factors influencing the integrity of the resource)*						
Statement of Significance: *(please provide a brief assessment of the significance of the resource, in your opinion)*	Negligible	Low	Medium	Med-Hi	High	V. High
	Consider aesthetic, historic, scientific and social criteria					
Are there any observable / apparent threats / impacts to the resource?						
Can this impact be avoided?	YES		NO			
Describe why.						
Please include any additional notes here: *(e.g. any notable features, additional information from an informant, damage)* *Should this be a Chance Find, please include details surrounding the find (e.g. personnel involved, activities being undertaken, decisions made and steps taken after find, date and time of find)*						

Type of Resource: Archaeological: Artefacts, Rock Art, Deposit, Shell Midden, Ruin > 100 years, Stone walling, Settlement; Living heritage / sacred site; Battlefield; Burial Grounds and Graves; Conservation Area; Cultural Landscape; Geological; Meteorites; Monuments & Memorials; Natural, Palaeontological; Place; Structure: bridge, building, transport infrastructure; Underwater: Shipwreck, Submerged (intertidal, partially submerged, fully submerged).
Summary Description: Artefact: Isolated surface, Artefact: Low density surface scatter, <10:1 sq m, Artefact: medium density surface scatter, <20:1 sq m, Artefact: high density surface scatter, >20:1 sq m, Artefact: embedded in rock matrix, Burial ground: Undetermined, Single grave , ≤10 graves, ≤20 graves, ≤50 graves, >100 graves; ≤100 graves; Deposit: ash, ≤1 cm , ~5 cm, ~10 cm, ~20 cm, >20 cm; Deposit: charcoal; Deposit: Faunal; Deposit: Kraal; Fossil, hominin: embedded in rock matrix; Fossil, hominin: isolated surface; Fossil, hominin: tracks; Fossil, invertebrate: embedded in rock matrix; Fossil, invertebrate: isolated surface; Fossil, invertebrate: tracks; Fossil, plant: embedded in rock matrix; Fossil, plant: isolated surface; Fossil, vertebrate: embedded in rock matrix; Fossil, vertebrate: isolated surface; Fossil, vertebrate: tracks; Fossil: breccia with visible remains; Fossil: breccia without visible remains; Rock art: combination; Rock art: engraving; Rock art: painting; Shelter: including artefact/s;
Shelter: including artefact/s + deposit; Shelter: including artefact/s + deposit + structures; Shelter: rock art + artefacts / deposit / structures; Shelter: rock art combination; Shelter: rock art engraving; Shelter: rock art painting; Site: high complexity, multiple components >2500 sq m / 50 x 50 m; Site: low complexity, multiple components <25 sq m / 5 x 5 m; Site: medium complexity, multiple components >25 sq m / 5 x 5 m to <2500 sq m / 50 x 50 m; Structural: complex, e.g. werf; Structural: functional, e.g. fences, wind pumps, troughs; Structural: industrial, e.g. warehouse, headgear; Structural: remains, e.g. daga, hut floor, foundations, bricks; Structural: stonewall; Other

DIGBY WELLS
ENVIRONMENTAL

Appendix B: Site Specific Examples

Glossopteris Leaf

Petrified Wood

MSA Artefact

Rock Paintings

Mixed Archaeological Assemblage

Calamites Culm

Shelly Coquina

LSA Artefacts

Historical Artefacts

Rippled Sandstone with invertebrate burrows

Lower Grinding Stone

Farmstead

Corbelled Huts