Visual Compliance Statement for the Proposed New Science Exploratorium, Carnarvon, Northern Cape

SUBMITTED FOR ENVIRONMENTAL AUTHORISATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) (NEMA) (AS AMENDED).

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STATEMENT OF INDEPENDENCE

Neither ETC nor any of the authors of this Report have any material present or contingent interest in the outcome of this Report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of ETC.

ETC has no beneficial interest in the outcome of the assessment which is capable of affecting its independence.

TABLE OF CONTENT

LIST OF FIGURES

LIST OF ABBREVIATIONS

Abbreviation	Description
EIA	Environmental Impact Assessment
EnviroAfrica	EnviroAfrica NC CC
ETC	Eco Thunder Consulting (Pty) Ltd
SKA	Square Kilometre Array
VAC	Visual Absorption Capacity
VCS	Visual Compliance Statement

GLOSSARY LIST

Glossary Item	Description
Aesthetic Value	Aesthetic value is the emotional response derived from the experience of the environment with its natural and cultural attributes. The response can be either to visual or non-visual elements and can embrace sound, smell and any other factor having a strong impact on human thoughts, feelings, and attitudes (Ramsay, 1993). Thus, aesthetic value encompasses more than the seen view, visual quality, or scenery, and includes atmosphere, landscape character and sense of place (Schapper, 1993).
Landscape Character	The individual elements that make up the landscape, including prominent or eye-catching features such as hills, valleys, woods, trees, water bodies, buildings, and roads. They are generally quantifiable and can be easily described.
Study area	For the purposes of this report this Project the study area refers to the proposed Project footprint / Project site as well as the 'zone of potential influence' (the area defined as the radius about the centre point of the Project beyond which the visual impact of the most visible features will be insignificant) which is a 5,0km radius surrounding the proposed Project footprint / site.
Project Footprint / Site	For the purposes of this report the Project site / footprint refers to the actual layout of the Project as described.
Sense of Place (Genius loci)	Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. A genius locus literally means 'spirit of the place'.
Visibility	The area from which Project components would potentially be visible. Visibility depends upon general topography, aspect, tree cover or other visual obstruction, elevation, and distance.

Glossary Item	Description
Visual Impact	Visual effects relate to the changes that arise in the composition of available views because of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity available views because of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity.
Visual Intrusion	The nature of intrusion of an object on the visual quality of the environment resulting in its compatibility (absorbed into the landscape elements) or discord (contrasts with the landscape elements) with the landscape and surrounding land uses.
VAC	VAC is defined as the landscape's ability to absorb physical changes without transformation in its visual character and quality. The landscape's ability to absorb change ranges from low-capacity areas, in which the location of an activity is likely to cause visual change in the character of the area, to high-capacity areas, in which the visual impact of development will be minimal (Amir & Gidalizon 1990).
Worst-case Scenario	Principle applied where the environmental effects may vary, for example, seasonally or collectively to ensure the most severe potential effect is assessed.

1 Background

1.1 Scope and Objective of the Specialist Study

Eco-Thunder Consulting (Pty) Ltd (ETC) was commissioned by EnviroAfrica NC CC (EnviroAfrica) as the lead consultant to manage the Visual Compliance Statement (VCS) for the establishment of the proposed New Science Exploratorium in Carnarvon, Northern Cape. The VCS Statement focuses on the potential impact of the physical aspects of the proposed development (i.e., form, scale, and bulk), and their potential impacts within the local landscape and receptor context.

The project is an initiative to enhance scientific exploration and education in the region, aligning with the local developmental goals and leveraging the presence of the Square Kilometre Array (SKA) project. The Visual Compliance study considers the following:

- **Development of the New Science Exploratorium:** This includes multiple public and non-public zones such as a planetarium, community resource centres, administrative offices, and other related facilities designed to foster scientific education and exploration.
- **Design and Architectural Considerations:** The New Science Exploratorium's design will need to emphasis integration with the existing landscape, utilising materials and colours that harmonise with the natural surroundings to minimise visual impact. The design includes reinforced concrete elements, structural steel components, and various concrete structures.
- **Landscape and Visual Integration:** Strategies include planting native vegetation, installing low-intensity lighting, and creating screening structures to reduce the visual prominence of the development.

The VCS aims to ensure that the development of the New Science Exploratorium will be conducted in a manner that is visually sensitive and sustainable, with minimal disruption to the existing landscape and visual receptors in the area.

1.2 Specialist Details

ETC is a privately owned company fully owned by women. We specialise in a wide range of specialised studies, including visual impact assessments, air quality impact assessments, noise impact assessments, socio-economic impact assessments, socio-economic research, economic development planning, development program design and implementation, as well as community trust management. Our expertise extends to conducting VCSs across Africa and optimising projects in the environmental sector. Our work encompasses landscape characterisation studies, end-use studies for quarries, and computer modelling and visualisation.

Based across South Africa, Eco Thunder has built a reputation as a leading authority on the conditions, needs, and assets of communities associated with independent power generation

facilities. Additionally, ETC actively implements development programs in energy communities, ensuring a comprehensive understanding of how to drive positive social impact.

2 Project Information

2.1 Project Description

EnviroAfrica has engaged ETC as the principal consultant to oversee the Visual Compliance Statement (VCS) for the establishment of the proposed New Science Exploratorium in Carnarvon, Northern Cape. This innovative development is set to enhance scientific exploration and education in the region, leveraging the strategic presence of the SKA project.

The New Science Exploratorium is designed to include various state-of-the-art facilities aimed at fostering scientific knowledge and community engagement. The project encompasses:

- **Public Zones:** These include a planetarium, multi-purpose auditoriums, community resource centres, retail gift shops, and interactive play areas. These spaces are intended to be accessible to the public and encourage community participation in scientific endeavours.
- **Non-Public Zones:** These comprise administrative offices, staff boardrooms, mechanical and electrical control rooms, and storage areas. These zones are essential for the operational efficiency and maintenance of the New Science Exploratorium.

The primary goal of this project is to create a visually harmonious and educationally enriching environment that aligns with local developmental objectives while adhering to stringent environmental management practices. The scope of the project includes:

- **Development and Construction:** Erecting various buildings and structures as part of the Exploratorium, designed to integrate seamlessly with the existing landscape and minimise visual impact.
- **Advanced Infrastructure:** Installing necessary support infrastructure such as automated systems for lighting and climate control, as well as ensuring accessibility and safety measures are in place throughout the facility.
- **Sustainability Measures:** Implementing eco-friendly practices, including the use of renewable energy sources, sustainable building materials, and water conservation techniques to ensure the project's long-term environmental sustainability.

By integrating these elements, the New Science Exploratorium aims to provide a stable and enriching resource for scientific education and community engagement in the Carnarvon region.

2.2 Project Site and Study Area

The proposed site for the New Science Exploratorium is located on Erf 431 in Carnarvon, Northern Cape. The site is strategically positioned within the jurisdiction of the Pixley ka Seme District Municipality (PkSDM) and falls under the local governance of the Kareeberg Local Municipality (KLM). This region is notable for its association with the SKA project, a key factor in the selection of Carnarvon as the site for the New Science Exploratorium.

Characterised by its flat terrain, sparse vegetation, and expansive vistas, the semi-arid environment of Carnarvon presents both opportunities and challenges for construction and operational logistics. The visual context of the site is predominantly rural, with minimal existing infrastructure and a landscape that allows for significant visibility of new developments.

The strategic location of the New Science Exploratorium is pivotal for its educational and infrastructural significance, as well as for its potential impact on local communities, including residents, visitors, and stakeholders involved in the SKA project. The study area for the VCS encompasses the following key elements:

- **Visual Receptors:** These include local residents, visitors to the SKA project, commuters on nearby roads such as Mark Street, End Street and South Street, as well as users of public facilities in Carnarvon. The visibility of the New Science Exploratorium from these receptors is a critical factor in the assessment.
- **Landscape Character:** The surrounding landscape is characterised by its open vistas and minimal obstructions, making any new development prominently visible. The design of the New Science Exploratorium aims to integrate seamlessly with this landscape, utilising materials and colours that harmonise with the natural environment.
- **Cultural and Historical Context:** The area has a rich cultural and historical background, which is considered in the design and placement of the New Science Exploratorium to ensure it complements the existing heritage of Carnarvon.

Table 1, and Figure 1 to Figure 4 provide the details of the project, including the main infrastructure components and services that will be required during the project lifecycle. These include the layout of the New Science Exploratorium, the proposed landscaping plans, and the integration of sustainable practices to minimise visual impact and promote environmental stewardship.

By considering these factors, the project aims to develop the New Science Exploratorium in a manner that enhances scientific education and exploration while respecting and preserving the visual and cultural integrity of the Carnarvon region.

Table 1: Project Specifications

Component	Description/Dimensions
District Municipality	Pixley ka Seme District Municipality (PkSDM)
Local Municipality	Kareeberg Local Municipality (KLM)
Ward Number(s)	3
Affected Farm/Erf Name(s) & SG Digit Code(s)	Erf 431 (C01700010000043100000), Carnarvon, Northern Cape, South Africa.
Site Coordinates (middle point)	Latitude: 30°58'1.34"S Longitude: 22°7'25.75"E
Property Size(s) (m^2)	45 154m^2
Development Footprint Size(s) (m^2)	904m^2
Current Zoning	Vacant Land
Nearest Town(s)	Carnarvon
Utilities and Infrastructure	The project will require the development of utilities infrastructure, including water supply, sewage systems, and electricity. Sustainable solutions such as solar panels and rainwater harvesting systems will be incorporated.
Accessibility	The site is accessible via End Street, which connects to major roads in Carnarvon, facilitating easy access for construction and future visitors.

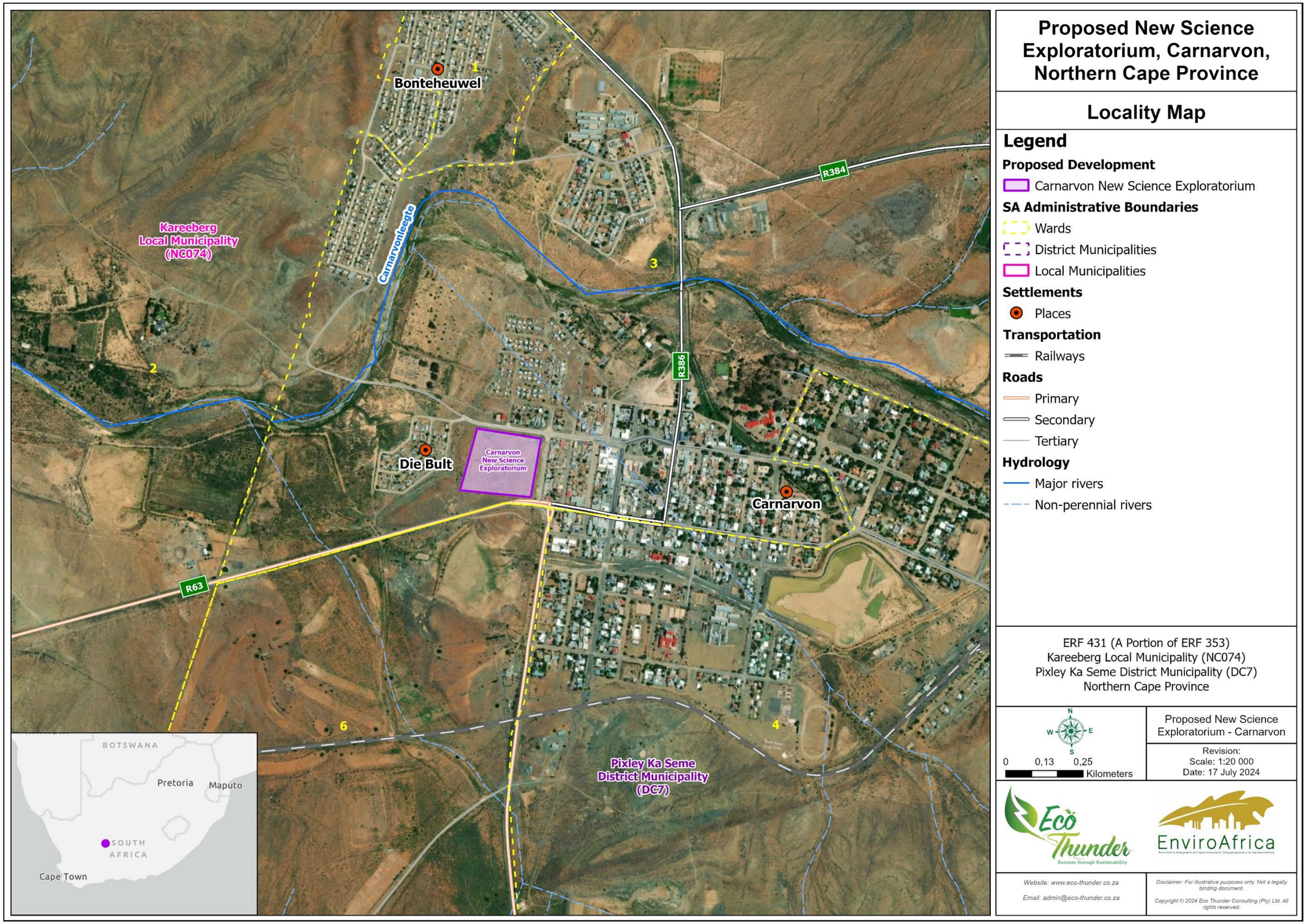


Figure 1: Locality Map

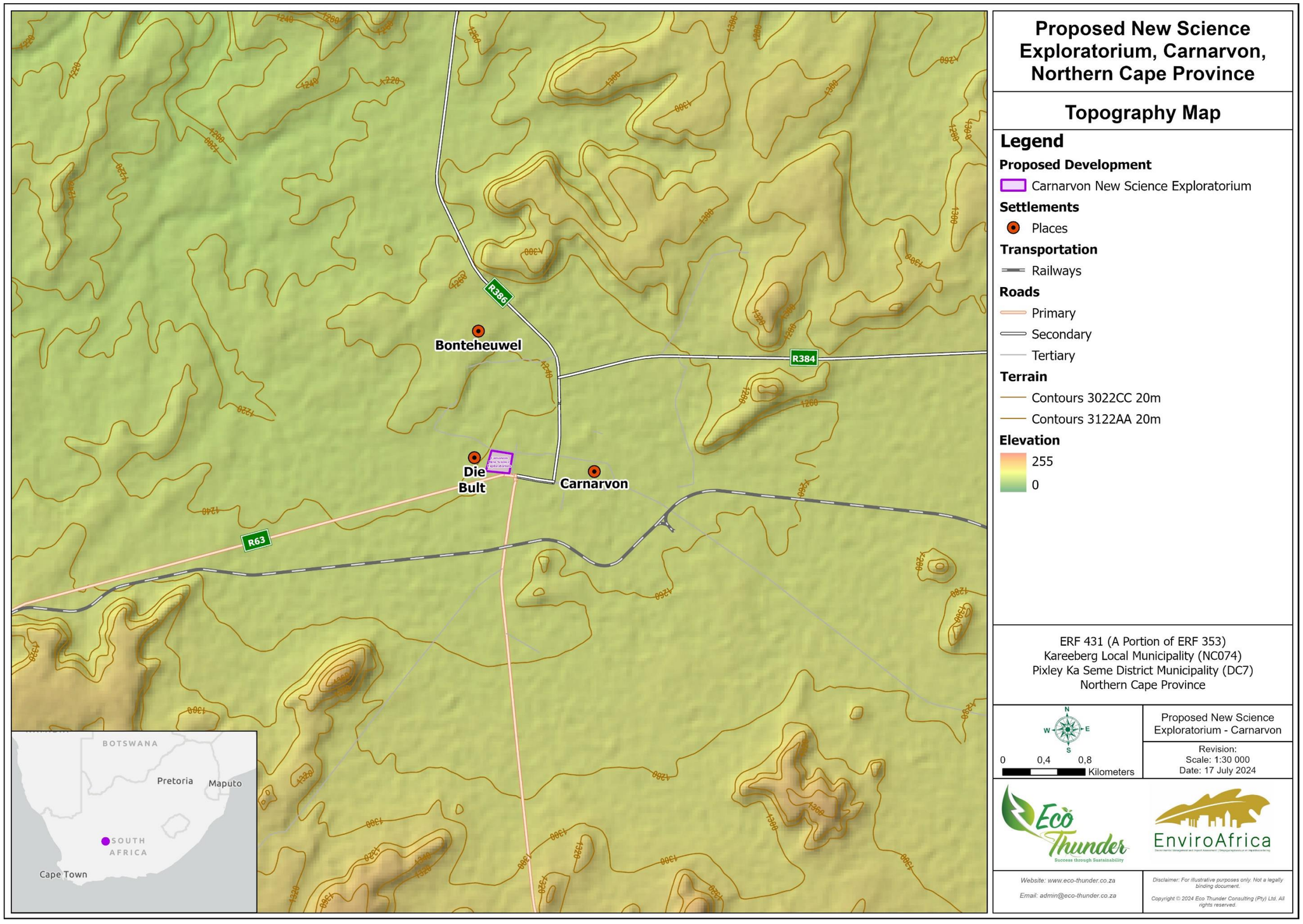
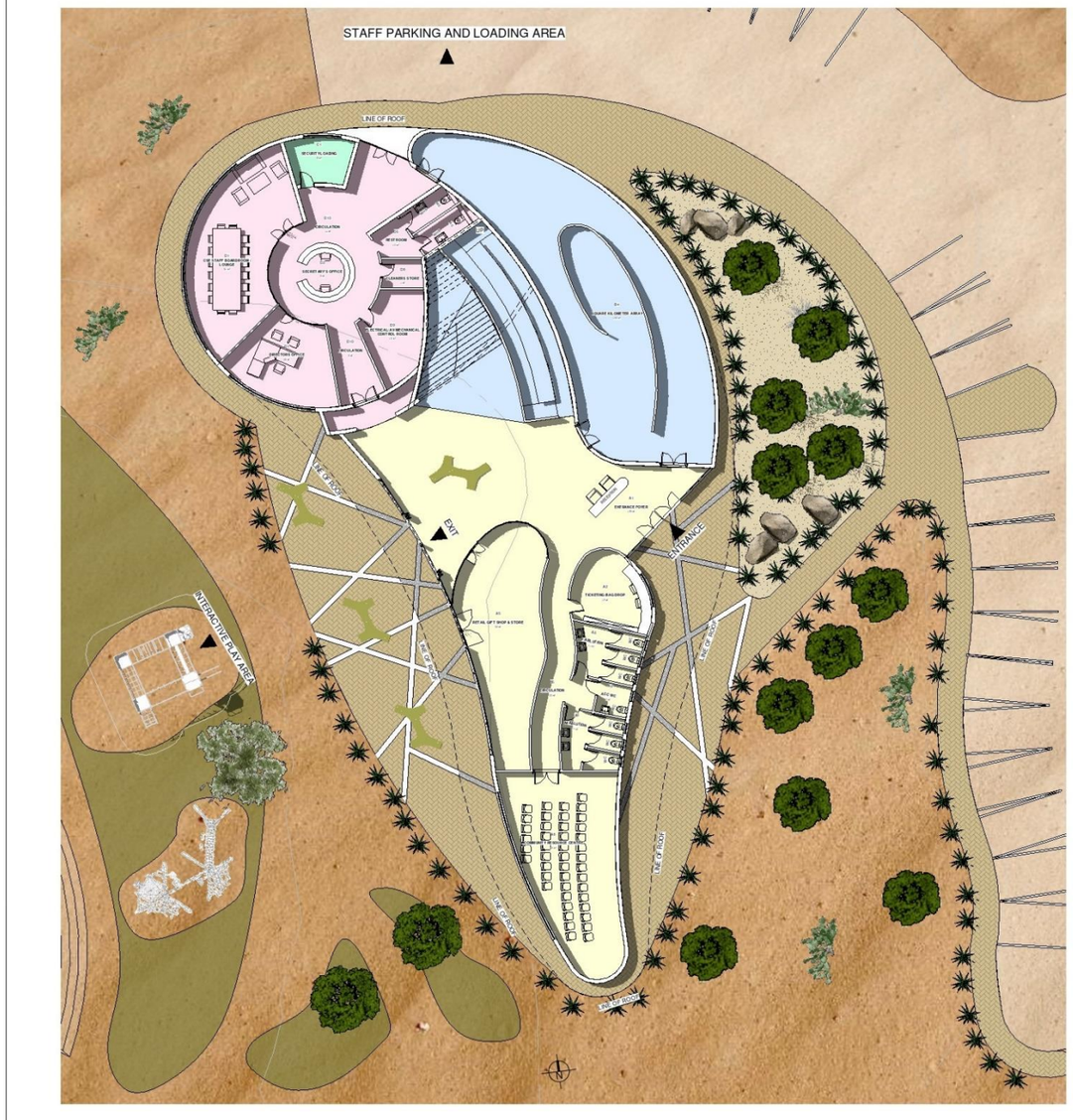
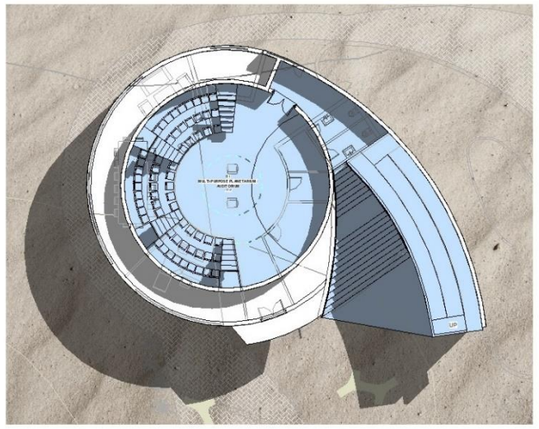


Figure 2: Topographical-Hydrological Map

Figure 3: Master Plan of the proposed New Science Exploratorium



1 **OBSERVATORIUM PLAN**
1 : 100



2 **PLANETARIUM PLAN**
1 : 100

SITE AREA	45 132m²
COVERAGE	912m²
F.A.R	788m2

SARAO CARNARVON SCIENCE EXPLORTORIUM (CSE)
PHASE 1/2 - BASED ON AVAILABLE Rebn BUDGET

COLOUR	ZONE DESCRIPTION
	ZONE A - PUBLIC NON- COLLECTION
	ZONE B - PUBLIC COLLECTIONS
	ZONE C - NON-PUBLIC COLLECTIONS
	ZONE D - NON-PUBLIC NON-COLLECTIONS

ZONE LEGEND
1 : 25

Room Schedule

Name	Area	Department
ACC WC	4 m²	BLOCK A - PUBLIC NON COLLECTION
COMMUNITY RESOURCE CENTRE	60 m²	BLOCK A - PUBLIC NON COLLECTION
ENTRANCE FOYER	170 m²	BLOCK A - PUBLIC NON COLLECTION
F/ABLUTION	11 m²	BLOCK A - PUBLIC NON COLLECTION
M/ABLUTION	11 m²	BLOCK A - PUBLIC NON COLLECTION
RETAIL GIFT SHOP & STORE	53 m²	BLOCK A - PUBLIC NON COLLECTION
SECRETARY'S OFFICE	9 m²	BLOCK A - PUBLIC NON COLLECTION
TICKETING/BAG DROP	17 m²	BLOCK A - PUBLIC NON COLLECTION
BLOCK A - PUBLIC NON COLLECTION	336 m²	
MULTI-PURPOSE PLANETARIUM / AUDITORIUM	109 m²	BLOCK B - PUBLIC COLLECTION
SQUARE KILOMETER ARRAY	150 m²	BLOCK B - PUBLIC COLLECTION
BLOCK B - PUBLIC COLLECTION	259 m²	
CIRCULATION	9 m²	BLOCK C - NON PUBLIC COLLECTION
SECURITY/LOADING	9 m²	BLOCK C - NON PUBLIC COLLECTION
BLOCK C - NON PUBLIC COLLECTION	18 m²	
CIRCULATION	44 m²	BLOCK D - NON PUBLIC NON COLLECTION
CIRCULATION	23 m²	BLOCK D - NON PUBLIC NON COLLECTION
CLEANERS STORE	4 m²	BLOCK D - NON PUBLIC NON COLLECTION
CSE STAFF BOARDROOM / LOUNGE	51 m²	BLOCK D - NON PUBLIC NON COLLECTION
DIRECTORS OFFICE	25 m²	BLOCK D - NON PUBLIC NON COLLECTION
ELECTRICAL/A-V/MECHANICAL CONTROL ROOM	16 m²	BLOCK D - NON PUBLIC NON COLLECTION
RESTROOM	13 m²	BLOCK D - NON PUBLIC NON COLLECTION
BLOCK D - NON PUBLIC NON COLLECTION	175 m²	
Grand total	788 m²	

NOTES:

GENERAL NOTES:

DRAINAGE NOTES:

ALL STRUCTURAL CONCRETE WORK TO ENGINEER'S DESIGN AND SPECIFICATION

NO	REVISION	DATE

CLIENT: NRF SARAO — National Research Foundation — South African Radio Astronomy Observatory

ARCHITECTURE | DESIGN | INNOVATION
THE CREATIVE AXIS ARCHITECTS

PROJECT: SARAO CARNAVON SCIENCE CENTER

DRAWING: DESIGN PROPOSAL

SCALE	DATE	DRAWN	CHECKED
As indicated	13/06/2023	Author	Checker

PROJECT NUMBER: WC 028
DRAWING NUMBER: A102
REVISION:

Figure 4: Design Proposal of the Proposed New Science Exploratorium

3 Identification of Potential Issues

A desktop review was conducted by ETC, which was pivotal in assessing the proposed development of the New Science Exploratorium, Carnarvon, Northern Cape. The primary goal was to closely examine the visual aspects of the development, ensuring a thorough understanding of the landscape's characteristics and potential challenges.

The desktop review involved the following:

- **Analysis of Topographical Data:** Detailed examination of topographical maps and digital elevation models to understand the site's terrain and elevation. This provided insights into the visual prominence of the proposed structures.
- **Review of Aerial and Satellite Imagery:** Analysis of recent aerial and satellite images to assess the existing vegetation, land use patterns, and the proximity of the site to existing infrastructure. This helped in understanding the current visual context of the area.
- **Identification of Visual Receptors:** Identification of key visual receptors, including local residents, visitors, and stakeholders, based on their locations relative to the site. The study considered how these receptors might be affected by the visual changes brought about by the development.
- **Examination of Surrounding Infrastructure:** Examination of nearby roads, buildings, power lines, and other infrastructure to determine their potential impact on the visual setting of the New Science Exploratorium.
- **Cultural and Historical Context Review:** Consideration of the cultural and historical significance of the area through available literature and online resources. This ensured that the design of the New Science Exploratorium would respect and integrate with the heritage of Carnarvon.

3.1 Visual Observations

The desktop study provided essential insights into the visual aspects related to the proposed New Science Exploratorium, including:

- **Visual Absorption Capacity (VAC):** The VAC of the site is assessed as moderate due to the flat terrain and sparse vegetation characteristic of the semi-arid Northern Cape. While the natural environment offers limited visual screening, the design of the Exploratorium utilises materials and colours that blend with the surroundings to enhance the site's visual absorption capacity. The implementation of landscaping with native vegetation further improves the VAC by providing additional visual buffering.
- **Visual Intrusion:** The visual intrusion of the New Science Exploratorium is expected to be moderate due to the scale of the development and its visibility from various vantage points. However, the design considerations, including low-rise structures and the use of natural materials, aim to reduce visual intrusion. The strategic placement of buildings and infrastructure within the site's natural contours helps to minimise their visual impact, maintaining the area's visual harmony.

3.2 Identified Issues

During the desktop review for the proposed New Science Exploratorium, several issues were identified that could potentially impact the visual harmony of the development:

- **Natural Vegetation:** The region is characterised by sparse natural vegetation typical of the semi-arid Northern Cape, which offers limited visual screening. The preservation and enhancement of this existing vegetation around key construction access points and infrastructure are critical for mitigating visual impacts and enhancing the site's natural aesthetic appeal.
- **Topography:** The site's flat to mildly undulating terrain does not significantly obstruct views but presents a challenge in terms of visual prominence. Utilising the natural depressions and contours of the land to strategically place buildings and infrastructure will help reduce the visual footprint of the development. Careful grading and the use of earth-toned materials can further blend the structures with the landscape.
- **Existing Infrastructure:** The site's proximity to the R63, Mark Street and End Street emphasises the need for strategic placement and thoughtful design to integrate seamlessly with existing elements. Special consideration is required to ensure that construction activities and any temporary installations do not disrupt the current usage patterns and visual aesthetics of these infrastructures.
- **Visual Receptors:** The site is visible from several key visual receptors, including the Carnarvon Golf Course, New Apostolic Church Carnarvon, Carnarvon Cemetery South, and residential areas along the roads bordering the south, east and north of the site. These receptors will experience the most significant visual changes due to the development. Mitigation measures such as screening, strategic placement of buildings, and thoughtful architectural design will be necessary to minimise the visual impact on these receptors.

By proactively addressing each identified challenge, the project can be tailored to respect the local landscape, ensuring that visual impacts are minimised. Effective mitigation measures, such as strategic landscaping, sensitive architectural design, and careful site planning, will help preserve the visual integrity of the Carnarvon region while enhancing its educational and scientific value.

4 Visual Compliance Statement and Conclusion

Building on the observations outlined in the previous sections, this section addresses the visual influence and expected visual impacts of the proposed New Science Exploratorium in Carnarvon, Northern Cape.

4.1 Visual Influence

The proposed New Science Exploratorium is designed to integrate seamlessly with the semi-arid landscape and existing infrastructural elements of the Carnarvon region, promoting a harmonious blend with the local landscape character.

- **Existing Visual Context:** A thorough review of the area's existing visual context, which includes natural landscapes and intermittent infrastructural features, has confirmed the project's capacity to harmonise with the regional aesthetic. The strategic design of the New Science Exploratorium, with low-rise structures and earth-toned materials, ensures effective integration with the surroundings, thereby enhancing visual integration and reducing potential disruptions.
- **Visibility and Exposure:** Special emphasis has been placed on reducing visibility from multiple viewpoints, including key visual receptors such as the Carnarvon Golf Course, New Apostolic Church Carnarvon, Carnarvon Cemetery South, and residential areas along Mark Street, End Street, and South Street. The placement of buildings and infrastructure within the site's natural contours, combined with landscaping strategies such as planting native vegetation, ensures minimal visual intrusion and allows the infrastructure to integrate seamlessly into its surroundings.

Strategic visual integration involves employing restoration strategies that mimic the natural environment and using landscaping to enhance visual buffering. These efforts leverage the area's semi-arid characteristics and sparse vegetation, providing a backdrop that supports the subtle integration of infrastructure elements.

4.2 Expected Visual Impacts

The proposed New Science Exploratorium project's principal visual impacts include:

- **Alteration of Landscape Character:** The introduction of new buildings and infrastructure will alter the visual character of the natural and open vistas typically found in the region. While the design aims to minimise visual disruption, the presence of new structures will be noticeable.
- **Local Land Use:** The development of the New Science Exploratorium will change the visual and functional character of the land use in the immediate vicinity. This includes the transformation of open land into built environments with educational and community-focused facilities.
- **Dust and Construction Impact:** Construction activities are expected to generate temporary visual disruptions, including dust, debris, and construction equipment, which could affect the local visual environment.

- **Nighttime Lighting:** The use of lighting for security and operational purposes may introduce light pollution, diminishing the local community's enjoyment of naturally dark night skies.

To mitigate these visual impacts, the New Science Exploratorium project will need to employ a comprehensive set of strategies. Detailed restoration plans that utilise native vegetation need to will be implemented to rehabilitate the landscape post-construction, with strategic planting providing visual buffering and enhancing the site's aesthetic appeal. Careful siting and architectural design will minimise the visibility of structures, using earth-toned materials and integrating buildings within the natural contours of the land to help reduce visual prominence.

Rigorous construction management practices, including effective dust suppression techniques and restricting operations to daylight hours, will be need to implemented to reduce visual disturbances. Controlled lighting systems will need to be designed to minimise light pollution, ensuring minimal disruption to the natural nighttime environment. Ongoing community engagement will be prioritised to align the project with local values and address any visual impact concerns, and temporary structures and debris will need to be promptly removed after construction to restore the site's visual integrity.

4.3 Conclusion

The proposed New Science Exploratorium project can be authorised from a visual specialist's perspective, provided it is integrated effectively within the Carnarvon region with minimal visual intrusions. The strategic use of the land's inherent visual absorption capacity (VAC) enhances the project's ability to minimise visual impacts substantially.

The cumulative visual impact of the project is manageable, given its scope and nature, and must be continually managed through best practice methods throughout the project's lifecycle. This comprehensive approach respects the aesthetic values of the local community, ensuring the responsible advancement of South Africa's educational and scientific infrastructure goals.

The report has assessed the existing visual conditions and the project's compatibility with the landscape. The potential visual impacts, while notable, can be effectively mitigated through careful planning, strategic placement, and conscientious ongoing management. By adhering to these practices, the New Science Exploratorium will enhance the region's scientific and educational resources while preserving the visual integrity of the Carnarvon landscape.

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