PROPOSED DEVELOPMENT OF THE MAPUNGUBWE NATIONAL PARK VISITOR ORIENTATION CENTRES AND OVERNIGHT FACILITIES, LIMPOPO PROVINCE

Draft Basic Assessment Report

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Prepared for:

South African NATIONAL PARKS

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QUALITY AND REVISION RECORD

QUALITY APPROVAL

	Capacity	Name	Signature	Date
Author	Environmental Assessment Practitioner	Christoff du Plessis		09/09/2022
Reviewer	Quality Check Officer	Elana Mostert		09/09/2022

This report has been prepared in accordance with the Enviroworks Quality Management System.

REVISION RECORD

Revision Number	Objective	Change	Date
Version 1	Basic Assessment Report for the proposed development of the Mapungubwe National Park Visitor Facilities.	-	09/09/2022

DISCLAIMER

Even though every care is taken to ensure the accuracy of this report, Environmental Impact Assessment studies are limited in scope, time and budget. Discussions are to some extent made on reasonable and informed assumptions built on bona fide information sources, as well as deductive reasoning. Since Environmental Impact Assessment studies deal with dynamic natural systems additional information may come to light at a later stage during the impact assessment phase. The author does not accept responsibility for conclusions made in good faith based on own databases or on the information provided. Although the Author exercised due care and diligence in rendering services and preparing documents, he accepts no liability, and the client, by receiving this document, indemnifies the Author against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by the authors and by the use of this document. This report should therefore be viewed and acted upon with these limitations in mind."

EXECUTIVE SUMMARY

INTRODUCTION AND BACKGROUND

South African National Parks (SANParks) (The Applicant) appointed Enviroworks, an Independent Environmental Assessment Practitioner (EAP), to undertake the required Basic Assessment (BA) Process for the proposed development of Visitor Orientation Centres and Overnight Facilities (hereafter referred to as the Proposed Development) situated within the Mapungubwe National Park (MPNP), Limpopo Province.

The proposed project is a listed activity in terms of Sections 24(2) and 24(d) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) (as amended). The Environmental Impact Assessment (EIA) Regulations, 2017 (as amended) promulgated in terms of Chapter 5 of the NEMA provide for the control of certain activities as listed in Government Notice Regulation (GN R.) No. 327, 325 and 324. Activities listed in these notices must comply with the regulatory requirements listed in GN R. 326, which prohibits such activities until written Authorisation is obtained from the Competent Authority (CA).

Such Environmental Authorisation (EA), which may be granted subject to certain conditions, will only be considered once there has been compliance with the EIA Regulations of 2017 (as amended). GN R. 326 sets out the procedures and documentation that need to be compiled when undertaking a Basic Assessment Report (BAR).

PROJECT DESCRIPTION

Mapungubwe National Park received thirty-four thousand five hundred and forty-three (34 543) day visitors during the 2019/2020 reporting period. The inclusion of Mapungubwe's history in the South African school curriculum furthermore makes school visits the norm for the park, with approximately eighteen thousand (18 000) of the abovementioned visitors being part of educational visits (Coetzee, 2021).

Mapungubwe National Park furthermore has the opportunity to provide extensive cultural and environmental education, as there are additional relevant topics that can be addressed. The lack of suitable overnight facilities furthermore makes it impossible to provide extended programmes for various stakeholders such as local communities during cultural events, Vhembe Biosphere Reserve and the Greater Mapungubwe Trans-frontier Conservation Area to name a few. A need for low-cost accommodation for special interest groups such as research institutions have been identified and will greatly improve the continued research within the cultural and environmental fields, not only for the park but the Trans-frontier Conservation Area and region as a whole (Coetzee, 2021).

Mapungubwe Hill, an iconic southern African cultural heritage site, attracts visitors from all walks of life. Although the site is only accessible accompanied by trained cultural heritage guides, these visitors may only have a superficial understanding of the history surrounding this remarkable snapshot of human endeavour and therefore are not able to understand the significance of the site without appropriate Orientation aids. On site Orientation facilities are however, lacking and very different from that of other iconic world heritage sites such as the Cradle of Humankind (Coetzee, 2021).

SANParks wish to upgrade their facilities at MPNP in order to enhance visitor experience and provide adequate accommodation for educational tour groups. The proposed upgrades will include the following activities:

1. Mapungubwe Overnight Facilities (Figure 1):

The overnight facilities will include the construction of:

- Four (4) hostels inclusive of ablution facilities;
- Open air functions space;
- Dining Block inclusive of a kitchen, pantry, reception and a general store;
- Teachers block;
- Laundry room;
- Adequate bus parking; and,
- Associated infrastructure.

2. Orientation Centre at Mapungubwe Hill (Figure 2):

The orientation centre will include the construction of:

- Covered viewing deck;
- Resting areas;
- Mapungubwe exhibit;
- Bambanyanalo exhibit;
- Serving area; and,
- Ablution facilities.

3. Schroda Orientation Centre (Figure 3):

The Schroda Orientation Centre will include the following:

- Interactive exhibit of the sharpening of the blade, games and pottery;
- Covered viewing deck;
- Resting area;
- Schroda/Zhizo exhibit;
- Site model;
- Pre-history exhibit;
- Serving area; and,
- Ablution facilities.

4. Dig Site (Figure 4):

The Dig site will be formalised where a formal building will be constructed above the dig site to ensure adequate protection thereof. The development will include:

- Display boards of Mapungubwe;
- Exhibition and viewing area; and,

- Archaeological Dig Site viewing area.


Figure 1: Visual Impression of the Proposed Hostels.

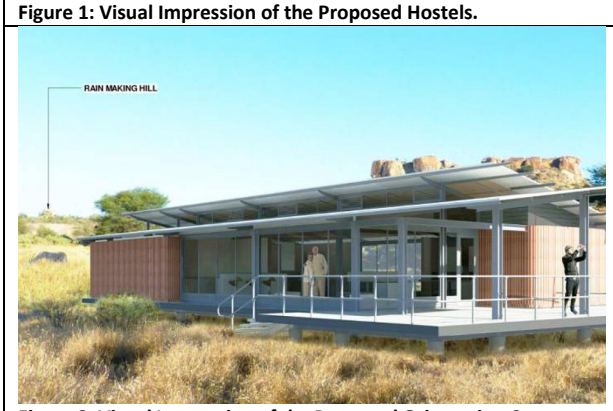

Figure 2: Visual Impression of the Proposed Orientation Centre at Mapungubwe Hill.


Figure 3: Visual Impression of the Proposed Orientation Centre at Schroda.


Figure 4: Visual Impression of the Proposed Dig Site Upgrade.

Sewage System

The Mapungubwe Overnight Facilities will generate a total of twenty-eight thousand three hundred and five litres (28 305 l) of wastewater per day. The dormitories will tie in with the existing Interpretive Centre Complex sewage system which was approved on 07 June 2006 (EA Ref. No.: 12/12/20/610/21/7) and consist of a reedbed system situated within the Mapungubwe National Park staff village.

Both the Mapungubwe Hill Orientation Centre and Schroda Orientation Centre will make use of polyethylene conservancy tanks. All waste will flow into the sewerage system through a one hundred- and ten-millimetre (110 mm) diameter pipe connected between the building and the conservancy tank and will be installed according to SANS approved slopes. The polyethylene conservancy tank will have a capacity of seven thousand litres (7 000 l) and will be situated within an area easily accessible to vehicles for cleaning and pumping purposes.

In summary, the upgrade of the Mapungubwe National Park Facilities will assist in achieving the tourism objective by improving the tourism experience and provide overnight facilities for large tour groups who wish to explore the rich history of this magnificent National Park.

LEGISLATIVE CONTEXT

The proposed project constitutes the following listed activities of the NEMA:

Environmental Impact assessment (EIA) Regulations Listing Notice 1 (as amended) Government Notice Regulations No. (GN R.) 327 of 07 April 2017, as amended by GN R. 517 of 11 June 2021 of the National Environmental Management Act, 1998 (Act No. 107 of 1998)

Activity 12: The development of –

(ii) infrastructure or structures with a physical footprint of 100 square metres or more;

Where such development occurs –

(a) Within a watercourse;

If no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.

Environmental Impact assessment (EIA) Regulations Listing Notice 3 (as amended) Government Notice Regulations No. (GN R.) 324 of 07 April 2017, as amended by GN R. 517 of 11 June 2021 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

Activity 5: The development of resorts, lodges, hotels, tourism or hospitality facilities that sleep less than 15 people.

e. Limpopo

i. A protected area identified in terms of NEMPAA;

ii. Outside urban areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve;

iii. Outside Urban Areas:

(aa) Critical biodiversity areas identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; or,

(bb) Areas within a watercourse, or within 100 metres from the edge of a watercourse.

Activity 6: The development of resorts, lodges, hotels, tourism or hospitality facilities that sleeps 15 people or more.

e. Limpopo

i. Outside urban areas:

(aa) a protected area identified in terms of NEMPAA, excluding conservancies;

(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;

(dd) Sites or areas identified in terms of an international convention;

(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.

(gg) Areas within 10 kilometres from National Parks or world heritage sites or 5 kilometre from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve;

(hh) Areas within a watercourse; or within 100 metres from the edge of a watercourse.

Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation.

e. Limpopo

i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;

ii. Within critical biodiversity areas identified in bioregional plans; or,

iii. On land, where at the time of coming into effect of this notice or thereafter such land was zoned open space, conservation or had an equivalent zoning.

Activity 14: The development of –

(ii) Infrastructures or structures with a physical footprint of 10 square metres or more;

Where such development occurs –

(a) Within a watercourse;

(c) If no development setback has been adopted within 32 metres of a watercourse, measured from the edge of a watercourse

e. **Limpopo**

i. Outside urban areas:

(aa) A protected area identified in terms of NEMPAA, excluding conservancies;

(cc) World Heritage Sites;

(dd) Sensitive areas as identified in an environmental management framework as contemplated in Chapter 5 of the Act and as adopted by the competent authority;

(ee) Sites or areas identified in terms of an international convention;

(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;

(hh) Areas within 10 kilometres from national parks or world heritage sites or within 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve.

REPORT STRUCTURE

This Report is set out as follow:

- **Section A: Activity Description** provides an overview of the development proposal and listed activities which are triggered in terms Listing Notices GN R. 327 and R. 324; of the EIA Regulations of 07 April 2017 (as amended).

- **Section B: Description of Receiving Environment** provides detail on the affected landscape in its present state. A range of aspects relating to the biophysical (e.g. geology, soil surface and sub-surface water and biodiversity), socio-economic and historic and cultural character of the immediate site and surrounding areas are described herein, whilst applicable legislation, policies and guidelines considered are recognised.

- **Section C: Public Participation** describes the consultation component of this study between the EAP and Interested and Affected Parties (I&AP's) as well as Organs of States. Regulatory requirements of the process are discussed, with a summary of consultation made with state departments as well as comments and response are given. Comment periods were afforded to parties, with an initial registration period provided to parties.

- **Section D: Impact Assessment, Management, Mitigation and Monitoring Measures,** describe how the proposed project may impact on the geographical and physical, biodiversity, socio-economic and historical and cultural aspects of the receiving environment. Resource uses of the proposed project phases, attributes to waste and emissions, water use, power supply and energy efficiency are further discussed.

- **Section E: Recommendations of the EAP** provides, based on such findings as various site surveys, impact assessment, investigation of alternatives and the review of strategic policies to consider the needs and desirability, the outgoing opinion of the EAP is detailed. Any noteworthy recommendations emanating from the study are described here.

- **Section F: Appendices** list all supportive documents enclosed with this report, after which declarations of the Applicant, EAP and Specialists are given.

ALTERNATIVES

Two (2) Location Alternatives are proposed for the Mapungubwe Hill Orientation Centre, as detailed below.

LOCATION ALTERNATIVE 1 (PREFERRED ALTERNATIVE):

It was decided to move the Orientation Centre from its original position to ensure that it is not constructed within thirty-two metres (32 m) of watercourses and to restrict the visual impact thereof. The Preferred Alternative (Figure 5) will be situated at the following co-ordinates:

- 22˚ 13' 10.98'' S; and,
- 29˚ 23' 19.08'' E.

Figure 5: Preferred Site Alternative.

Advantages of the Preferred Alternative:

- The Preferred Alternative is situated at the foot of a hill which restricts the visual impact;
- The proposed development will be light to earth colour; and,
- The proposed facility will not be situated within thirty-two metres (32 m) of any watercourses and outside of the floodplain.

Disadvantages of the Preferred Alternative:

- The preferred alternative is situated further away from the road and as such it may be a challenge for the elderly and people of disability to access the facility if a proper access path is not constructed.

LOCATION ALTERNATIVE 2:

The alternative location was originally considered as it is situated adjacent to the road leading to Mapungubwe Hill and provide clear views of the surrounding area and drainage lines. Location Alternative 2 (Figure 6) will be situated at the following co-ordinates:

- 22˚ 13’ 02.70’’ S; and,
- 29˚ 23’ 16.13’’ E.

Figure 6: Visual Impression of Location Alternative 1.

Advantages of the Preferred Alternative:

- The location alternative will offer great views of Mapungubwe Hill and the valley;
- The location alternative is situated directly adjacent to the road and as such will be easily accessible for the elderly and persons with disability; and,
- The proposed facility will be light to earth colour.

Disadvantages of the Preferred Alternative:

- The proposed facility will be situated within thirty-two metres (32 m) of a watercourse and will be situated within the floodplain. During flooding there is a possibility that damages can occur to the facility resulting in higher maintenance budgets.

LAYOUT ALTERNATIVE

Two (2) Layout Alternatives are proposed for the Dormitories complex as illustrated below.

LAYOUT ALTERNATIVE 1 (PREFERRED ALTERNATIVE)

The preferred Layout Alternative entails the construction of four (4) dormitories with one (1) teacher block, a dining block and a laundry room. Each hostel will be two hundred and eighteen square metres (218 m^2) in size with the dining block equalling to three hundred and seventy-two square metres (372 m^2). The total development footprint will be one thousand five hundred and five square metres (1 505 m^2) with sleeping arrangements for one hundred and thirty-two (132) individuals. Figure 7 below illustrates the layout of the preferred layout alternative.

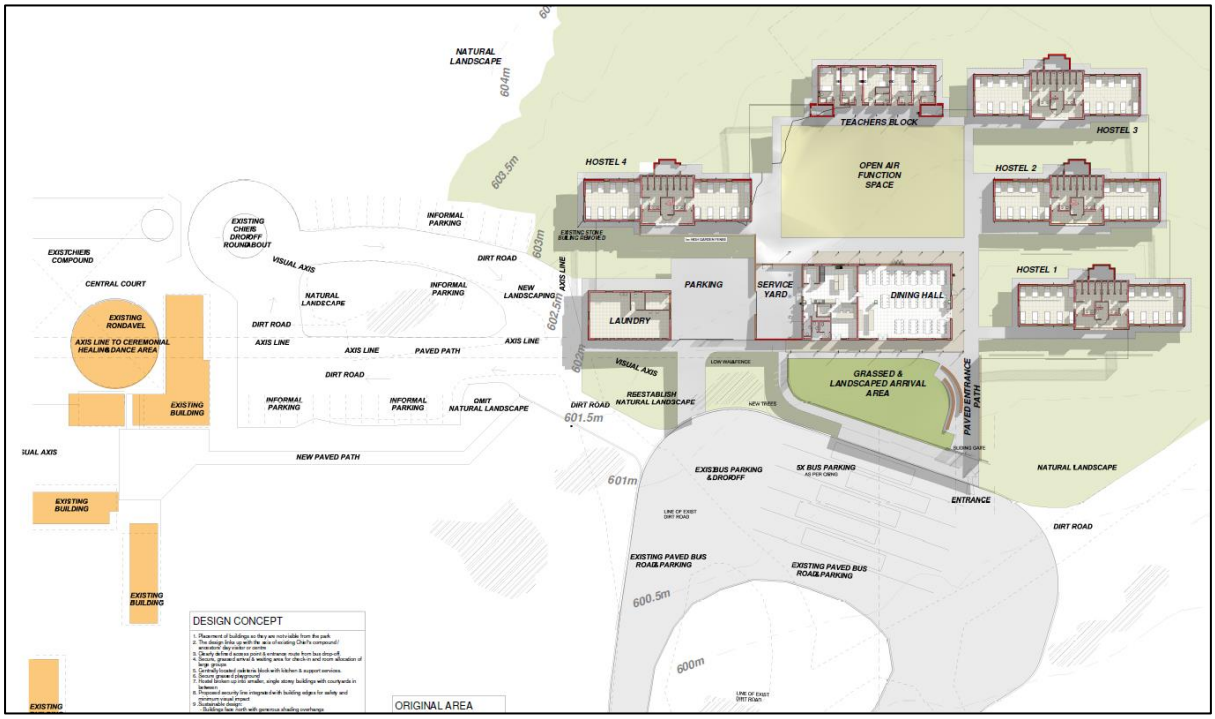

Figure 7: Preferred Dormitories Layout Alternative

Advantages of the Preferred Alternative:

- The layout alternative will provide the exact same beds as Layout Alternative 2; however, one (1) less dormitory will be constructed;
- The preferred Layout Alternative will be constructed on a smaller land parcel than Layout Alternative 2; and,
- The preferred layout alternative allows for a Laundry Room.

Disadvantages of the Preferred Alternative:

- The preferred Layout Alternative will have a bigger development footprint for the dormitories (218 m^2) than that of Layout Alternative 2 (149 m^2).

LAYOUT ALTERNATIVE 2

Layout Alternative 2 entails the construction of five (5) dormitories with one (1) teacher block and a dining block. Each hostel will be one hundred and forty-nine square metres (149 m^2) in size with the dining block equalling to four hundred and ten square metres (410 m^2). The total development footprint will be one thousand three hundred and ten square metres (1 310 m^2) with sleeping arrangements for one hundred and thirty-two (132) individuals. Figure 8 below illustrates the layout of layout alternative 2.

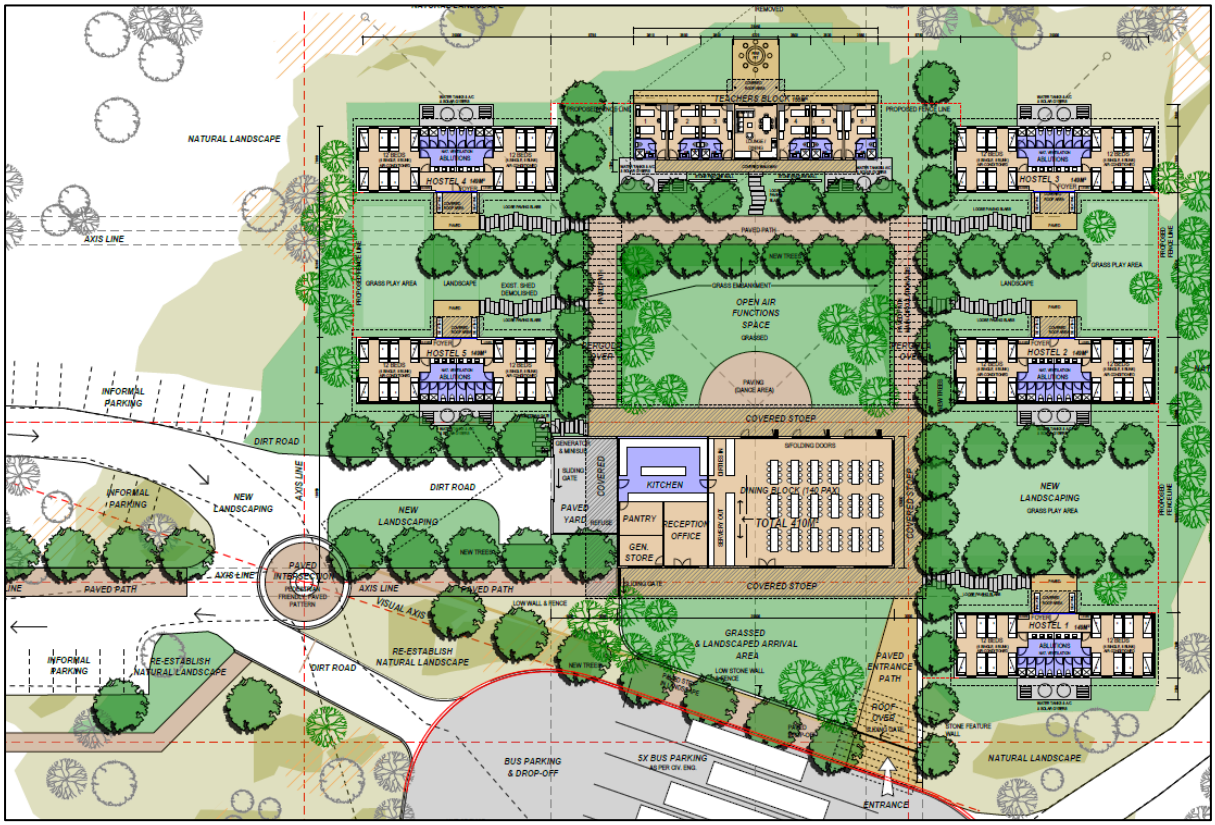

Figure 8: Dormitories Layout Alternative 2

Advantages of the Preferred Alternative:

- Layout Alternative 2 will have a smaller development footprint than that of the preferred layout alternative.

Disadvantages of the Preferred Alternative:

- The layout alternative does not make provision for a laundry room;
- It consists of an extra dormitory facility; and,
- The overall footprint will be constructed on a larger land parcel than that of the preferred layout alternative.

PUBLIC PARTICIPATION PROCESS

A comprehensive **Public Participation** will be undertaken to engage stakeholders I&AP's on the development proposal. I&AP's will be informed of the BA Process through an advertisement in one (1) national newspaper and (1) local newspaper and poster notices will be erected at strategic locations. The surrounding landowners will be informed of the proposed project by means of the distribution of comment forms and the BAR, as well as relevant Organs of State.

This BAR will be made available for a thirty (30) day comment period from **12 September 2022 to 13 October 2022.** The BAR will be made available on Enviroworks website (**www.enviroworks.co.za**) and SANParks' website (**www.sanparks.org.za**) and a link to both websites will be sent via email to all relevant Stakeholders and Organs of State.

SPECIALIST FINDINGS

VISUAL IMPACT ASSESSMENT

The visual impact for the Overnight Facilities will be moderate within the short distance zone. The developments planned at Mapungubwe Hill will have a low impact as it will only be visible over a distance of three hundred metres (300 m) due to the high vegetation cover and undulating topography of the study area. The highest visual exposure will occur from Schroda Orientation Centre; however, the areas of high viewer incidence primarily consist of natural vegetation with limited observers within this area. The aforementioned will result in a low visual impact over a two-kilometre (2 km) radius. As the proposed upgrades will result in a higher visitors experience and draw more visitors to the park. The upgrades will result in a positive visual impact if all mitigation measures are implemented (Du Plessis, 2020).

Construction phase:

- Access roads are to be kept clear to minimise impacts of vehicle movement;
- Site offices and structures should be limited to one location and carefully situated to reduce visual intrusions. Roofs should be grey and non-reflective;
- Adequate waste bins must be placed at each development site and waste need to be removed on a regular basis;
- No unnecessary cutting of trees and shrubs may take place except where needed for the construction of buildings;
- No open fires must be allowed on site;
- Batching activities must be conducted on impermeable surfaces to ensure no spillages are left behind once the construction has been finalised;
- Construction camps as well as development areas should be screened with green netting;
- Lights within the construction camp should face directly down;
- Limit vegetation clearance to the development footprint;
- Litter should be strictly controlled, as the spread thereof through wind could have a very negative visual impact;
- A plan must be in place to ensure that the dig site is protected from construction activities and vandalism;
- Avoid shiny materials in structures. Where possible shiny metal structures should be darkened or screened to prevent glare;
- Rehabilitation measures include the following:
    - On completion of a section of works, the area must be rehabilitated by suitable landscaping, levelling, topsoil dressing, land preparation, alien plant eradication and where ascribed for by the ECO, vegetation establishment;
    - Clear and completely remove from site all construction structures and temporary infrastructure;
    - All permanent infrastructure must be returned to a suitable state;

- Remove all inert waste and rubble, such as excess rock, any structural foundations and remaining aggregate. Only once this material has been removed, the site shall be re-instated and rehabilitated;
- Domestic waste must be completely removed from site and disposed of at a landfill site;
- The reinstatement of disturbed areas must follow immediately after the removal of structures and temporary infrastructure;
- Topsoil backfilling must be undertaken when the soil is dry, and not following any recent rainfall events;
- All stockpiled topsoil together with herbaceous vegetation must be replaced and redistributed over a disturbed area such as temporary access roads;
- Any re-vegetation must be done using plant species in occurrence on site;

- Mitigation of visual impacts associated with the construction phase would entail proper planning, management and rehabilitation of the construction site. Mitigation measures include the following:
  - Reduce the time of construction through careful planning of logistics and ensure the productive implementation of resources;
  - Limit disturbance of the environment to the development footprint; and,
  - Limit construction activities to business hours (07:00 – 17:00) (Du Plessis, 2020).

Operational Phase:

- Avoid shiny materials in structures. Where possible shiny metal structures must be darkened or screened to prevent glare;
- Mitigation to minimise lighting impacts include the following:
  - Shielding the source of light with physical barriers (walls, vegetation or structures itself);
  - Limit mounting height of light features, or alternatively use foot-lights or bollard level lights;
  - Make use of downward directional lighting features;
  - Make use of minimum lumen or wattage in lights;
  - Use motion sensors to activate lights to ensure light is available when needed;
- The colour scheme should be in line with the Mapungubwe National Park Interpretive Centre Complex;
- The height of buildings must be kept as stipulated within the building plans;
- No open fires will be allowed on site;
- Adequate waste bins must be properly screened by brick walls or similar materials;
- Rehabilitation and post-closure measures:
  - All above-ground structures should be removed safely disposed of or possibly recycled for use elsewhere; and,
  - The affected area should be regraded to pre-development topographic conditions, unless the area is required for new specific uses (Du Plessis, 2020).

HERITAGE IMPACT ASSESSMENT

Archaeological Summary:

This study looked at the development of several new structures within the Mapungubwe National Park and World Heritage Site and surrounds. The Youth Centre Dormitories – could possibly have an impact on heritage related deposits although no virgin deposits could be observed directly or through trowel test. There were some displaced potsherds and stone tools suggesting that there might be deposits close by or sub-surface. Monitoring of alteration activities are recommended (Gaigher, 2020).

The Mapungubwe and Schroda Orientation Centres – will have the greatest impacts in terms of heritage resources as they are located on very important archaeological deposits. It is imperative that the recommendations in the Report be followed strictly should these developments continue. Overall the socio-economic benefits to be gained through these developments seems to outweigh the localised impacts they might have on the archaeological deposits. This is; however, provided the mitigation is strictly followed and long-term monitoring is put in place and kept up. It is further recommended that a comprehensive and clear Development Management Plan be compiled for each of these sites that should include specifications for the necessary mitigation work and controlled activities as well as monitoring actions (Gaigher, 2020).

Palaeontological Summary:

The Mapungubwe National Park is underlain by continental sediments of the Karoo Supergroup (Stormberg Subgroup) of Late Triassic to Early Jurassic age that are correlated with the Elliot and Clarens Formations of the Main Karoo Basin. Previous palaeontological studies have demonstrated that the fluvial Elliot reedbeds here contain abundant vertebrate fossils – principally of sauropodomorph dinosaurs – as well as rare vertebrate trackways. While most of the fossil material exposed at surface is highly-weathered and of limited scientific value, some specimens may represent undescribed new dinosaur taxa. Other fossil groups represented within the overlying Clarens Formation in the region include petrified logs and various burrows, including putative termitaria and vertebrate burrows, while vertebrate body fossils are rare (Almond, 2020).

While the Mapungubwe Valley Orientation Centre is underlain by Elliot Formation bedrocks, potentially fossiliferous mudrocks are not seen here, while the better exposed channel sandstones are generally fossil-poor. The nearby shelter spot for hikers en-route to Mapungubwe Hill overlies alluvial deposits of low palaeo-sensitivity. Sites for the Mapungubwe Dormitories is highly disturbed at surface, are mantled by palaeontological insensitive superficial deposits and overlie fossil-poor Clarens sandstones. The study area for the Schroda Orientation Centre is likewise largely underlain by insensitive Clarens bedrocks. Two (2) puzzling occurrences of probable fossil casts and moulds of indeterminate affinity – possibly trace fossils/plant axes and/or vertebrate moulds – were recorded from karstified Clarens sandstones just north of and outside the study area; they are unlikely to be affected by the proposed development. Late Caenozoic colluvial rubble, alluvial sands, gravely soils and down wasted gravels encountered at many of the study sites away from the Limpopo River are generally of low palaeontological sensitivity (Almond, 2020).

It is concluded that, given the low palaeontological sensitivity of the study areas and small development footprints envisaged, the impact significance of all the proposed developments within the Mapungubwe National Park under consideration here is Very Low. There are no objections on palaeontological heritage grounds to the authorisation of the developments. Pending the discovery of significant new fossils during

construction, no further specialist palaeontological studies or mitigation are therefore recommended (Almond, 2020).

It should be noted that any new fossil finds made within the Mapungubwe National Park would be of geo-tourism as well as scientific research interest and the Chance Fossil Finds Protocol appended to this report should be applied by the responsible ECO during construction. If any substantial fossil remains (e.g. vertebrate bones, teeth, petrified wood) are found during construction SAHRA should be notified immediately (contact details: SAHRA, 111 Harrington Street, Cape Town. P.O. Box 4637, Cape Town, 8000, South Africa. Phone +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). This is so that appropriate mitigation (i.e. recording, sampling or collection) by a Palaeontological Specialist can be considered and implemented, at the developer's expense (Almond, 2020).

These recommendations must be incorporated into the Environmental Management Programme for the proposed developments. The palaeontologist concerned with mitigation work will need a valid collection permit from SAHRA. All work would have to conform to international best practise for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere to the minimum standards for Phase 2 palaeontological studies published by SAHRA (2013) (Almond, 2020).

ECOLOGICAL IMPACT ASSESSMENT

Although the proposed development will completely transform the existing surface vegetation on the project footprint area, the low species diversity and lack of species of conservation concern has resulted in overall low Ecological Importance and Sensitivity (EIS) scores. The proposed development areas are therefore not of high conservational significance for habitat preservation or ecological functionality persistence in support of the surrounding ecosystem or broader vegetation type. No provincially protected species were found to be present on site (Mostert, 2017).

Even though large-mammal tracks were observed in the development footprint, no important faunal species are expected to utilize the area for breeding or persistence habitat. It is in the opinion of the Specialist that the identified significant potential ecological impacts associated with destruction/damage to vegetation and habitat can be suitably reduced and mitigated to within acceptable levels (Mostert, 2017).

Any risk of pollution due to inappropriate disposal of waste and litter can be mitigated to an acceptable level through the appropriate waste management and ensuring that no runoff or effluent from the construction site and operation enters the environment. The proposed project is recommended to continue only if all recommended mitigation measures as per the ecological report are adequately implemented and managed during the construction-, operational- and decommissioning phases of the proposed project. All necessary authorisations and permits must be obtained prior to any commencement (Mostert, 2017).

Conditions of the Ecological Impact Assessment:

- All mitigation measures should be strictly adhered to;
- No fauna or flora should be harmed, moved, damaged or killed outside of the development footprint;

- Monitoring of the continued spread of alien and invasive plants should be conducted as part of SANPark's invasive alien species monitoring and eradication program (Mostert, 2017).

CONCLUSION AND RECOMMENDATIONS OF THE EAP

Derived from the Ecological Impact Assessment it is advised that Alternative 1 of the Mapungubwe Hill Orientation Centre is the preferred and recommended site. Even though both sites have a similar ecological state, Alternative 2 is closer to the drainage line and would increase the risk of pollution and contamination during the construction- and operational- phases. Overall, the likely impacts associated with the development are likely to be low and there are no anticipated impacts of high significance. Consequently, it is recommended that the proposed development should be allowed to continue.

The Visual Specialist indicated that the proposed upgrades would result in a higher quality of visitors experience and will draw more visitors to the park. The upgrades will result in a positive impact if all mitigation measures are implemented and therefore, the proposed development should be allowed to continue.

The Heritage Practitioner concluded that the Youth Centre Dormitories could possibly have an impact on heritage related deposits although no virgin deposits could be observed directly or through trowel tests. There were some displaced potsherds and stone tools suggesting that there might be deposits close by or sub-surface. The Mapungubwe and Schroda Orientation Centres – will have the greatest impacts in terms of heritage resources as they are located on very important archaeological deposits. It is imperative that the recommendations in this report be followed strictly should these developments continue. The socio-economic benefits to be gained through these developments seems to outweigh the localised impacts they might have on the archaeological deposits.

The Environmental Impact Assessment appended to this BAR illustrates that the proposed developments post mitigation will likely have a low impact on the surrounding environment. If all mitigation measures are implemented as listed within the Impact Assessment Report and Environmental Management Programme (EMP'r) the positive impacts will outweigh the negative impacts and as such from an environmental point of view it is recommended that the proposed developments be authorised. The EAP; however, recommends that the following conditions be included within the Environmental Authorisation:

- The use of designated roads should be maintained under all circumstances, except under exceptional circumstances where existing roads can't be used;
- Disturbed areas should be rehabilitated as soon as possible after the construction period;
- The facility and compliance with the EMP'r should be monitored intermittently during the construction and operational phase of the project;
- No open fires are to be allowed on site;
- Designated smoking areas must be marked on site;
- All applicable mitigation measures recommended by the various Specialists should be strictly implemented; and,

- The EMP'r should be approved by the Department of Forestry, Fisheries and Environment (DFFE) prior to construction and its implementation should form part of the conditions of the Environmental Authorisation.

BASIC ASSESSMENT REPORT CONTENT REQUIREMENTS

Table 1: Requirements of a Basic Assessment Report.

Content Requirements of a Basic Assessment Process	Section in the Report
(a) details of – (i) the EAP who prepared the report, and (ii) the expertise of the EAP, including a curriculum vitae;	Appendix H
(b) the location of the activity, including: (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Section B
(c) a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale;	Appendix A
(d) a description of the scope of the proposed activity, including – (i) all listed and specified activities triggered and being applied for; and (ii) a description of the activities to be undertaken including associated structures and infrastructure;	Section A
(e) a description of the policy and legislative context within which the development is proposed including – (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to **this** activity and have been considered in the preparation of the report; and (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools framework, and instruments;	Section A
(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	Section A
(g) a motivation for the preferred site, activity and technology alternative;	Section A
(h) a full description of the process followed to reach the proposed preferred alternative within the site, including: (i) details of all the alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts – (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risk associated with the alternatives;	Section A

Content Requirements of a Basic Assessment Process	Section in the Report
(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) the outcome of the site selection matrix; (x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including – (i) a description of all environmental issues and risk that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Appendix F
(j) an assessment of each identified potentially significant impact and risk, including- (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impacts and risk occurring; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be avoided, managed or mitigated;	Appendix F
(k) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulation and an indication as to how these findings and recommendations have been included in the final report;	Section D
(l) an environmental impact statement which contains – (i) a summary of the key findings of the environmental impact assessment; (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the proposed site indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section D
(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMP'r;	Appendix G
(n) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Section E
(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section D

Content Requirements of a Basic Assessment Process	Section in the Report
(p) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section E
(q) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	N/A
(r) an undertaking under oath or affirmation by the EAP in relation to: (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties; and	Section E
(s) where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	N/A
(t) any specific information that may be required by the competent authority; and	Appendix J
(u) any other matters required in terms of section 24(4)(a) and (b) of the Act.	N/A

DETAILS OF THE EAP

EAP DETAILS

Table 2: Details of the EAP

Business name of Specialist:	Enviroworks
Specialist Name:	Christoff du Plessis
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Christoff du Plessis

RELEVANT QUALIFICATIONS

Baccalaureus Scientiae (B.Sc.) in Environmental Geography: University of the Free State (2014)
Baccalaureus Scientiae (B.SC) Honours in Environmental Management: University of South Africa (2018)

WORK EXPERIENCE

January 2015 – Present: Environmental Specialist at Enviroworks

ENVIRONMENTAL IMPACT ASSESSMENT EXPERIENCE

- Environmental Impact Assessment for the proposed 171ha expansion of Nalisview Cemetery in Bloemfontein on behalf of Mr. Jannie Nel

BASIC ASSESSMENT EXPERIENCE

- Construction of 30 Broiler Houses and an Abattoir, Leipoldtville, Western Cape Province (Mocke Poultry).
- Dewetsdorp Reservoir System Augmentation, Dewetsdorp, Free State Province (Bloemwater).
- Construction of the Palmiet Truck Stop, Vrede, Free State Province (DeStudio Town Planning).
- Section 24G for the unlawful operation of a Recycling Centre, Swellendam, Western Cape Province (Agri-World Recyclers).
- Construction of a 3.2 kilometre pipeline and associated infrastructure, Olifantshoek, Northern Cape Province (Ghamagara Local Municipality).
- Construction of 4 telecommunication masts, Cape Town, Western Cape Province (Highwave Consultants).
- Installation of a 90 000l LPG Cylinder, Bloemfontein, Free State Province (EASIGAS).
- Installation of a 45 000l LPG Cylinder, East London, Eastern Cape Province (EASIGAS).
- Upgrade of Day-visitor facilities at Kraalbaai, West Coast National Park, Western Cape Province (SANParks).
- Development of the Phalaborwa Wildlife Activity Hub, Kruger National Park, Limpopo Province (SANParks).

- Periodic maintenance of National Route 2 Section 4 between Riviersonderend (Km 0.0) and Swellendam (Km 56.9), Western Cape Province (SANRAL).
- Proposed development of the Klein Mooimaak Rest Camp Facility, West Coast National Park (SANParks).
- Proposed development of the 35m Buffeljagsrivier Monopole Mast, Western Cape Province (Coast to Coast Towers).
- Compilation of a River Maintenance Management Plan for Bath River, Caledon, Western Cape Province (Theewaterskloof Local Municipality).
- Proposed development of a 12.5 ha cemetery, Grabouw, Western Cape Province (Theewaterskloof Local Municipality).
- Proposed development of Hostels and Orientation Centres, Mapungubwe National Park, Limpopo Province (SANParks).
- Proposed upgrade of the R27 Gate & Geelbek Restaurant, West Coast National Park, Western Cape Province SANParks).
- Proposed development of the 25m Joostenbergvlakte Monopole Mast, Western Cape Province (Coast to Coast Towers).
- Proposed development of 30 Chicken Houses and an Abattoir, Odendaalsrus, Free State Province (Chridel Consulting).
- Design, Rehabilitation / Improvement, Routine Maintenance works of N220: Chissano to Chibuto and N/C Crz. N220 to N1, Mozambique (World Bank).
- Proposed development of a Curro Castle on Portion 54 of the Farm Blue Hills No. 397, Midrand, Gauteng Province (Curro Holdings).
- Proposed development of a 25m Monopole Mast on Portion 25 of the Farm Klein Bottelary No. 17, Brackenfell, Western Cape Province (Coast to Coast Towers).
- Proposed development of a Housing Development in Hartswater, Northern Cape Province (Makespace Architects).
- Routine maintenance of TR/1, TR1/3, TR44/1, TR88/1, MR401, MR402 and DR1834 near Uniondale, Western Cape Province (Western Cape Department of Transport and Public Works).
- Proposed development of a Tree Mast on Portion 87 of the Farm Cragga Kamma No. 23, Port Elizabeth, Eastern Cape Province (Blue Sky Towers).
- Proposed expansion of the Karan Beef Feedlot on Erf 1205, Adendorp, Eastern Cape Province (Karan Beef).
- Proposed development of a Retirement Village on Portion 196 of the Farm Vyf-Brakke-Fonteinen No. 220, Mossel Bay, Western Cape Province (Adler's Nest Retirement Village).

EXPERIENCE IN PERMITS AND LICENCING

- Water Use License (General Authorisation) for the expansion of a cemetery by more than 2500 m^2 (Jannie Nel).
- Water Use License for 30 Broiler Houses and Abattoir, Leipoldtville, Western Cape Province (Mocke Poultry).
- Waste Management License and Section 24 G report for Agri World Recycling, Swellendam, Western Cape Province (Agri-World Recycling).
- Water Use License (General Authorisation) for the construction of a 3.2km pipeline, Olifantshoek, Northern Cape Province (Ghamagara Local Municipality).
- Water Use License (General Authorisation) for the proposed development of Sport Fields, Olifantsvlei, Gauteng Province (Curro Holdings).
- Amendment of the Water Use License for KaXu Solar One near Pofadder, Northern Cape Province (Atlantica Yield).
- Amendment of the Water Use License for XiNa Solar One near Pofadder, Northern Cape Province (Abengoa Solar).
- Water Use License for the Proposed Expansion of the Karan Beef Feedlot on Erf 1205, Adendorp, Easter Cape Province (Karan Beef).

ENVIRONMENTAL CONTROL OFFICER (ECO)

- The construction of the Cecilia Park powerline and sub-station, Bloemfontein, Free State Province (Centlec).
- The construction of a dual carriageway and bridge from Mthatha up to and including the Ngqeleni interchange of Provinsial Road 61 Section 8, Eastern Cape Province.
- The construction of a road from Moretele to Khaukhwe, North West Province (Department Public Works).
- The construction of a 14km water pipeline, Botshabelo, Free State Province (Bloemwater).
- The construction of a sub-station, Bloemfontein, Free State Province (Centlec).
- The rehabilitation of bridges on National Route 14: Upington to Kuruman, Northern Cape Province (SANRAL).
- The rehabilitation of the Theekloof Pass, Fraserburg, Northern Cape.

- Reseal of Diversional Road 1468, 1470, 1473 and Minor Road 5873 on behalf of Actophambili, Witzenberg, Western Cape Province.
- Reseal of Section MR 201 and MR 305 on behalf of Actophambili, Wolsely, Western Cape Province.
- Reseal of the National Route 1, on behalf of Actophambili, Leeu Ghamka, Western Cape Province (SANRAL).
- The widening of Pella Road on behalf of the City of Cape Town, Atlantis, Western Cape Province (City of Cape Town).
- The widening of structures over the Orange River on National Route 12 Section 9 near Hopetown, Northern Cape Province (SANRAL).
- The construction of a bulk water supply reservoir, Olifantshoek, Northern Cape Province (Ghamagara Local Municipality).
- Rehabilitation of the Donkergat Road within the West Coast National Park on behalf of BVI Procurement Management Engineers, Western Cape Province (Department of Defence & Department of Public Works).
- Periodic Maintenance of National Route 2 Section 4 between Swellendam and Riviersonderend, Western Cape Province (SANRAL).
- Upgrading of Road ZZ422 from the Intersection of Albert Luthuli through Lokaleng and Mogosane Villages to Tlapeng Phase 1 (km 8.0), Mahikeng, North West Province (North West Department of Public Works and Roads).
- Routine maintenance of TR/1, TR1/3, TR44/1, TR88/1, MR401, MR402 and DR1834 near Uniondale, Western Cape Province (Western Cape Department of Transport and Public Works).
- Expansion of the diesel storage capacity for back-up power on Erf 358, Midrand, Gauteng Province (Liquid Telecoms).

ENVIRONMENTAL AUDITING:

- Decommissioning Audit for the closure of a warehouse, Cape Town, Western Cape Province (Wheatherford).
- Annual Audit on the Waste Management License for Elgin Fruit Juice, Grabouw, Western Cape (Elgin Fruit Juice).
- Annual Environmental Compliance Audit for the operation of the Olive Hill Quarry, Bloemfontein, Free State Province (Lafarge Aggregate).
- Monthly Environmental Compliance Audit for the operation of a Sand Mine near Sasolburg, Free State Province (Mission Point Mine).
- Annual Water Use License Compliance Audit for the operation of a Sand Mine near Sasolburg, Free State Province (Mission Point Mine).
- Quarterly Environmental Compliance Audit for the Xina Solar Thermal Plant (Phase 2) and its associated infrastructure near Pofadder, Northern Cape Province (Abengoa Solar).
- Annual Water Use License Compliance Audit for the Xina Solar Thermal Plant (Phase 2) and its associated infrastructure near Pofadder, Northern Cape Province (Abengoa Solar).
- Annual Water Use License Compliance Audit for the Khi Solar Thermal Plant and its associated infrastructure near Upington, Northern Cape Province (Abengoa Solar).
- Section 54 Legal Compliance Audit at KaXu Solar Thermal Plant and its associated infrastructure near Pofadder, Northern Cape Province (Atlantica).
- Annual Water Use License and Environmental Authorisation Compliance Audit at KaXu Solar Thermal Plant and its associated infrastructure near Pofadder, Northern Cape Province (Atlantica).
- Annual Water Use License Compliance Audit at REISA Solar One Energy Facility and its associated infrastructure near Kathu, Northern Cape Province (REISA).
- Annual Water Use License Compliance Audit at Letsatsi PV Solar One Energy Facility and its associated infrastructure near Bloemfontein, Free State Province (Firefly Investments).
- Environmental GAP Audit at the Franki Group Head Office within Midrand, Gauteng Province (Franki Group).
- Environmental GAP Audit at a Raisins Factory situated near Keimoes, Northern Cape Province (Red Sun Raisins).
- Environmental Compliance Audit at the Bloemfontein Offices for VNA Consulting, Free State Province (VNA Consulting).
- Annual Water Use License and Waste License Compliance Audit at Lesedi PV Solar One Energy Facility and its associated infrastructure near Postmasburg, Northern Cape Province (Firefly Investments).
- Annual Mining Right Compliance Audit at Droogehout Mine and its associated infrastructure near Upington, Northern Cape Province (Strauss Group).
- Environmental GAP Audit at Mercedes George and its associated infrastructure, Western Cape Province (Stanmar Motors)

VISUAL IMPACT ASSESSMENT (VIA):

- Phalaborwa Wildlife Activity Hub, Kruger National Park, Limpopo Province (SANParks).
- 4.9ha Sand Mine on Portion 5 of the Farm Doornekraal No. 830, Western Cape Province (Greenmined).
- Proposed development of the Harvard Powerline, Bloemfontein, Free State Province (Centlec).
- Proposed development of the 35 m Buffeljagsrivier Monopole Mast, Buffeljagsrivier, Western Cape Province (Coast to Coast Towers).
- Proposed development of the 25 m Robertson Monopole Mast, Robertson, Western Cape Province (Coast to Coast Towers).
- Proposed development of the Klein Mooimaak Rest Camp Facility, West Coast National Park (SANParks).
- Proposed development of a Sand Mine near Malmesbury, Western Cape Province (Greenmined).
- Proposed upgrade of the R27 Gate and Geelbek Restaurant, West Coast National Park, Western Cape Province (SANParks).
- Proposed development of the 25 m Roodekrans Monopole Mast, Krugersdorp, Gauteng Province (Coast to Coast Towers).
- Proposed development of a 25 m Monopole Mast on Portion 25 of the Farm Klein Bottelary No. 17, Brackenfell, Western Cape Province (Coast to Coast Towers).
- Proposed development of a Landfill Site on Portion 3 of the Farm Katbosch No. 93, Sasolburg, Free State Province (Metsimaholo Landfill).
- Proposed development of numerous visitor information centres at Schroda and Mapungubwe Hill, Mapungubwe National Park, Limpopo Province (SANParks).
- Proposed development of a 35 m Monopole Mast on Portion 13 of the Farm Van Aries Kraal No. 455, Grabouw, Western Cape Province (Coast to Coast Towers).
- Proposed development of a 25 m Monopole Mast on Erf 532, Gansbaai, Western Cape Province (Coast to Coast Towers).
- Proposed development of a 35 m Lattice Mast on Portion 7 of the Farm Jagersvlakte No. 292, Grabouw, Western Cape Province (Warren Petterson Planning).
- Proposed development of a 35 m Lattice Mast on Erf 532, Stanford, Western Cape Province (Warren Petterson Planning).
- Proposed development of a 15 m Lattice Mast on Portion 4 of the Farm No. 53, Genadendal, Western Cape Province (Warren Petterson Planning).
- Proposed development of a 25 m Monopole Mast on Portion 8 of the Farm Delta No. 1003, Groot Drakenstein, Western Cape Province (Coast to Coast Towers).
- Proposed development of a 30 m Tree Mast on Portion 87 of the Farm Langverwacht No. 241, Kuils River, Western Cape Province (Warren Petterson Planning).
- Proposed development of a 20 m Tree Mast on Erf 679, Gouda, Western Cape Province (Atlas Towers).
- Proposed development of an IPP 400kV Power Line from Grommis to Aggeneys, Northern Cape Province (Eskom).
- Proposed development of a 30 m Lattice Mast on Erf 2819, Caledon, Western Cape Province (Atlas Towers).
- Proposed development of a 54 m Lattice Mast on Portion 7 of the Farm Haane Kuil No. 335, Beaufort West, Western Cape Province (Star Towers).
- Proposed development of a 25 m Monopole Mast on Erf 1035, Caledon, Western Cape Province (Atlas Towers).
- Proposed development of a 25 m Tree Mast on Erf 47, Birkenhead, Western Cape Province (Atlas Towers).
- Proposed development of a 25 m Monopole Mast on Erf 1201, Van Dyks Bay, Western Cape Province (Atlas Towers).
- Proposed development of a 20 m Tree Mast on Erf 1671, Melkbosstrand, Western Cape Province (Atlas Towers).
- Proposed development of a 15 m Tree Mast on Erf 740, Klein Brak River, Western Cape Province (Atlas Towers).
- Proposed Upgrades to the Alpha 1 Recreational Lounge, Robben Island, Western Cape Province (Robben Island Museum).
- Proposed development of a 25 m Tree Mast on Erf 969, Picaltsdorp, Western Cape Province (Atlas Towers).
- Proposed development of a 25 m Tree Mast on Erf 20601, George, Western Cape Province (Atlas Towers).
- Proposed development of a 25 m Monopole Mast on Erf 571, Dellville Park, Western Cape Province (Atlas Towers).
- Proposed development of a 15 m Tree Mast on Portion 113 of the Farm Ruygte Vally No. 205, Sedgefield, Western Cape Province (Atlas Towers).
- Proposed development of a 15 m Dome Mast on Erf 8281, Mossel Bay, Western Cape Province (Atlas Towers).
- Proposed development of a 35 m Tree Mast on Portion 42 of the Farm Harkerville No. 428, Plettenberg Bay, Western Cape Province (Atlas Towers).
- Proposed development of a 25 m Monopole Mast on the Remaining Extent of the Farm No. 790, Philippi, Western Cape Province (Atlas Towers).

- Proposed development of a 15 m Tree Mast on Portion 3 of the Farm No. 452, Grabouw, Western Cape Province (Atlas Towers).
- Proposed development of a 15 m Tree Mast on the Remainder of Erf 3331, Vredenburg, Western Cape Province (Atlas Towers).
- Proposed development of a 40 m Lattice Mast on Portion 24 of the Farm Olyven Boomen No. 83, Malan Valley, Western Cape Province (Atlas Towers).
- Proposed development of the Lendlovu Lodge, Addo Elephant Park, Eastern Cape Province (SANParks).
- Proposed development of a 25 m Tree Mast on Erf 2, Villiersdorp, Western Cape Province (Atlas Towers).
- Proposed development of a 25 m Tree Mast on Erf 270, Franschhoek, Western Cape Province (Galaxy Palms).
- Proposed development of a 25 m Lattice Mast on Erf 9, Nuwerus, Western Cape Province (Atlas Towers).
- Proposed development of the Karoo Power Reserve, Prieska, Northern Cape Province (Greenbox Consulting).
- Proposed development of the Khauta Solar PV Cluster (Three 100 MW PV Plants) near Welkom, Free State Province (WKN Windcurrent).
- Proposed development of the 25 m Monopole Mast on Erf 3266, Onrusrivier, Western Cape Province (Gyro)

WETLAND DELINEATION STUDIES:

- Development of 13 borrow pits along National Road 8, Ladybrand, Free State Province (SANRAL).
- Development of a 12.5ha cemetery on Erf 4233, Western Cape Province (Theewaterskloof Local Municipality).
- Proposed development for the proposed Alfred Nzo Agri-Hub, Cederville, Eastern Cape Province (Department Public Works).
- Proposed development of a Curro Castle on Portion 54 of the Farm Blue Hills No. 397, Midrand, Gauteng Province (Curro Holdings).

STORMWATER MANAGEMENT PLANS:

- Stormwater Management Plan for a Recycling Plant on Erf 5172, Swellendam, Western Cape Province (Agri-World Recycling).
- Stormwater Management Plan for the proposed Granite Mine on the Remaining Extent of the Farm Biesjesfontein No. 218, Springbok, Northern Cape Province (Greenmined Environmental).
- Stormwater Management Plan for the proposed development of Six Layer Hen Houses on the Remainding Extent of the Farm Helena 1492, Bloemfontein, Free State Province (Katawa Trading).
- Stormwater Management Plan for the Routine Maintenance of a Drainage System near Karatara, Western Cape Province (Garden Route District Municipality).
- Stormwater Management Plan for the Unlawful establishment of a Chicken Broiler Facility on Portions 10 and 11 of the Farm Blesbokfontein No. 558, Bronkhorspruit, Gauteng Province (Sintier Poultry).
- Stormwater Management Plan for the proposed development of Lay Hen House, Chicken Broilers and Compost Facility, Brandford, Free State Province (Moreson Hoenders).
- Stormwater Management Plan for Baramakama Poultry on the Remaining Extent of Portion 1 of the Farm Elandsfontein No. 21, Moloti City, North West Province (Baramakama Poultry).
- Stormwater Management Plan for an Oil Recycling Plant on Portion 5 of the Farm Rietfontein No. 107, Bloemfontein, Free State Province (Patrick Mofokeng Trading).
- Stormwater Management Plan for the Proposed Installation of BESS on Erf 2202, Ashton, Western Cape Province (Eskom).

OTHER EXPERIENCE:

- Conducting the Public Participation Process on the Draft Management Plan for the Goukamma Nature Reserve Complex, Western Cape Province (Cape Nature).
- Compilation of an Environmental Management Plan and a Risk Assessment for the pressure testing of a 1 000 000 litre LPG Cylinder within the Port Elizabeth Harbour, Eastern Cape Province (EASIGAS).
- Compilation of an Environmental Management Plan for the development of two Billboards, Bloemfontein, Free State Province (Outdoor Network).
- GIS mapping and technical for various projects, including the drawing of locality, sensitivity, and alien and invasive management maps.
- Public Participation Processes and assistance to several projects.

CONTENTS

LIST OF TABLES:

LIST OF FIGURES:

ACRONYMS AND ABBREVIATIONS

BA	–	Basic Assessment
BAR	–	Basic Assessment Report
CBA	–	Critical Biodiversity Area
DFFE	–	Department of Forestry, Fisheries and the Environment
EAP	–	Environmental Assessment Practitioner
ECO	–	Environmental Compliance Officer
EIA	–	Environmental Impact Assessment
EIE	-	Environmental Orientation and Education
EMF	–	Environmental Management Framework
EMPr	–	Environmental Management Programme
ESA	–	Ecological Support Area
GMTFCA	-	Greater Mapungubwe Transfrontier Conservation Area
GN R	–	Government Notice Regulation
I&AP	–	Interested & Affected Party
IDP	–	Integrated Development Plan
LED	–	Local Economic Development
LM	–	Local Municipality
MPNP	-	Mapungubwe National Park
NDT	–	National Department of Tourism
NEM:PAA	–	National Environmental Management: Protected Areas Act
NEM:WA	–	National Environmental Management: Waste Act
NEMA	–	National Environmental Management Act
NHRA	–	National Heritage Resources Agency
NPA	–	National Parks Act
NWA	–	National Water Act

PSDF	–	Provincial Spatial Development Framework
SAHRA	–	South African Heritage Resources Agency
SANParks	–	South African National Parks
SAPS	-	South African Police Service
SDF	–	Spatial Development Framework
YOF	-	Youth Overnight Facilities

1 SECTION A: ACTIVITY INFORMATION

1.1 PROJECT DESCRIPTION

Mapungubwe National Park received thirty-four thousand five hundred and forty-three (34 543) day visitors during the 2019/2020 reporting period. The inclusion of Mapungubwe's history in the South African school curriculum furthermore makes school visits the norm for the park, with approximately eighteen thousand (18 000) of the abovementioned visitors being part of educational visits (Coetzee, 2021).

Mapungubwe National Park furthermore has the opportunity to provide extensive cultural and environmental education, as there are additional relevant topics that can be addressed. The lack of suitable overnight facilities furthermore makes it impossible to provide extended programmes for various stakeholders such as local communities during cultural events, Vhembe Biosphere Reserve and the Greater Mapungubwe Transfrontier Conservation Area to name a few. A need for low-cost accommodation for special interest groups such as research institutions have been identified and will greatly improve the continued research within the cultural and environmental fields, not only for the park but the Transfrontier Conservation Area and region as a whole (Coetzee, 2021).

Mapungubwe Hill, an iconic southern African cultural heritage site, attracts visitors from all walks of life. Although the site is only accessible accompanied by trained cultural heritage guides, these visitors may only have a superficial understanding of the history surrounding this remarkable snapshot of human endeavour and are therefore not able to understand the significance of the site without appropriate Orientation aids. On site Orientation facilities are; however, lacking and very different from that of other iconic world heritage sites such as the Cradle of Humankind (Coetzee, 2021).

SANParks wish to upgrade their facilities at Mapungubwe National Park in order to enhance visitor experience and provide adequate accommodation for educational tour groups. The proposed upgrades will include the following activities:

Mapungubwe Overnight Facilities (Figure 9):

The overnight facilities will include the construction of:

- Four (4) hostels inclusive of ablution facilities;
- Open air functions space;
- Dining Block inclusive of a kitchen, pantry, reception and a general store;
- Teachers block;
- Laundry room;
- Adequate bus parking; and,
- Associated infrastructure.

5. Orientation Centre at Mapungubwe Hill (Figure 10):

The orientation centre will include the construction of:

- Covered viewing deck;
- Resting areas;
- Mapungubwe exhibit;
- Bambanyanalo exhibit;
- Serving area; and,
- Ablution facilities.

6. Schroda Orientation Centre (Figure 11):

The Schroda Orientation Centre will include the following:

- Interactive exhibit of the sharpening of the blade, games and pottery;
- Covered viewing deck;
- Resting area;
- Schroda/Zhizo exhibit;
- Site model;
- Pre-history exhibit;
- Serving area; and,
- Ablution facilities.

7. Dig Site (Figure 12):

The Dig site will be formalised where a formal building will be constructed above the dig site to ensure adequate protection thereof. The development will include:

- Display boards of Mapungubwe;
- Exhibition and viewing area; and,
- Archaeological Dig Site viewing area.


Figure 9: Visual Impression of the Proposed Hostels.

Figure 10: Visual Impression of the Proposed Orientation Centre at Mapungubwe Hill.

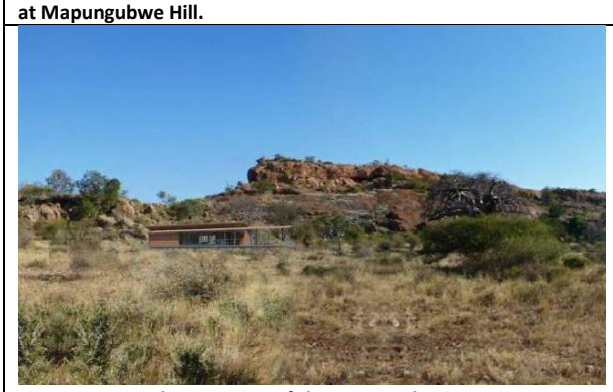


Figure 11: Visual Impression of the Proposed Orientation Centre at Schroda.


Figure 12: Visual Impression of the Proposed Dig Site Upgrade.

Sewage System

The Mapungubwe Dormitories will generate a total of twenty-eight thousand three hundred and five litres (28 305 l) of wastewater per day. The dormitories will tie in with the existing Interpretive Centre Complex sewage system which was approved on 07 June 2006 (EA Ref. No.: 12/12/20/610/21/7) and consist of a reedbed system situated within the Mapungubwe National Park staff village.

Both the Mapungubwe Hill Orientation Centre and Schroda Orientation Centre will make use of polyethylene conservancy tanks. All waste will flow into the sewerage system through a one hundred- and ten-millimetre (110 mm) diameter pipe connected between the building and the conservancy tank and will be installed according to SANS approved slopes. The polyethylene conservancy tank will have a capacity of seven thousand litres (7 000 l) and will be situated within an area easily accessible to vehicles for cleaning and pumping purposes.

In summary, the upgrade of the MPNP Facilities will assist in achieving the tourism objective by improving the tourism experience and provide overnight facilities for large tour groups who wish to explore the rich history of this magnificent National Park.

1.2 LISTED ACTIVITIES, POLICIES AND GUIDELINES ASSOCIATED WITH THE PROJECT

1.2.1 LISTED ACTIVITIES

Table 3: Triggered Listed Activities.

Listed Activity as described in GN R. 327 of 07 April 2017 (as amended)	**Description of project activity**
Activity 12: The development of – (ii) infrastructure or structures with a physical footprint of 100 square metres or more; Where such development occurs – (b) Within a watercourse; (c) If no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.	Locality Alternative of the Mapungubwe Hill Orientation Centre will be situated within thirty-two metres (32 m) of a watercourse.
Listed Activity as described in GN R. 324 of 07 April 2017 (as amended)	**Description of project activity**
Activity 5: The development of resorts, lodges, hotels, tourism or hospitality facilities that sleep less than 15 people. **f. Limpopo** iv. A protected area identified in terms of NEMPAA; v. Outside urban areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; vi. Outside Urban Areas: (aa) Critical biodiversity areas identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; or, (bb) Areas within a watercourse, or within 100 metres from the edge of a watercourse.	The proposed Mapungubwe Hill Orientation Centre, Dig Site Orientation Centre and Schroda Orientation Centre will sleep less than fifteen (15) people. Furthermore, these developments will all be situated within the boundaries of the MPNP and will serve as hospitality facilities.
Activity 6: The development of resorts, lodges, hotels, tourism or hospitality facilities that sleeps 15 people or more. **e. Limpopo** ii. Outside urban areas: (aa) a protected area identified in terms of NEMPAA, excluding conservancies;	The Mapungubwe Overnight Facilities (Dormitories) will sleep more than fifteen (15) people and will be situated within the boundaries of the MPNP. Furthermore, the Dormitories will be situated within ten kilometres (10 km) of a World Heritage Site.

(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an international convention; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans. (gg) Areas within 10 kilometres from National Parks or world heritage sites or 5 kilometre from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; (hh) Areas within a watercourse; or within 100 metres from the edge of a watercourse.	
Activity 12: The clearance of an area of 300 square metres or more of indigenous vegetation. **e. Limpopo** iv. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; v. Within critical biodiversity areas identified in bioregional plans; or, vi. On land, where at the time of coming into effect of this notice or thereafter such land was zoned open space, conservation or had an equivalent zoning.	The proposed dormitories will have a development footprint of approximately one thousand five hundred square metres (1 500 m^2) and will result in the removal of indigenous vegetation in excess of three hundred square metres (300 m^2).
Activity 14: The development of – (iii) Infrastructures or structures with a physical footprint of 10 square metres or more; Where such development occurs – (b) Within a watercourse; (d) If no development setback has been adopted within 32 metres of a watercourse, measured from the edge of a watercourse e. **Limpopo** ii. Outside urban areas: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (cc) World Heritage Sites; (dd) Sensitive areas as identified in an environmental management framework as contemplated in Chapter 5 of the Act and as adopted by the competent authority; (ee) Sites or areas identified in terms of an international convention; (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (hh) Areas within 10 kilometres from national parks or world heritage sites or within 5 kilometres from	Alternative 2 of the Mapungubwe Hill Orientation Centre will be situated within thirty-two metres (32 m) of a watercourse.

	any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve.	

1.3 FEASIBLE AND REASONABLE ALTERNATIVES

1.3.1 SITE ALTERNATIVES

Two (2) Location Alternatives are proposed for the Mapungubwe Hill Orientation Centre, as detailed below.

1.3.1.1 LOCATION ALTERNATIVE 1 (PREFERRED ALTERNATIVE):

It was decided to move the Mapungubwe Hill Orientation Centre from its original position to ensure that it is not constructed within thirty-two metres (32 m) of watercourses and to restrict the visual impact thereof. The Preferred Alternative (Figure 13) will be situated at the following co-ordinates:

- 22˚ 13’ 10.98’’ S; and,
- 29˚ 23’ 19.08’’ E.

Figure 13: Preferred Site Alternative.

Advantages of the Preferred Alternative:

- The Preferred Alternative is situated at the foot of a hill which results in the restriction of the visual impact;
- The proposed development will be light to earth; and,
- The proposed facility will not be situated within thirty-two metres (32 m) of any watercourse and outside the floodplain.

Disadvantages of the Preferred Alternative:

- The preferred alternative is situated further from the road and as such it may be a challenge for the elderly and people of disability to access the facility if a proper access path is not constructed.

1.3.1.2 LOCATION ALTERNATIVE 2:

The alternative location was originally considered as it is situated adjacent to the road leading to Mapungubwe Hill and provide clear views of the surrounding area and drainage lines. Location Alternative 2 (Figure 14) will be situated at the following co-ordinates:

- 22˚ 13’ 02.70’’ S; and,
- 29˚ 23’ 16.13’’ E.

Figure 14: Visual Impression of Location Alternative 1.

Advantages of the Preferred Alternative:

- The location alternative will offer great views of Mapungubwe Hill and the valley;
- The location alternative is situated directly adjacent to the road and as such will be easily accessible for the elderly and persons with disability; and,
- The proposed facility will be light to earth.

Disadvantages of the Preferred Alternative:

- The proposed facility will be situated within thirty-two metres (32 m) of a watercourse and will be situated within the floodplain. During flooding there is a possibility that damages can occur to the facility resulting in higher maintenance budgets.

1.3.2 LAYOUT ALTERNATIVE

Two (2) Layout Alternatives are proposed for the Overnight Facilities as illustrated below.

1.3.2.1 LAYOUT ALTERNATIVE 1 (PREFERRED ALTERNATIVE)

The preferred Layout Alternative entails the construction of four (4) dormitories with one (1) teachers’ block, a dining block and a laundry room. Each hostel will be two hundred and eighteen square metres (218 m^2) in size with the dining block equalling to three hundred and seventy-two square metres (372 m^2). The total development footprint will be one thousand five hundred and five square metres (1 505 m^2) with sleeping arrangements for one hundred and thirty-two (132) individuals. Figure 15 below illustrates the layout of the preferred layout alternative.

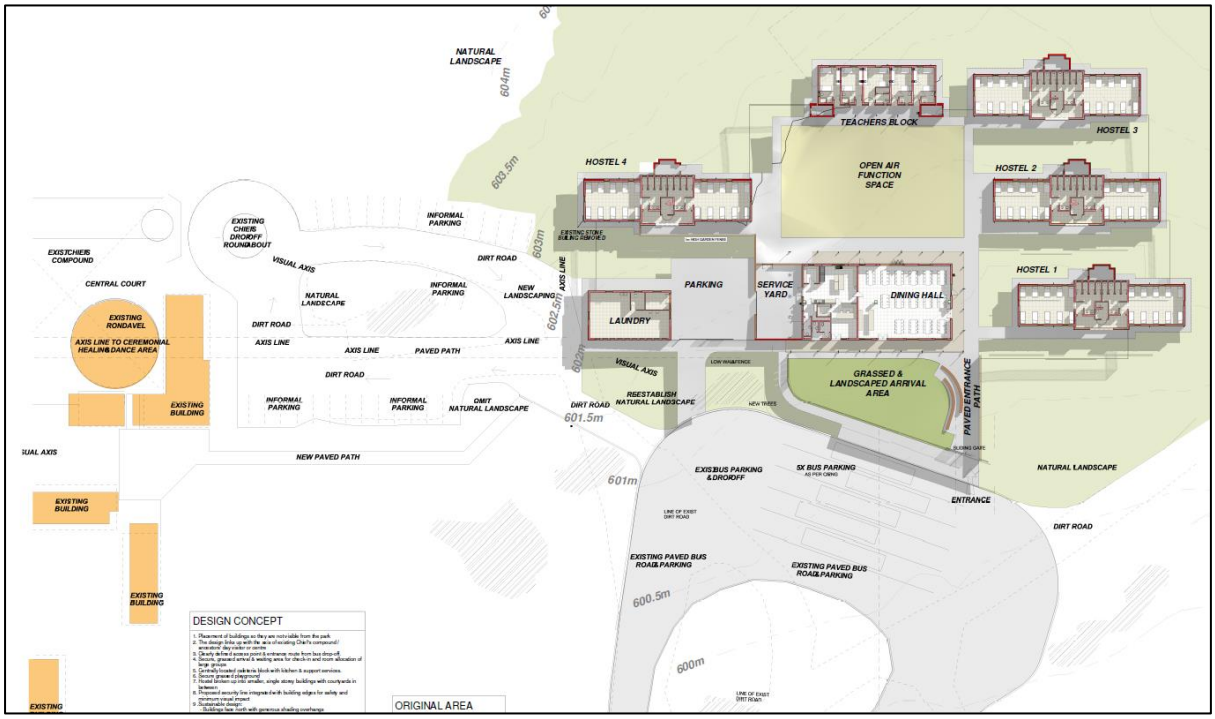

Figure 15: Preferred Dormitories Layout Alternative

Advantages of the Preferred Alternative:

- The layout alternative will provide the exact same beds as Layout Alternative 2; however, one (1) less dormitory will be constructed;
- The preferred Layout Alternative will be constructed on a smaller land parcel than Layout Alternative 2; and,
- The preferred layout alternative allows for a Laundry Room.

Disadvantages of the Preferred Alternative:

- The preferred Layout Alternative will have a bigger development footprint for the dormitories (218 m^2) than that of Layout Alternative 2 (149 m^2).

1.3.2.2 LAYOUT ALTERNATIVE 2

Layout Alternative 2 entails the construction of five (5) dormitories with one (1) teachers' block and dining block. Each hostel will be one hundred and forty-nine square metres (149 m^2) in size with the dining block equalling to four hundred and ten square metres (410 m^2). The total development footprint will be one thousand three hundred and ten square metres (1 310 m^2) with sleeping arrangements for one hundred and thirty-two (132) individuals. Figure 16 below illustrates the layout of Layout Alternative 2.

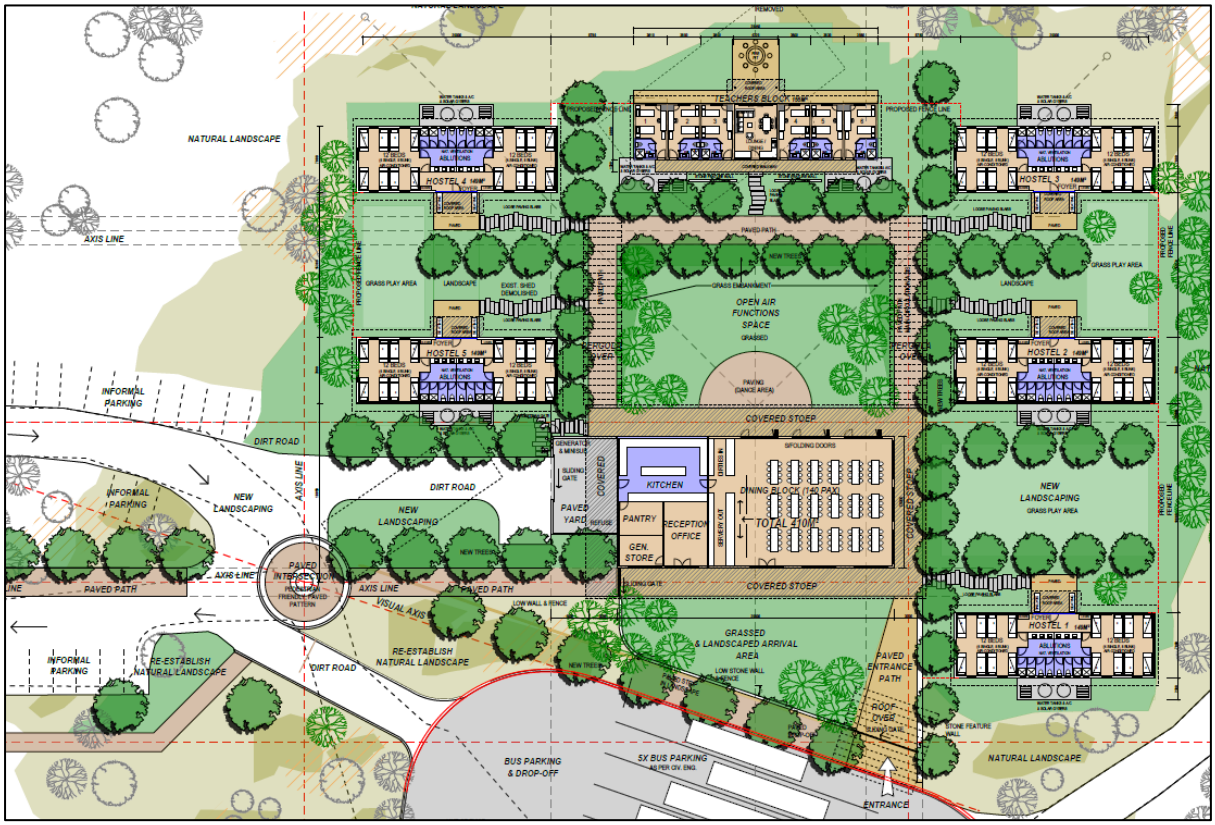

Figure 16: Dormitories Layout Alternative 2

Advantages of the Preferred Alternative:

- Layout Alternative 2 will have a smaller development footprint than that of the preferred layout alternative.

Disadvantages of the Preferred Alternative:

- The layout alternative does not make provision for a laundry room;
- It consists of an extra dormitory; and,
- The overall footprint will be constructed on a larger land parcel than that of the preferred layout alternative.

1.3.3 NO-GO ALTERNATIVE

The no-go alternative will result in the proposed upgrades not taking place. With regards to the dormitories this will result in insufficient accommodation within the park as no affordable accommodation is available for larger tour groups within the immediate vicinity. Furthermore, it allows students less time on site as travel time need to be factored in from Musina, resulting in shortened tours of the MPNP. The Orientation centres will educate visitors, provide comfort, and provide orientation on the surrounding landscape which enhances the visitor experience as they will be able to grasp the historical significance of the area. These developments will have a positive financial impact as more tourists will be drawn to MPNP. With an increase in finances more funds can be allocated for the maintenance and protection of the Mapungubwe National Park Heritage Resources.

1.4 ACTIVITY MOTIVATION

1.4.1 PARK MANAGEMENT PLAN

The primary objective of a park zoning plan is to establish a coherent spatial framework in and around a park to guide and co-ordinate conservation, tourism and visitor experience initiatives. A zoning plan plays an important role in minimizing conflicts between different users of a park by separating potentially conflicting activities such as game viewing and day visitors picnic areas whilst ensuring that activities which do not conflict with the park's values and objectives (especially the conservation of the protected area's natural systems, its biodiversity and heritage resources) can continue in appropriate areas (SANParks, 2019).

The Park Zoning Plan was one of the tools SANParks developed to assist them in reaching the desired long-term state as outlined within the Mapungubwe National Park Management Plan.

Zoning categories include:

Primitive Zone: The primary characteristic of this zone is the experience of wilderness qualities with the emphasis on controlled access. Access is controlled in terms of numbers, frequency and group sizes. The zone shares the wilderness qualities of wilderness areas and the remote zone, but with the provision of small basic self-catering facilities with controlled access. Views of human activities and development outside of the park may be visible from this zone (SANParks, 2019).

This zone serves to protect sensitive environments from high levels of development. The primitive zone may contain concession sites and other facilities where impacts are managed through strict control of the movement and numbers of tourists, for example if all tourists are in concession safari vehicles.

Low Intensity Leisure: The underlying characteristic of this zone is motorised self-driven access, with basic self-catering facilities. Small or seasonal commercial or catered facilities can be accommodated; however, these facilities must be small and aligned to the general ambiance of the zone. Numbers of visitors are higher in the low intensity leisure zone as compared to the remote and primitive zones. Relatively comfortable facilities are positioned in the landscape retaining an inherent natural and visual quality, which enhances the visitor experience of a more natural and mostly self-providing experience. Within the Low Intensity Leisure Zone deviation from a natural/pristine state must be minimised and limited to restricted impact footprints as far as possible.

High Intensity Leisure Zone: The main objective of this tourist-orientated zone is the concentration and containment of commercial, tourism, managerial, operational and industrial park activities within a restricted and designated area, which is robust enough to tolerate development, and where these diverse activities can share multi-use infrastructure (roads, plumbing, power), thus reducing their overall footprint. As impacts and particularly cumulative impacts are higher, where possible the High Intensity Leisure must be placed in areas that have low sensitivity values and are sufficiently robust to tolerate development, and idyllically be close to the periphery of the park. The main characteristic is that of a high-density tourist development node with modern commercial amenities such as restaurants and shops. This is the zone where more concentrated human

activities are allowed. High intensity leisure is accessible by motorised transport on high volume transport routes. The main focus is to ensure a high-quality visitor experience; however, the conservation objectives still require that the high levels of tourism activity and infrastructure that are accommodated within this zone are planned and managed to minimise the effect on the surrounding natural environment, and that the zone must still retain a level of ecological integrity consistent with a protected area.

Priority Natural Areas: These are key areas for both pattern and process that are required for the long-term persistence of biodiversity in and around the park. The zone also includes areas identified for future park expansion. Inappropriate development and negative land-use changes should be opposed in this area. Developments and activities should be restricted to sites that are already transformed.

Viewshed Protection Areas: These are areas where development is likely to impact on the aesthetic quality of the visitor's experience in a park. Within these areas any development proposals should be carefully screened to ensure that they do not impact excessively on the aesthetics of the park.

Table 4 below summarise each proposed development and the zoning thereof:

Table 4: Proposed development and the zoning thereof.

INFRASTRUCTURE	STATUS	ZONE	PRIORITY	PROBABILITY OF DEVELOPMENT	COMPATIBLE WITH ZONING
Youth Centre Dormitories/Budget Accommodation	New	High Intensity Leisure	High	High	Yes
K8 Excavation Pit Profile Upgrade	New	Primitive	High	High	Yes
Orientation Centre at Mapungubwe Hill	New	Primitive	High	High	Yes
Orientation Centre and Pathways at Schroda / Zhizo	New	Low Intensity Leisure	High	High	Yes

From the above mentioned it is evident that the proposed developments will be in line with the zoning scheme of the Mapungubwe National Park. Figure 17 below illustrates the zonings as listed within Table 4.

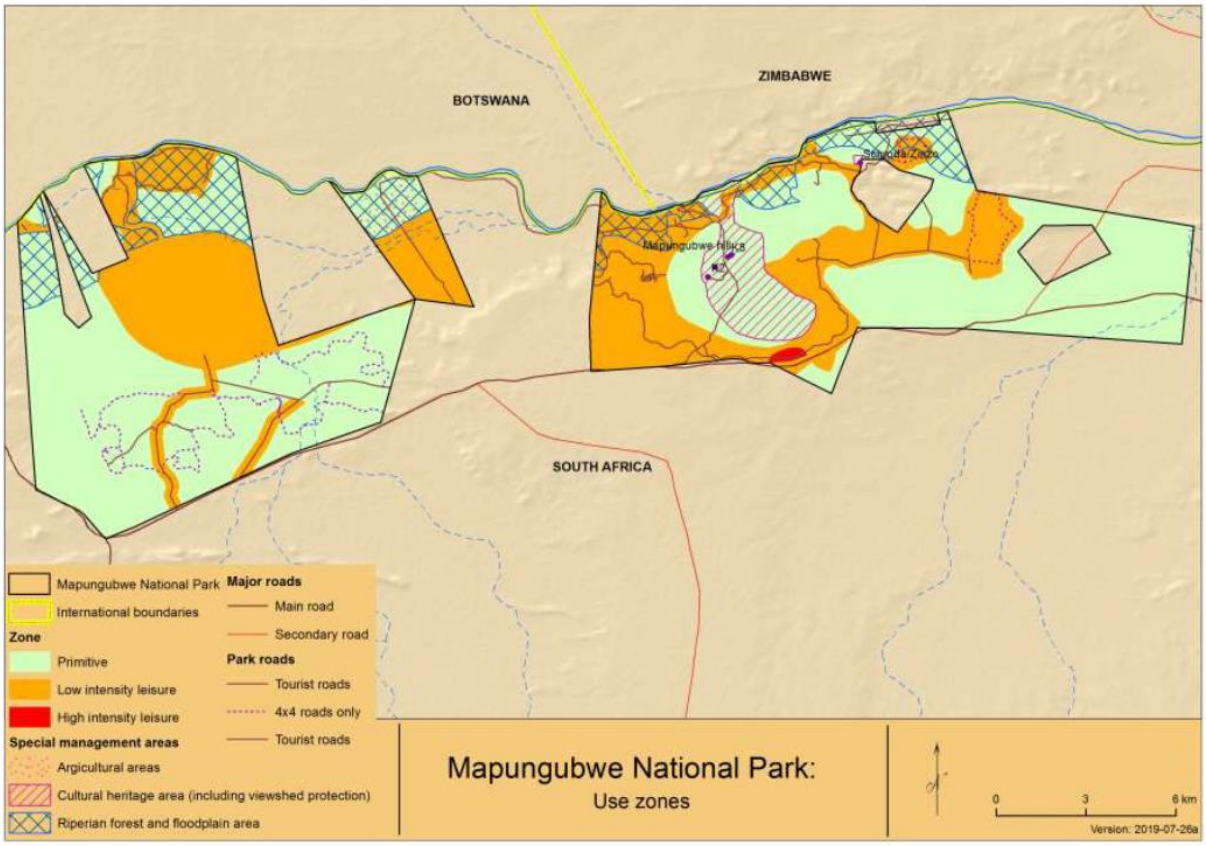

Figure 17: Zoning of the Mapungubwe National Park, Limpopo Province.

1.4.2 INTEGRATED DEVELOPMENT PLAN AND SPATIAL DEVELOPMENT PLAN

The Musina Local Municipality Integrated Development Plan (IDP) 2020 – 2021 states that the economic growth and development of Limpopo province is anchored around three major competitive advantages which is mining, agriculture and tourism. The Musina Local Municipality is a home to a number of formal protected areas in the form of nature reserves, conservation areas and national parks. These protected areas play a significant role with respect to conservation as well as tourism (Municipal Manager's Office, 2020).

As per the above-mentioned explanation the proposed development is in line with the IDP and Spatial Development Plan (SDF) as the Musina Local Municipality identified tourism as a Local Economic Development driver within the area. The proposed MPNP developments will contribute to tourism directly.

1.4.3 ACTIVITY NEED AND DESIRABILITY

1.4.3.1 Youth Overnight Facilities

Mapungubwe National Park received thirty-four thousand five hundred and forty-three (34 543) day visitors during the 2019/20 reporting period. The inclusion of the Mapungubwe's history in the South African school curriculum furthermore makes school visits the norm for the park, with approximately eighteen thousand (18 000) of the abovementioned visitors being part of educational visits. Mapungubwe National Park furthermore has the opportunity to provide extensive cultural and environmental education, as there are additional relevant topics that can be addressed. For example, the Grade 5 curriculum includes the history of hunter-gatherers and herders in southern Africa, of which their history can be found within the MPNP. There are furthermore numerous ways in which the life sciences curriculum can be linked to the SANParks mandate (Coetzee, 2021).

However, with educational groups travelling as far afield as KwaZulu-Natal and the remote location of MPNP (approximately 70 – 76 km to the closest towns of Alldays and Musina alone), the time available for visits to the park Orientation facilities and other points of interest are very constrained. Per illustration, should a group from Thohoyandou travel by bus to MPNP, travel time alone will be in excess of six (6) hours to and from the park, leaving little time for any constructive Environmental Orientation and Education (EIE) to take place. The lack of suitable overnight facilities furthermore makes it impossible to provide extended programmes for various stakeholders such as local communities during cultural events, Vhembe Biosphere Reserve (VBR) and Greater Mapungubwe Transfrontier Conservation Area (GMTFCA) events and outreach, to name a few. A need for low-cost accommodation for special interest groups such as research institutions have been identified and will greatly improve the continued research within the cultural and environmental fields, not only for the park but the Transfrontier Conservation Area (TFCA) and region as a whole (Coetzee, 2021).

The use of existing tourism facilities such as Leokwe Rest Camp etc. are not adequate in size to allow for medium to large groups (10 or more individuals). These facilities do not have the required infrastructure such as communal, industrial-sized kitchens or safe play/activity areas for full EIE programmes. The use of these facilities for educational groups will furthermore negatively affect the existing income from the leisure tourism component, for which a higher tariff rate is chargeable. Although the YOF will play a greater role as a catalyst to provide enhanced environmental educational and engagement with relevant stakeholders, a need for low-cost accommodation within the park was identified. The layout of the YOF lends itself to the possibility of allowing a backpacker style accommodation experience to visitors (Coetzee, 2021).

In view of the above factors and in the context of the Development Framework, it is therefore of vital importance for MPNP and the Mapungubwe Cultural Landscape World Heritage Site (MCLWHS) to play a more active role in the dissemination of environmental Orientation and education through the provision of overnight facilities for youth and other relevant stakeholders (Coetzee, 2021).

1.4.3.2 Mapungubwe Valley Orientation Facilities

Mapungubwe Hill is undoubtedly the most recognisable heritage site within the MCLWHS. At present, the is the only archaeological site open to guided visitors within the MCLWHS. During a reactive monitoring mission to the MCLWHS in 2012, it was however noted that there was no interpretative guidance at the top of Mapungubwe Hill and at Schroda. Although Eloundou and Avango (2012) states that this absence of Orientation leaves the landscape at the sites unaffected, they also reflect on the fact that visitors to the site will need interpretative guidance in order to understand what they are observing. Mapungubwe Hill and the MCLWHS, an iconic southern African cultural heritage site, attracts visitors from all walks of life. Although the site is only accessible accompanied by trained cultural heritage guides, these visitors may only have a superficial understanding of the history surrounding this remarkable snapshot of human endeavour and therefore are not able to understand the significance of the site without appropriate Orientation aids. On-site Orientation facilities are however lacking and very different from that of other iconic world heritage sites such as the Cradle of Humankind. Here, apart from the expansive Maropeng Orientation Centre, the Cradle of Humankind also has an Orientation centre and other facilities situated adjacent to the Sterkfontein Caves (Coetzee, 2021).

The South African school curriculum for Grade 6 learners furthermore discuss the occupation of sites such as K2 and Schroda. These sites are therefore of equal significance; however, Schroda, K2 (and Bambandyanalo) currently only forms a small part of Orientation by guides, as these sites are not generally accessible by visitors. Discussion of these sites' significance without visual aids are difficult and resulted in the envisioning of site models to better explain the connectedness of the various sites, in time and space. These envisioned site models provided the provisional name of these facilities, namely Orientation Area or Facility. The use of Orientation Area/Facility intends to create a distinction between smaller Orientation centres in the park and the main Orientation Centre Complex located on the park periphery. The addition of these orientation facilities will provide visitors with a better understanding of the Mapungubwe Cultural Landscape as being more than the Mapungubwe Hill (Coetzee, 2021).

As a rule, no children under 12-years old are allowed to partake in SANParks tourism activities such as night drives and walks. The availability of a safe, covered space may; however, make is possible for younger visitors to access the site safely. The provision of an easily accessible covered area will furthermore greatly facilitate the access to the site by visitors that would normally not be able to experience the Mapungubwe Hill or its surrounds, such as the elderly, mobility impaired or visitors that otherwise may find the climb to the Hill daunting. The availability of safe, covered spaces will therefore make it possible for a diverse range of visitors to access the site (Coetzee, 2021).

The Limpopo-Shashe Valley is furthermore extremely hot during the height of summer, which makes visitation to the Mapungubwe Hill (including the K8 Orientation area) somewhat uncomfortable, even to those who are accustomed to the climate. The provision of covered resting spaces will therefore greatly enhance the visitor experience to this site (Coetzee, 2021).

1.4.3.3 Schroda Orientation Centre

The Schroda Archaeological Site, although an extremely important part of the cultural landscape's story, has not featured prominently in the available access and Orientation available to park visitors. Even though the main Mapungubwe Orientation Centre does have interpretive information about and artefacts from the Schroda site, it is not easily put into context for those visitors that does not have a good understanding of the landscape; in other words, most of the general park visitors and educational groups. The Schroda site provides tangible cultural Orientation options (possibly more so than Mapungubwe Hill) for general visitors, due to the vast number of stone engravings that can be found on the site (Coetzee, 2021).

The South African school curriculum for Grade 6 learners furthermore discusses the occupation of sites such as K2 and Schroda. However, Schroda currently only forms a small part of Orientation by guides during excursions to the Mapungubwe Hill and in the main Orientation Centre. Opening the Schroda archaeological site will greatly enhance the general understanding of the Mapungubwe Cultural Landscape's occupation history.

As a rule, no children under 12-years old are allowed to partake in SANParks tourism activities such as night drives and walks. The availability of a safe, covered space may; however, make is possible for younger visitors to access the site safely. The provision of an easily accessible covered area will furthermore greatly facilitate the access to the site by visitors that would normally not be able to experience the Mapungubwe Hill or its

surrounds, such as the elderly, mobility, impaired or visitors that otherwise may find the climb to the Hill daunting. The availability of safe, covered spaces will therefore make it possible for a diverse range of visitors to access the site (Coetzee, 2021).

The Limpopo-Shashe Valley is furthermore extremely hot during the height of summer, which makes visitation to the Mapungubwe Hill (including the K8 Orientation area) somewhat uncomfortable, even to those who are accustomed to the climate. The provision of covered resting spaces will therefore greatly enhance the visitor experience to this site (Coetzee, 2021).

1.4.4 SECTION 23 OF NEMA

Through the undertaking of a BA Process by a competent EAP, informed by guidelines, the consideration of impacts and alternatives (advantages and disadvantages coupled thereto) has been made. Moreover, the conducting of Public Participation and Specialist investigations form part of the process, whilst mitigation measures and the need and desirability of the proposed project were interrogated. This ensured that all provisions of the Act were considered and as such Integrated Environmental Management were accounted for.

1.5 PRINCIPLES OF NEMA

1.5.1 SECTION 2 OF NEMA

Through the undertaking of a BA Process by a competent EAP, informed by guidelines, the consideration of impacts and alternatives (advantages and disadvantages coupled thereto) has been made. Moreover, the conducting of a Public Participation Process and Specialist Investigations formed part of this BA Process, whilst mitigation measures and the needs and desirability of the proposed project were interrogated. This ensured that all provisions of the Act were considered and as such Integrated Environmental Management were accounted for as follow:

(2) Environmental Management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural heritage and social interests equitably.

The goal of this BAR is to identify and mitigate potential socio-economic impacts in order to meet the terms of Section 24 of the Constitution.

(3) Development must be socially, environmentally and economically sustainable.

The overall goal of this BAR is to predict, identify and manage potential positive and negative impacts in the socio-economic, cultural-heritage and biophysical environments in order to meet the needs of present generations without compromising the needs of future generations which will give effect to sustainable development.

(4)(a) Sustainable development requires the consideration of all relevant factors including the following:

i. *That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;*

ii. *that pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;*

iii. *that the disturbance of landscapes and sites that constitute the nation´s cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;*

iv. *that waste is avoided, or where it cannot be altogether avoided, minimised and reused or recycled where possible and otherwise disposed of in a responsible manner;*

v. *that the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;*

vi. *that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised;*

vii. *that a risk averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and,*

viii. *that negative impacts on the environment and on people´s environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.*

An Environmental Management Program Report (EMP'r) was compiled to mitigate and manage all activities during the planning, construction and operational phases of the proposed MPNP developments.

(b) Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option.

All aspects, including socio-economic, cultural-heritage and biophysical were evaluated and assessed in order to minimize potential negative impacts which will give effect to Integrated Environmental Management, as set out in Chapter 5 of NEMA, 1998.

(c) Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons.

A Public Participation Process (PPP) will be undertaken in terms of Section 41 of the NEMA EIA Regulations (GN R. 326), which came into effect on 07 April 2017 (as amended), in order to give effect to Section 32 of the Constitution and Section 24 of the Constitution.

(d) Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing must be pursued and special measures may be taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination.

This will be taken into account during the operational phase of the activity.

(e) Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.

The EMP'r will be applicable throughout the lifecycle of the project as it will form part of the Environmental Authorisation.

(f) The participation of all Interested and Affected Parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured.

A PPP will be undertaken in terms of Section 41 of the NEMA EIA Regulations (GN R. 326), which came into effect on 07 April 2017 (as amended), in order to give effect to Section 32 of the Constitution in such a way that adherence is given to Section 24 of the Constitution.

(g) Decisions must take into account the interests, needs and values of all Interested and Affected Parties, and this includes recognising all forms of knowledge, including traditional and ordinary knowledge.

The DFFE decision making process has to be in accordance with the above.

(h) Community wellbeing and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means.

Where feasible, efforts should be made to employ Local Contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria; and,

Bedding materials (e.g. sand) should be sourced locally from a mining site who's owner has a valid mining permit issued by the Department of Mineral Resources (DMR).

(i) The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment.

This BAR does give effect to Section 5 of NEMA whereby all social, economic and environmental impacts of activities were considered, assessed, evaluated and mitigated.

(j) The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected.

Human rights will be taken into account during all phases of the proposed project.

(k) Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law.

The decision will take place in an open and fair manner and give effect to Section 32 of the Constitution. I&AP's will be notified of the decision in terms of the requirements as set out in Section 41 of the NEMA EIA Regulations (GN R. 326), 2017 (as amended).

(l) There must be intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment.

All Governmental Authorities and Organs of State will be considered during the EIA process to provide their inputs on the project.

(m) Actual or potential conflicts of interest between Organs of State should be resolved through conflict resolution procedures.

Actual or potential conflicts of interest between organs of state should/will be resolved through conflict resolution procedures.

(n) Global and international responsibilities relating to the environment must be discharged in the national interest.

Tourism programmes are aimed at the development, management, enhancement and provision of a range of sustainable tourism products to ensure a memorable experience for all park visitors. The high-level objective is to ensure that visitors have access to a range of unique and top-quality products and services that are competitively priced and in line with diverse and dynamic visitor needs.

South African National Parks wish to develop certain tourist destinations through-out the MPNP to enhance visitor experience and offer accommodation to tour groups. South African National Parks is the mandated institutional entity responsible for the management of conservation and tourism within the MPNP and whose operational responsibility it will be to manage the proposed development in a sustainable manner. Accordingly, global and international responsibilities relating to the environment will be discharged in the national interest.

(o) The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people´s common heritage.

Through the appointment of various specialists (Ecological, Visual and Heritage), mitigation measures have been compiled to ensure that the proposed project does not harm the environment. Architectural plans were designed according to South African Norms and Standards.

(p) The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.

An EMP'r was compiled in order to prevent or minimise any potential negative impacts to the environment. It will be the responsibility of the Applicant and Contractor to adhere to all measures set out in the EMP'r, in order to give effect to Section 28 (1) of NEMA.

(q) The vital role of women and youth in environmental management and development must be recognised and their full participation therein must be promoted.

The recruitment selection process should seek to promote gender equality and the employment of woman wherever possible, particularly for less labour-intensive work.

(r) Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

A Sensitivity map containing all vulnerable vegetation, water courses and ecosystems were prepared in order to determine that the proposed project will have no negative impact thereon.

1.6 APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

The following lists of Legislation, Policies and Guidelines from all spheres of Government are applicable to the Application as contemplated in the EIA Regulations:

Table 5: Applicable Legislation, Policies and/or Guidelines applicable to the Project.

Title of Legislation, Policy or Guideline	Applicability to the Project	Administering Authority	Date
National Environmental Management Act, 1998 (Act No. 107 of 1998) and the Environmental Impact Assessment Regulations, 2017 (as amended) published in Government Notice Regulation No. 327 and 324	The proposed upgrade will trigger Listed Activities as outlined in GN R. 327 and 324 and is subject to an Environmental Impact Assessment as per the National Environmental Management Act, 1998 (Act No. 107 of 1998)	National Department of Forestry, Fisheries and Environmental Affairs	2021
Government Notice Regulation No. 326 of 07 April 2017 (as amended)	GN R. 326 provides the steps and requirements that need to be followed and included within the Environmental Impact Assessment.	National Department of Forestry, Fisheries and Environmental Affairs	2021
National Heritage Resources Act, 1999 (Act No. 25 of 1999)	Section 38 (1) (c) states that a Heritage Permit must be obtained for any development or activity that will change the character of a site (i) exceeding 5 000 m^2 in extent. As such, an application has been submitted to the Competent Authority.	South African Heritage Resources Agency	1999
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	Determination of biodiversity impacts. Should any protected plant species be observed on site an application to relocate the plants must be submitted.	National Department of Forestry, Fisheries and Environmental Affairs	2004
National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)	SANParks is the custodian of the MPNP which is zoned as a Protected Area and is therefore subjected to the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) and its principles/conditions.	National Department of Forestry, Fisheries and Environmental Affairs	2003
South African National Biodiversity Institute Geographical Information Systems	BGIS is the responsible Authority to map the Biodiversity Sensitive areas for the Limpopo Province. National parks are cadastral parcels held by SANParks and therefore are not included in these maps.	South African National Biodiversity Institute	2017

Title of Legislation, Policy or Guideline	Applicability to the Project	Administering Authority	Date
Musina Local Municipality Integrated Development Plan	Although SANParks is the custodian of the MPNP, it must be ensured that the proposed development is in line with the IDP.	Mapungubwe Local Municipality	2020 – 2021
Musina Local Municipality Spatial Development Framework	Although SANParks is the custodian of the Mapungubwe National Park, it must be ensured that the proposed development is in line with the SDF.	Musina Local Municipality	2019
Mapungubwe National Park: Park Management Plan 2019 - 2028	The MPNP Management Plan serves as a reference to the management and development of the park in its current and envisaged future form with information on the background, biophysical context, desired state, management and programmes at strategic and operational levels.	National Department of Fisheries, Forestry and Environmental Affairs and SANParks.	2019

1.7 WASTE, EFFLUENT AND NOISE MANAGEMENT

1.7.1 WASTE MANAGEMENT

The overall objective of waste management is to:

- Formalise waste handling, transfer and disposal activities associated with waste from the proposed Mapungubwe development;
- To prevent inappropriate management of waste and associated risk of pollution of the environment;
- To facilitate waste minimisation entailing avoidance, reduction, re-use, recycling or treatment before disposal;
- To streamline waste segregation, storage, disposal and promote resource recovery from waste;
- Contain, control and dispose of waste in accordance with the required waste management practices;
- Define responsibility for waste management at the various levels of operation associated with the operational activities; and,
- To provide a framework for the selection of waste management service providers in line with the cradle to grave principles.

Waste minimisation mitigation measures which are in-line with the aforementioned objectives for the construction and operational phases are included within the EMP'r. All waste must be disposed of at a Registered Landfill site.

1.7.2 EFFLUENT

The Mapungubwe Dormitories will generate a total of twenty-eight thousand three hundred and five litres (28 305 l) of wastewater per day. The dormitories will tie in with the existing Interpretive Centre Complex sewage

system which was approved on 07 June 2006 (EA Ref. No.: 12/12/20/610/21/7) and consist of a reedbed system situated within the Mapungubwe National Park staff village.

Both the Mapungubwe Hill Orientation Centre and Schroda Orientation Centre will make use of polyethylene conservancy tanks. All waste will flow into the sewerage system through a one hundred- and ten-millimetre (110 mm) diameter pipe connected between the building and the conservancy tank and will be installed according to SANS approved slopes. The polyethylene conservancy tank will have a capacity of seven thousand litres (7 000 l) and will be situated within an area easily accessible to vehicles for cleaning and pumping purposes.

1.7.3 NOISE MANAGEMENT

Noise will be generated during the construction and operational phase of the proposed developments. During the construction phase noise will emanate from the following activities:

- The establishment of a site camp;
- Movement of construction vehicles on site;
- Use of machinery and power tools;
- Presence of construction personnel working on site; and,
- Delivery of construction material.

Mitigation measures are outlined within the EMPr to assure noise impacts are adequately addressed and managed in order not to become a nuisance within the study area.

1.8 WATER USE AND ENERGY EFFICIENCY

1.8.1 WATER SUPPLY:

1.8.1.1 Mapungubwe Dormitories

The Mapungubwe Dormitories will tie in with the existing Interpretive Centre Complex basic service infrastructure network which was approved on 07 June 2006 (EA Ref. No.: 12/12/20/610/21/7). The Dormitories will require thirty-six thousand four hundred and fifty litres (36 450 l) of potable water per day which will be supplied by the existing municipal water line. The demand was calculated as follow:

Table 6: Total Water Demand for the Dormitories development.

DESCRIPTION	NO OF PEOPLE	LITRES PER DAY	TOTAL DEMAND
Hostels	132	200	26 400 l/d
Kitchen and Dining	140	60	8 400 l/d
Irrigation/Public Open Space	0.07 Ha	15 kl	1 050 l/d
Guard House	1	600	600 l/d
TOTAL WATER DEMAND PER DAY			**36 450 l/d**

1.8.1.2 Mapungubwe Hill Orientation Centre

Water will be supplied to the Mapungubwe Hill Orientation Centre via a water truck and a month's water supply to be kept on site as reserve. It is anticipated that twenty-seven (27) people will visit the orientation centre per day. The daily water consumption is estimated around three hundred and nineteen litres per day (319 l/d) with the monthly water consumption estimated at nine thousand eight hundred and seventy-nine litres per month

(9 879 l/m). Furthermore, two (2) five thousand litre (5 000 l) water tanks will be installed beneath the building which will act as the reserve tanks. Water pressure beneath the facility and the reserve tanks will be created through the installation of a small booster pump. SANParks have confirmed that disinfection of water will be done with an ozone sterilization system. The tanks to be installed as reserve will have a diameter of two point two metres (2.2 m) by one point six metres (1.6 m) in height. The Dig Site Orientation Centre won't require water provision.

1.8.1.3 Schroda Orientation Centre

Water will be supplied to the Schroda Orientation Centre via a water truck and a month's water supply to be kept on site as reserve. It is anticipated that thirteen (13) people will visit the orientation centre per day. The daily water consumption is estimated around two hundred and one litres per day (201 l/d) with the monthly water consumption estimated at six thousand two hundred and forty-one litres per month (6 241 l/m). Furthermore, one (1) five thousand litre (5 000 l) water tank will be installed beneath the building which will act as the reserve tank. Water pressure beneath the facility and the reserve tank will be created through the installation of a small booster pump. SANParks have confirmed that disinfection of water will be done with an ozone sterilization system. The tank to be installed as reserve will have a diameter of two point two metres (2.2 m) by one point six metres (1.6 m) in height.

1.8.2 ENERGY EFFICIENCY:

The electricity demand for both the Mapungubwe Hill Orientation Centres (Mapungubwe Hill and Dig Site) and the Schroda Orientation Centre was calculated at seven thousand six hundred kilowatt per hour (7 600 kW/h) and includes a twenty-five percent (25 %) safety factor. Electricity will be supplied through solar panels which will be installed on the roof (approximate footprint of 40 m^2) and coupled to an inverter and limited battery backup. The following electrical items were allowed for:

- Ceiling Lights;
- Light within the Ablution and Service area;
- Light display;
- Ceiling fan;
- Fridge/Vending Machine;
- Booster-pump disinfection;
- Booster-pump circulation; and,
- Electrical plug points.

Where possible energy efficient light bulbs will be used; furthermore, the buildings (Mapungubwe Overnight Facilities, Orientation Centres and the Dig Site) were designed to capture as much natural light as possible which lower the demand for lighting. It must be noted that the Overnight Facilities will tie in with the existing electricity grid of the Interpretive Centre Complex (EA Ref. No.: 12/12/20/610/21/7).

2 SECTION B: SITE/AREA/PROPERTY DESCRIPTION

2.1 PROPERTY DETAILS

2.1.1 DIG SITE AND MAPUNGUBWE HILL ORIENTATION CENTRE

Table 7: Property details of the Dig Site and Mapungubwe Hill Orientation Centre.

Province	Limpopo Province
District Municipality	Vhembe District Municipality
Local Municipality	Musina Local Municipality
Ward Number(s)	Ward No. 2
Farm name and number	Greefswald No. 37 MS
Portion Number	N/A
SG Code	T0MS0 00000 000037 00000

2.1.2 MAPUNGUBWE OVERNIGHT FACILITIES

Table 8: Property details of the Mapungubwe Overnight Facilities.

Province	Limpopo Province
District Municipality	Vhembe District Municipality
Local Municipality	Musina Local Municipality
Ward Number(s)	Ward No. 2
Farm name and number	Hamilton No. 41 MS
Portion Number	N/A
SG Code	T0MS0 00000 000041 00000

2.1.3 SCHRODA ORIENTATION CENTRE

Table 9: Property details of the Schroda Orientation Centre.

Province	Limpopo Province
District Municipality	Vhembe District Municipality
Local Municipality	Musina Local Municipality
Ward Number(s)	Ward No. 2
Farm name and number	Schroda No. 46 MS
Portion Number	8
SG Code	T0MS0 00000 000046 00008

2.2 GROUNDWATER, SOIL AND GEOLOGICAL STABILITY

The table below provides a summary of the groundwater, soil and geology stability of the study area.

Table 10: Groundwater, Soil and Geological Stability of the site.

Description	**Mapungubwe Hill Complex**		**Mapungubwe Hostels**		**Schroda Orientation**	
Shallow water table (less than 1.5m deep)		**NO X**		**NO X**		**NO X**
Dolomite, sinkhole or doline areas		**NO X**		**NO X**		**NO X**
Seasonally wet soils (often close to water bodies)	**YES X**			**NO X**		**NO X**
Unstable rocky slopes or steep slopes with loose soil		**NO X**		**NO X**		**NO X**

Description	Mapungubwe Hill Complex		Mapungubwe Hostels		Schroda Orientation	
Dispersive soils (soils that dissolve in water)		NO X		NO X		NO X
Soils with high clay content (clay fraction more than 40%)		NO X		NO X		NO X
Any other unstable soil or geological feature		NO X		NO X		NO X
An area sensitive to erosion		NO X		NO X		NO X

2.3 GROUNDCOVER AND SURFACE WATER

2.3.1 MAPUNGUBWE OVERNIGHT FACILITIES

The following groundcover is present on site:

Table 11: Groundcover of the site.

Natural veld – good condition	**Natural veld with scattered aliens X**	Natural veld with heavy alien infestation	Veld dominated by alien species	Gardens
Sport Field	Cultivated Land	**Paved Surfaces X**	**Building or other Structures X**	**Bare Soil X**

The following surface water is present on/or adjacent to the site and alternative sites.

Table 12: Types of surface water present on site.

Perennial River		**No X**	
Non-Perennial River		**No X**	
Permanent Wetland		**No X**	
Seasonal Wetland		**No X**	
Artificial Wetland		**No X**	
Estuarine/Lagoon Wetland		**No X**	

As per the sensitivity map (Please refer to Appendix A2: Sensitivity Map) and Table 12 above, no watercourses have been identified on the preferred or alternative sites.

2.3.2 MAPUNGUBWE HILL COMPLEX

The Mapungubwe Hill Complex includes the Mapungubwe Hill Orientation Centre and the Dig Site Orientation Centre. The following groundcover is present on site:

Table 13: Groundcover of the site.

Natural veld – good condition	**Natural veld with scattered aliens X**	Natural veld with heavy alien infestation	Veld dominated by alien species	Gardens

Sport Field	Cultivated Land	Paved Surfaces	Building or other Structures	**Bare Soil X**

The following surface water is present on/or adjacent to the site and alternative sites.

Table 14: Types of surface water present on site.

Perennial River		**No X**	
Non-Perennial River	**Yes X**		
Permanent Wetland		**No X**	
Seasonal Wetland	**Yes X**		
Artificial Wetland		**No X**	
Estuarine/Lagoon Wetland		**No X**	

Layout Alternative 2 of the Orientation Centre situated within thirty-two metres (32 m) of a non-perennial river.

2.3.3 SCHRODA ORIENTATION CENTRE

The following groundcover is present on site:

Table 15: Groundcover of the site.

Natural veld – good condition	**Natural veld with scattered aliens X**	Natural veld with heavy alien infestation	Veld dominated by alien species	Gardens
Sport Field	Cultivated Land	Paved Surfaces	Building or other Structures	**Bare Soil X**

The following surface water is present on/or adjacent to the site and alternative sites.

Table 16: Types of surface water present on site.

Perennial River		**No X**	
Non-Perennial River		**No X**	
Permanent Wetland		**No X**	
Seasonal Wetland		**No X**	
Artificial Wetland		**No X**	
Estuarine/Lagoon Wetland		**No X**	

As per the sensitivity map (Please refer to Appendix A2: Sensitivity Map) and Table 15 above, no watercourses have been identified on the preferred or alternative sites.

2.4 ECOLOGICAL AND BIODIVERSITY

Each area will now be discussed in detail in terms of the vegetation type, fauna and flora in the development footprint, Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS).

2.4.1 HOSTEL ACCOMMODATION

2.4.1.1 VEGETATION TYPE

The hostel accommodation facilities development footprint falls in Musina Mopane Bushveld (SVmp1; Mucina & Rutherord 2006). The feature consists of undulating to very irregular plains with hills (Mucina & Rutherord 2006). The vegetation type is Least Concern with 2% formally conserved in MPNP. Vegetation can be described as open woodland to moderately closed shrubveld dominated by *Colophospermum mopane* on clayey bottomlands and *Combretum apiculatum* on hills. In the eastern section on basalt, moderately closed to open shrubveld is dominated by *C. mopane* and *Terminalia prunioides*. On areas with deep sandy soils, moderately open savanna dominated by *C. mopane*, *T. sericea*, *Grewia flava* and *C. apiculatum*. The vegetation is generally open during the dry season and the herbaceous layer is poorly developed in areas with dense cover of *C. mopane* shrubs (Mostert, 2017).

Most of the area is underlain by the Archaean Beit Bridge Complex, except where it is covered by younger Karoo sandstones and basalts (Mucina & Rutherord 2006). The Beit Bridge Complex consists of gneisses and metasediments and is structurally complex. Variable soils from deep red/brown clays, moderately deep, dark, heavy clays to deep, freely drained sandy soils to shallower types including skeletal Glenrosa and Mispah soil forms. Soil erosion is high to moderate (Mostert, 2017).

The proposed visitor accommodation is aimed at housing school groups, teachers and visitors. This will entail sleeping facilities, bathrooms, kitchen, cafeteria and gardens with parking lots. The proposed development is close to the main entrance gate (about 300 m) with an existing access road and structures with paving and parking (Mostert, 2017).

Table 17: Plant species in the Hostel Development Footprint.

FAMILY	SPECIES	REDLIST STATUS	LIMPOPO ENVIRONMENTAL MANAGEMENT ACT (Act No 7 of 2003)
MALVACEAE	*Abutilon sp.*	Least Concern	NA
FABACEAE	*Vachellia tortilis subsp. heteracantha*	Least Concern	NA
LAMIACEAE	*Acrotome inflate*	Least Concern	NA
BRASSICACEAE	*Boscia foetida subsp. rehmanniana*	Least Concern	NA
COMBRETACEAE	*Combretum apiculatum subsp. apiculatum*	Least Concern	NA
POACEAEA	*Enneapogon cenchroides*	Least Concern	NA
POACEAEA	*Eragrostis lehmanniana var. lehmanniana*	Least Concern	NA
BIGNONIACEAE	*Rhigozum zambesiacum*	Least Concern	NA
POACEAEA	*Themeda triandra*	Least Concern	NA
FABACEAE	*Colophospermum mopane*	Least Concern	NA
ASTERACEAE	*Dicoma tomentosa*	Least Concern	NA

FAMILY	SPECIES	REDLIST STATUS	LIMPOPO ENVIRONMENTAL MANAGEMENT ACT (Act No 7 of 2003)
RUBIACEAE	*Gardenia volkensii*	Least Concern	NA
COMBRETACEAE	*Terminalia prunioides*	Least Concern	NA
OLACACEAE	*Ximenia americana var. microphylla*	Least Concern	NA

2.4.1.2 PRESENT ECOLOGICAL STATE (PES) AND ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS)

The development footprint comprised of species typical of the sandy bushveld, dominated by a mopane (*C. mopane*) overstory, interspersed by medium-tall trees such as *T. prunioides, V. tortilis subsp. heteracantha* and *B. foetida subsp. rehmanniana* and a poorly developed undercover of grasses and herbs. The development footprint is disturbed on the areas bordering the existing structures, as indicated by the presence of *E. cenchroides* and *E. lehmanniana var. lehmanniana*. No alien invasive species were observed and the majority of the development footprint is in a similar condition as the surrounding intact bushveld (Mostert, 2017).

The PES would thus be classified as B, being **Largely natural** with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged (Mostert, 2017).

The vegetation type is of least concern and EIS will be classified as D, not ecologically important and sensitive at any scale. Biodiversity is ubiquitous and not sensitive to flow and habitat modifications. The development is capitalizing on existing structures (roads, parking and buildings) which will help minimize disturbance to the environment. No species of conservation concern will be affected by the proposed development. A list of plant species occurring in the development footprint can be found in Table 17 (Mostert, 2017).

2.4.2 MAPUNGUBWE HILL

2.4.2.1 VEGETATION TYPE

Planned developments at Mapungubwe Hill consist of three (3) Visitor Orientation Centres that are situated within the Subtropical Alluvial Vegetation (Aza 7; Mucina & Rutherford, 2006). This vegetation type consists of broad river alluvia and around some river-fed pans in the subtropical regions of eastern South Africa, in particular the Lowveld, Central Bushveld and in northern KwaZulu-Natal. The area is characterized by flat alluvial riverine terraces supporting an intricate complex of macrophytic vegetation (channel of flowing rivers and river-fed pans), marginal reed belts (in sheltered oxbows and along very slow-flowing water courses) as well as extensive flooded grasslands, ephemeral herb lands and riverine thickets. Vegetation occurring in the Hill footprint is listed in Table 18 (Mostert, 2017).

The soil comprised of recent alluvial deposits with deep fine-structured sandy to loamy soils (Dundee, Estcourt, Valsrivier, Sterkspruit, Oakleaf forms), waterlogged as it is often exposed to floods, especially during the rainy summer season (Mucina & Rutherford, 2006). Salt often accumulates in the alluvial soils due to strong evaporation (Mostert, 2017).

The visitor Orientation centres are situated in the floodplain. The development footprint is relatively small and includes an orientation centre with a deck (Mostert, 2017).

During the site visit a position alternative was suggested for the Orientation centre. Alternative one (1) is ideally situated close to the existing road, enabling convenient access for tourist groups. It is; however, situated in a natural depression and drainage line. During heavy rains or floods, the structure could be at risk of damage. Another alternative, the Preferred Alternative was located on higher ground at the foot of a small rocky hill. This position will be at considerably lower risk of flood damage (Mostert, 2017).

Table 18: Plant species in the Mapungubwe Hill Visitor Orientation Centres' Development Footprint.

FAMILY	SPECIES	REDLIST STATUS	LIMPOPO ENVIRONMENTAL MANAGEMENT ACT (Act No 7 of 2003)
MALVACEAE	*Abutilon sp.*	Least Concern	NA
FABACEAE	*Vachellia tortilis subsp. heteracantha*	Least Concern	NA
BRASSICACEAE	*Boscia foetida subsp. rehmanniana*	Least Concern	NA
POACEAEA	*Enneapogon cenchroides*	Least Concern	NA
ASTERACEAE	*Dicoma tomentosa*	Least Concern	NA
MALVACEAEA	*Grewia sp.*	Least Concern	NA
MALVACEAEA	*Grewia flavescens*	Least Concern	NA
RUBIACEAE	*Gardenia volkensii*	Least Concern	NA
AMARANTHACEAE	*Hermbstaedtia odorata*	Least Concern	NA
LAMIACEAE	*Ocimum americanum L. var. americanum*	Least Concern	NA
POACEAEA	*Panicum maximum*	Least Concern	NA
COMBRETACEAE	*Terminalia prunioides*	Least Concern	NA
POACEAEA	*Urochloa mosambicensis*	Least Concern	NA
FABACEAE	*Xanthocercis zambesiaca*	Least Concern	NA

2.4.2.2 PRESENT ACOLOGICAL SITE (PES) AND ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS)

2.4.2.2.1 ORIENTATION CENTRE ALTERNATIVE 1

Alternative 1 of the Orientation Centre is situated on an open sandy area next to an existing dirt road. The PES is classified as A, being **unmodified** and natural (Mostert, 2017).

The EIS is classified as C. The site is of moderate importance and sensitivity. It is ecologically important and sensitive on a provincial/local scale. Biodiversity is not usually sensitive to flow and habitat modifications. The site has a low species diversity. It is dominated by *V. tortilis subsp. heteracantha (*Umbrella thorn), *G. volkensii* and grasses. The reason for classifying it as moderate ecological importance and sensitivity is the location in the floodplain with visible drainage network. Even though flooding of the floodplain is unlikely and infrequent, the structure will be at risk of flood damage (Mostert, 2017).

2.4.2.2.2 ORIENTATION CENTRE PREFERRED ALTERNATIVE

The Preferred Alternative for the Orientation Centre is on slightly elevated ground on the foot of a hill. It has a low species diversity. The area has an open structure of low trees and shrubs (*Grewia sp., B. foetida subsp. rehmanniana* and *T. prunioides)* some grasses and herbs characteristic of the Subtropical Alluvial Vegetation (*O. americanum L. var. americanum)* and others of bushveld (*H. odoratal).* The PES is classified as A, being **unmodified** and natural (Mostert, 2017).

The EIS is classified as D and is marginal. The area is not ecologically important and sensitive at any scale. Biodiversity is ubiquitous and not sensitive to flow and habitat modifications. No species of conservation concern occur in the footprint and due to its location on a higher elevation, the risk to infrequent flooding is significantly lower (Mostert, 2017).

2.4.2.2.3 DIG SITE BUILDING

The dig site building will be constructed over the existing archaeological dig site. The site is denuded of vegetation, it is bare and sandy with an Umbrella thorn tree with weaver nests next to the proposed development site. The PES is D. Due to the existing structure and disturbance the area is **largely modified**. The site is surrounded by intact natural ecosystems. A large loss of natural habitat, biota and basic ecosystem functions has occurred (Mostert, 2017).

There are no sensitive natural features and the EIS is classified as D and is marginal. The area is not ecologically important and sensitive at any scale. Biodiversity is ubiquitous and not sensitive to flow and habitat modifications (Mostert, 2017).

2.4.3 SCHRODA DAM

2.4.3.1 VEGETATION TYPE

The Schroda Dam Orientation centre fall in Limpopo Ridge Bushveld (SVmp 2; Mucina & Rutherford, 2006). This vegetation type is characterized by extremely irregular plains with ridges and hills. The vegetation has a similar structure to Musina Mopane Bushveld: moderately open savanna with poorly developed ground layer. Vegetation is usually dominated by tall trees *Kirkia acuminata* and *Adansonia digitata* (Baobab) on shallow calcareous gravel; shrub *Catophractes alexandri* is dominant on calc-silicate soils (Mostert, 2017).

The landscape often has prominent rock formations of the Clarens Formation (Mucina & Rutherford, 2006). The geology is mostly of the Beit Bridge Complex (Swazian Erathem) as well as sediments (including sandstones of the Clarens Formation) and basalt (particularly in the east) of the Karoo Supergroup. Shallow gravel and sand (Glenrosa and Mispah soil forms) to calcareous clayey soil (Mostert, 2017).

The vegetation type is of Least Concern with the target of 19% being already conserved in nature reserves. The visitor Orientation centre is planned to be a closed structure with viewing deck. It will be used to display information of the archaeological and historical importance of the Schroda dam area to tourist groups and act as a vantage point of the landscape (Mostert, 2017).

Table 19: Plant species in the Schroda Dam Visitor Orientation Centres' Development Footprint.

FAMILY	SPECIES	REDLIST STATUS	LIMPOPO ENVIRONMENTAL MANAGEMENT ACT (Act No 7 of 2003)
MALVACEAE	*Abutilon sp.*	Least Concern	NA
FABACEAE	*Vachellia tortilis subsp. heteracantha*	Least Concern	NA
BRASSICACEAE	*Boscia albitrunca*	Least Concern	NA
POACEAEA	*Enneapogon cenchroides*	Least Concern	NA
APIACEAE	*Heteromorpha sp.*	Least Concern	NA
MALVACEAEA	*Grewia flavescens*	Least Concern	NA

BRASSICACEAE	*Maerua parvifolia*	Least Concern	NA
FABACEAE	*Senegalia senegal var. leiorhachis*	Least Concern	NA
COMBRETACEAE	*Terminalia prunioides*	Least Concern	NA

2.4.3.2 PRESENT ECOLOGICAL STATE (PES) AND ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS)

The vegetation has a typical bushveld vegetation structure, and species characteristic of the Limpopo Ridge Bushveld. It is dominated by *V. tortilis subsp. heteracantha, B. albitrunca, T. prunioides* interspersed but a sparse ground cover of grasses such as *E. cenchroides.* The grass can indicate other disturbances in the area such as grazing by cattle (cattle observed on site). The PES is classified as A, being **unmodified** and natural (Mostert, 2017).

The EIS is classified as D and is marginal. The area is not ecologically important and sensitive at any scale. Biodiversity is ubiquitous and not sensitive to flow and habitat modifications. No species of conservation concern occur in the footprint. A list of species in the development footprint can be seen in Table 19 (Mostert, 2017).

2.4.4 RED LISTED SPECIES

No listed species of vultures, trees, spiders, butterflies, Odonata, lacewings, dung beetles, frogs, fish or scorpions are known from the QDS (2229AB; ADU, 2017).

2.4.4.1 VEGETATION

Two Rare species (SANBI Redlist, 2017) are known from the QDS. *Dicliptera gillilandiorum* and *D. cliffordii* (SANBI, 2016). The former has a restricted range size but is locally common (Victor & Von Staden, 2007a). It occurs in Limpopo River Valley, in Zimbabwe and Limpopo Province between Beit Bridge and the confluence of the Limpopo and Shashe rivers. It prefers various habitats within mopane bushveld, including rocky hillsides and clay flats (Victor & Von Staden, 2007a). The latter is known from only three sub-populations, two of which are protected within the Vhembe-Dongola National Park (Victor & Von Staden, 2007b). It prefers the sandy soils of Kalahari sand in mopane bushveld (Victor & Von Staden, 2007b). Neither of the two were spotted in the development footprints (Mostert, 2017).

2.4.4.2 REPTILES

One Vulnerable species (also protected under Limpopo Environmental Management Act, Act No. 7 of 2003) of reptile is known from the QDS (RetileMAP, 2017). The Nile Crocodile (*Crocodylus niloticus*) is unlikely to be affected by the development as the proposed developments are not in or next to permanent water bodies (Mostert, 2017).

2.4.4.3 BIRDS

Weaver nests of probably the Southern Masked Weaver (*Phloceus velatus*) or the Village Weaver *(Phloceus cucullatus*) were noted outside the development site at Mapungubwe Hill. They are species of Least Concern. No other birds or nests were observed in the development footprints (Mostert, 2017).

Listed species known to be breeding in the area are discussed below (BIRP, 2017). White-backed vultures - *Gyps africanus*- nests are typically concentrated in tall trees along watercourses (Allan, 2015). Nests are built of sticks and usually lined with grass. The egg-laying period spans April-September, mainly April-July. The key conservation measures required focus primarily on the major threats stemming from poisoning, energy-related

infrastructure, the traditional health industry, potential food shortages, drowning and negative perceptions and ignorance. No tall riparian trees will be removed during construction and the development will pose a low threat to the White-backed vultures (Mostert, 2017).

Pel's Fishing Owl (*Scotopelia peli*) is known from the QDS. The most significant threat to the species is loss of suitable habitat due to a decline in the quality and quantity of water in rivers and other waterbodies (Barnes and Parker 2000). This may be a result of water extraction and pollution, due to such activities as water provision to urban settlements, agricultural, industrial and mining activities, and the construction of impoundments within catchments. The species is particularly sensitive to clearing and disturbance of tall riparian fringes (Mendelson 1997). The species is listed under Schedule 2: Specially Protected Wild Animal under the Limpopo Environmental Management Act No 7 of 2003. The Birds of Prey Programme endeavours to create greater awareness of the impact of human activities on the habitat and population of this species and actively engages with stakeholders within the catchments of river systems that could have an impact on water quality and quantity, and riparian habitats (Botha et al., 2015). Pel's Fishing Owl is found along river systems, pans and quiet backwaters that are fringed by suitable riparian vegetation, which provides hunting perches, cover and natural cavities in trees that the birds breed in (Mendelson, 1997). Breeding in neighbouring Botswana occurs January-June with egg-laying peaking February-April (Skinner 1996), and March-April in northern South Africa (Tarboton et al. 1987). The proposed development activities pose a very small threat to the owl as very little to no clearing of riparian vegetation will be done (Mostert, 2017).

Kori bastard (*Ardeotis kori*) is a polygynous, solitary nester (Allan 1997), with the breeding season lasting from July to April. The species inhabits fairly dry, open savannahs, within the 100-600 mm rainfall zone, as well as Nama Karoo dwarf shrublands and occasionally western grasslands where clumps of trees on tree-lined watercourses provide shade and shelter (Allan 1997). The species is faced by multiple threats although habitat destruction would seem to be the highest concern (Anderson 2000). Changes in land-use and habitat quality, e.g. through establishment of agricultural fields, overgrazing or bush encroachment, may lead to diminished food supplies, causing local extinction events (Allan 1997, Anderson 2000, Young et al. 2003). The proposed development activities pose a very small threat to the species (Mostert, 2017).

Greater Painted-snipe (*Rostratula benghalensis)* is found in the QDS and the main threat faced by this species is transformation, degradation and loss of its wetland habitat due to increasing human pressures (Navarro 1997). Threats to wetlands include drainage and clearing for development and agriculture, and invasion of bulrushes *Typha capensis* due to regulation of stream flow reducing the extent of flooding and drying cycles (Hockey and Tree 2005). Direct water abstraction and damming may also lead to reed overgrowth and salinisation. Greater Painted-snipe are limited to freshwater wetlands, where they prefer secluded muddy areas adjacent to concealing vegetation (Urban et al. 1986). The species occurs sparsely along the shorelines of dams, lakes and pans, on the banks of slow-flowing rivers, on marshy floodplains, in temporarily flooded grassland, at rainwater pools on clay soils with plentiful adjacent cover, and in other similar locations. Birds often congregate where the water is receding, but vacate such habitats when the water level falls beyond the fringes of vegetation (Hockey and Tree 2005). Reported occurrence in savannah and other terrestrial vegetation types is conditional on the presence of suitable, usually ephemeral, wetlands (Navarro 1997). Due to its nomadic and partly

migratory lifestyle, wanderers are occasionally encountered at small, isolated waterbodies in arid regions. The proposed sites are unlikely to pose a suitable habitat (Mostert, 2017).

The Tawny Eagle (*Aquila rapax*) is one of the most threatened eagles in South Africa (Barnes 2000), with a high sensitivity to land transformation making it largely dependent on conservation areas to survive (Herremans & Herremans-Tonnoeyr, 2000). Tawny Eagles are found in lightly wooded savannah and thornveld, as well as semi-desert (Simmons 1997), but avoid dense forest and highlands. Breeding occurs in winter (Hustler and Howells 1989). (Taylor, 2015). No trees should be removed if they contain bird nest or have bird activity. A suitably qualified Avifaunal Specialist should be consulted in these cases (Mostert, 2017).

The primary threat to the Lanner Falcon (*Falco biamicus*) is the loss or transformation of habitat within the Grassland Biome, through urbanisation, agriculture and afforestation, with corresponding reductions in preferred prey and foraging opportunities (Barnes and Jenkins 2000). Lanner Falcons favour open grassland, cleared woodlands and agricultural areas. Breeding pairs tend to favour cliffs as nesting and roosting sites; however, they will use alternative structures such as trees, pylons and buildings. The dominant prey group is birds, followed by small mammals, reptiles and insects (Jenkins and Avery 1999). The proposed development will not impact breeding sites and due to the small size of the development footprint will unlikely have a significant impact on foraging grounds (Mostert, 2017).

2.4.4.4 MAMMALS

There were droppings and animal tracts in the development footprints but the impact on mammals are unlikely to be significant in terms of breeding and feeding ground. The development footprints are most likely used for passing through and feeding for herbivores. The development footprint is small relative to the size of the park and suitable habitat is available to mammals outside of the development footprints. One of the Redlisted bats, Rusty Pipistrelle (*Pipistrellus rusticusl)* is the only species that could possible occur in the development footprint (MammalMap, 2017). The small bats have been recorded from savanna woodland, and both dry and moist savanna habitats. Animals have been reported roosting in tree crevices, under bark and in old buildings (Skinner and Chimimba 2005). The species is only locally threatened according to Friedman and Dalys (2004) and is not listed in terms of the IUCN Red listed species and are unlikely to be impacted by the proposed developments (Monadjem *et al.*, 2017; Friedman & Daly, 2004) Pictures of the Rusty Pipistrelle should be available on site. It is strongly recommended that any trees that are removed should be inspected prior to removal (by an ECO or SANPARKS ranger) for presence of the bats. No bats should be harmed during construction. If any bats are seen in the development footprint the ECO/Environmental Officer or SANPRKS ranger should be contacted (Mostert, 2017).

2.5 CULTURAL AND HISTORICAL FEUTURES

2.5.1 THE MAPUNGUBWE CULTURAL LANDSCAPE

The Mapungubwe Cultural Landscape demonstrates the rise and fall of the first (1st) indigenous kingdom in Southern Africa between nine hundred (900) and one thousand three hundred (1 300) AD. The core area covers nearly thirty thousand hectares (30 000 ha) and is supported by a suggested buffer zone around one hundred thousand hectares (100 000 ha). Within the collectively known Zhizo sites are the remains of three capitals –

Schroda; Leopard's Kopje; and the final one located around Mapungubwe Hill – and their satellite settlements and lands around the confluence of the Limpopo and the Shashe rivers whose fertility supported a large population within the kingdom (Gaigher, 2020).

Mapungubwe's position at the crossing of the north/south and east/west routes in southern Africa enabled it to control trade, through the East African ports to India and China, and throughout southern Africa. From its hinterland it harvested gold and ivory – commodities in scarce supply elsewhere – and this brought it great wealth as displayed through imports such as Chinese porcelain and Persian glass beads. This international trade created a society that was closely linked to ideological adjustments, and changes in architecture and settlement planning. Until its demise at the end of the thirteenth (13th) century AD, Mapungubwe was the most important inland settlement in the African subcontinent and the cultural landscape contains a wealth of information in archaeological sites that records its development. The evidence reveals how trade increased and development in a pattern influenced by an elite class with a sacred leadership where the king was secluded from the commoners located in the surrounding settlements (Gaigher, 2020).

Mapungubwe's demise was brought about by climatic change. During its final two (2) millennia, periods of warmer and wetter conditions suitable for agriculture in the Limpopo/Shashe valley were interspersed with cooler and drier pulses. When rainfall decreased after one thousand three hundred (1 300) AD, the land could no longer sustain a high population using traditional farming methods, and the inhabitants were obliged to disperse. Mapungubwe's position as a power base shifted north to Great Zimbabwe and, later, Khami (Gaigher, 2020).

After the discovery of Mapungubwe in 1932, the University of Pretoria established an Archaeological Committee, which from 1933 to 1947 oversaw research and excavations. Rev. Neville Jones from Zimbabwe and J.F. Schofield were appointed to undertake the first (1st) fieldwork in 1934 and 1935 and they were advised by Professor C. van Riet Lowe, Director of the Bureau of Archaeology. Their work focused on Mapungubwe Hill, the southern terrace and the midden there. They briefly surveyed other similar sites in the vicinity. From 1935-1940 six excavation seasons at K2 and Mapungubwe Hill were directed by Guy A. Gardner. The results of his work were published nearly twenty-five (25) years later. Meyer (1998) describes the excavations on Greefswald between 1933 and 1940 as rapid, large-scale excavations resulting in the recovery of valuable artefacts (Figure 18). Research was hampered by the lack of professional archaeologists in South Africa, the lack of full-time supervision of the excavations by efficient, trained staff, the fact that adequate scientific methods for Iron Age research had not yet been developed and that the Iron Age in South Africa was virtually unknown to Archaeologists. Consequently, many of the deposits on the sites were removed without the meticulous excavation and recording required. These problems inevitably resulted in a loss of irreplaceable deposits and eventually also of excavated materials and a lack of scientific data (Gaigher, 2020).

Figure 18: A plated golden rhino, one of many gold objects excavated from Mapungubwe Hill (Source: Gaigher, 2020).

The next phase of archaeological investigation, in 1953-1954 and in 1968-1970, under the direction initially of the Department of Anthropology, and then a Professor J.F. Eloff who was appointed as Head of the newly-formed Department of Archaeology at the University of Pretoria in 1970 to 1995, the Department of Archaeology at the University of Pretoria recognised that their first (1st) priority was to establish a firm database by testing, correcting and supplementing the earlier research, and concentrating on reconstructing the way of life of the site inhabitants. Between 1979 and 2002 reports have been published on the human and faunal remains, Chinese porcelain, gold objects, class beads and radiocarbon dating. In addition, sites on neighbouring farms have been investigated by students of the University of Pretoria during the 1970s and 1980s (Gaigher, 2020).

Greefswald has remained the property of the State since the 1930s. Management of the farm was taken over by the provincial Department of Nature Conservation in 1992, and control was transferred to SANParks in 1999. Since the 1990s, WITS archaeologists have worked in the Mapungubwe Landscape investigating Stone Age, Rock Art and Iron Age Sites (Figure 19). They concentrated on the last two thousand (2 000) years. The systematic survey of the National Park and buffer zone, including Little Muck, Schroda and Venetia, has now recorded some one thousand (1 000) Iron Age Sites. Using this data, various graduate students have investigated ethnic stratification, glass beads and international trade, the ethno-archaeology and archaeology of rainmaking, the relationship of settlements to the landscape, faunal remains, agricultural production and spherulites in cattle dung. Current research includes settlements during the Khami Period and herding strategies (Gaigher, 2020).

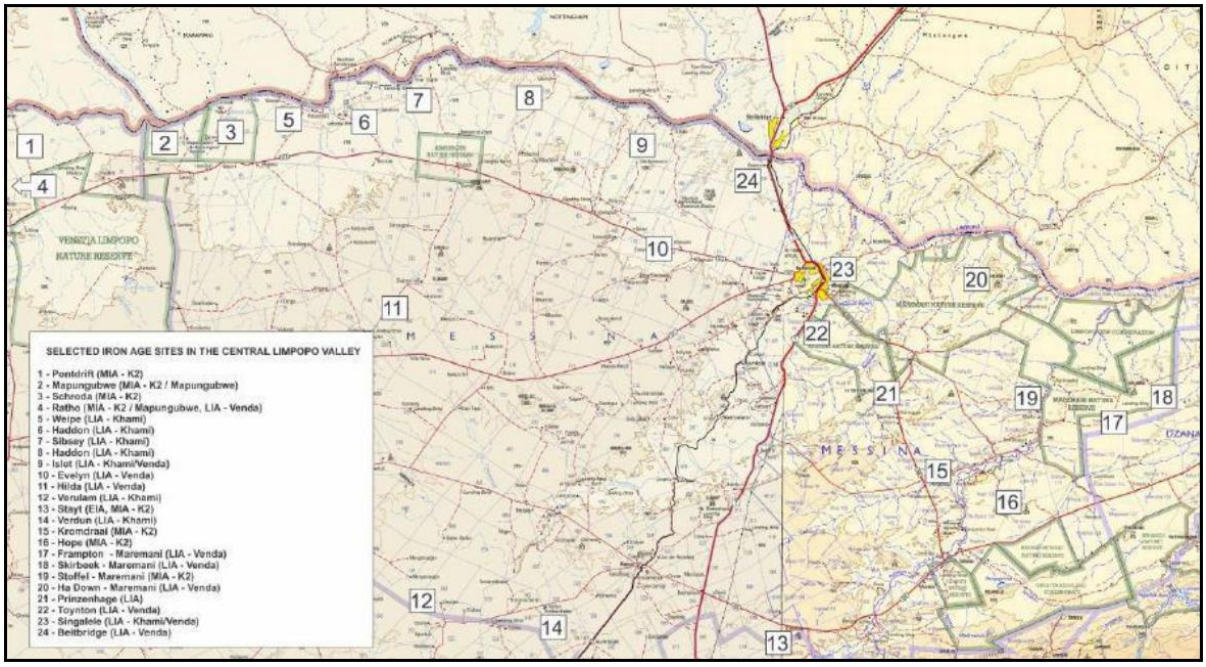

Figure 19: Map detailing the occurrence of Iron Age sites in the Limpopo Basin (Source: Gaigher, 2020).

2.5.2 FIELDWORK FINDINGS

Fieldwork performed during January 2020 provided the following information. Each proposed development will be discussed separately.

2.5.2.1 STUDENT DORMITORIES

2.5.2.1.1 ARCHAEOLOGICAL FINDINGS

The proposed Student Dormitories are located on the Hamilton section of Mapungubwe National Park. The proposed site is to the east and north of the existing agricultural shed. A wide buffer zone of around two hundred metres (200 m) was investigated since previous archaeological deposits have been noted close to this location. The area produced some out of context isolated potsherds as well as some LSA stone tools (Figure 20 – 23). This seems to indicate that a deposit area is most likely located close enough to this site to facilitate the deposit of out of context artefacts through earth relocation activities such as wind and erosion (Gaigher, 2020).

The origin of these artefacts could be deeper lying sub surface deposits. For this reason, it is important that any alteration activities do not expand outside of the indicated footprint. It is also important that any excavations be monitored. Some historic ash deposits with more recent farming related artefacts were noted. These are not thought to be of historic importance and will most likely relate to the adjacent Hamilton Farm Structures (Gaigher, 2020).

No deposits, sites or features of heritage significance could be identified; however, there were indicators of such deposits being present nearby or sub-surface. Although all due care was taken to determine if the local alluvial deposits might be obscuring lower lying sub-surface deposits (trowel tests) there is still a possibility (due to the overall rich heritage of the area and the identification of out of context artefacts) that these might still be encountered during earthmoving activities. It is therefore recommended that a suitably qualified Heritage Practitioner monitors any such activity (Gaigher, 2020).

Figure 20: LSA Stone Tools noted on site (Gaigher, 2020).

Figure 21: Banded Ironstone LSA tool in situ (Gaigher, 2020).

Figure 22: Non-diagnostic Potsherds in situ (Gaigher, 2020).

Figure 23: Dispersed recent ash deposits (Gaigher, 2020).

2.5.2.1.2 PALAEONTOLOGICAL FINDINGS

The project for the Mapungubwe Youth Centre Dormitories is situated on land parcel Hamilton No. 41MS in flat Mopaneveld, some one hundred and eighty metres (180 m) north of the R572 tar road to Musina. The terrain is already highly disturbed from previous building activities (Figure 24). It is blanketed by orange-brown sandy soils with dispersed calcrete gravels. A well-developed calcrete hardpan is visible locally at surface along the northern periphery of the project area, which lies along the border of the Clarens Formation and Elliot Formation outcrop areas (Figure 25). No bedrock exposures are visible there (Almond, 2020).

No fossil remains were recorded in the project area during the short site visit. The Late Caenozoic superficial sediments here are of low palaeontological sensitivity (Almond, 2020).

Figure 24: Highly-disturbed sandy terrain with dispersed calcrete gravels and building rubble on the margins of the Mapungubwe Dormitories project area (Almond, 2020).

Figure 25: Patchy exposure of a well-developed calcrete hardpan on the north-eastern margins of the Mapungubwe Dormitories project area (Almond, 2020).

Figure 26: Location of the project area for the Dormitories (1) situated in highly-disturbed terrain either side of the R572 Musina tar road and just east of the Mapungubwe National Park Interpretive Centre (IC) (Almond, 2020).

2.5.2.2 MAPUNGUBWE ORIENTATION CENTRES

2.5.2.2.1 ARCHAEOLOGICAL FINDINGS

The area proposed for the development of the Mapungubwe Orientation Centre and K8 Orientation Centre Complex lies within one of the most sensitive archaeological deposit areas within the Mapungubwe Park. All the proposed footprints are located on sensitive deposits, and it is imperative that these be managed and preserved. The impact should; however, be seen against the socio-economic and educational benefits that it will have as well as the resultant educational awareness. The structures have been designed to have a minimal footprint impact and in the case of the K8 orientation centre could in fact contribute to the enhanced preservation of the site through erosion control. The sites contained mainly Middle Iron Age (K2, Mapungubwe) deposits as well as deposits associated with the later Bambandanyalo Phase and some LSA stone tools (Figures 27 – 34) (Gaigher, 2020).

Figure 27: Pottery with hatched Mapungubwe type decoration (Gaigher, 2020).

Figure 28: One proposed location for the Mapungubwe Orientation Centre (Gaigher, 2020).

Figure 29: Non-diagnostic pottery with burnishing (Gaigher, 2020).

Figure 30: Typical Mapungubwe type decorated sherd with triangular design and cross-hatching (Gaigher, 2020).

Figure 31: Pottery with shoulder and earlier K2 decoration (Gaigher, 2020).

Figure 32: Combination of LSA flakes and non-diagnostic pottery (Gaigher, 2020).

Figure 33: LSA Stone Tool.

Figure 34: Achatina achatina (Land Snail) shell fragments (Gaigher, 2020).

2.5.2.2.2 PALAEONTOLOGICAL FINDINGS

The study area for the proposed Mapungubwe Valley Orientation Centre is situated between two (2) south bank tributary streams of the Limpopo River, some seven hundred and fifty metres (750 m) due south of Mapungubwe

Hill, on the east-central sector of the Farm Greedswald No. 37 (Figures 35 & 36). The site is surrounded on most sides by a scatter of small *koppies* of Clarens sandstone, some with a capping of dark Letaba basalt or transected by blocky-weathering dolerite dykes (Figures 45). A relict, west-east trending sandstone ridge surrounded by an apron of downwasted sandstone blocks lies on the southern edge of the area (Figure 37). Beneath the blocky scree and extending across the study area to the north lie bedrocks of the Elliot Formation ("Red Rocks Member") (Figures 37 & 38). The better exposed bedrocks in the vicinity of the shallow stream just to the west of the study area form low relief convex, lichen-patinated outcrops comprise locally well-jointed, pinkish to orange-hued, massive fluvial sandstones. They are fine- to medium-grained, blocky to platy- weathering and often contain dispersed small, angular maroon mud chips. Good exposures of Elliot Formation mud rocks are not present in the area (Almond, 2020).

The Elliot bedrocks here are largely obscured by a northward-thinning prism of sandy to finely-gravelly soils (locally admixed with archaeological material such as potsherds and cherty stone artefacts, especially in the south), and orange-brown, sandy to gravelly stream alluvium which reaches around two to three metre (2 – 3 m) in thickness (Figures 39, 40 & 44). The angular gravel clasts are mainly composed of pinkish Elliot sandstone, pale grey metaquartzite (baked sandstone from dolerite contact aureoles), blackish fine-grained Letaba basalt, dark dolerite with striking blade-shaped feldspar phenocrysts, occasional cherty concretions, milky vein quartz as well as an abundance of angular, creamy to pale pinkish cherty material (Figures 41 to 43). The cherty material may be of pedogenic origin and has probably down wasted from the upper part of the Elliot Formation where it typically occurs close to the Elliot / Clarens contact. No fossil remains were recorded in the Mapungubwe Valley Orientation Centre study area during the site visit. High-sensitivity Elliot Formation mud rock facies is not represented here, while the Elliot sandstone bedrocks and gravelly to sandy superficial cover sediments of mixed colluvial to alluvial origin are of much lower sensitivity (Almond, 2020).

Figure 35: Mapungubwe Valley Orientation Centre study area between two (2) stream courses on the Farm Greefswald No. 37 (Orange polygon). Jd = dolerite dyke & Lt = Letaba Formation basalts (Almond, 2020).

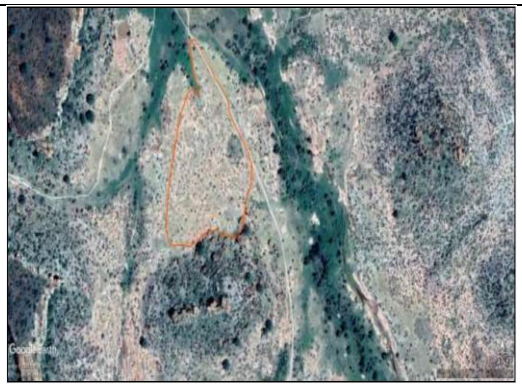

Figure 36: Mapungubwe Valley Orientation Centre study area shown in the previous figure (orange polygon). Good bedrock exposures of Elliot Formation mud rocks are not seen here, while channel sandstones are exposed along the stream to the west (Almond, 2020).

Figure 37: South-eastwards view across the Mapungubwe Valley Orientation Centre study area towards the west-east ridge of Clarens sandstone to the south. The undulating Elliot Sandstone Bedrock surfaces in the foreground lie outside and west of the area itself (Almond, 2020).

Figure 38: Southwards view across the study area with scabby-weathering Elliot Formation sandstones and overlying down wasted surface gravels in the foreground (Almond, 2020).

Figure 39: Thick banks of gravelly alluvial and colluvial superficial deposits in the southern sector of the study area, close to the sandstone *koppie* (Almond, 2020).

Figure 40: Huge downwasted scree blocks of Clarens sandstone bounding the study area on the southern side with an apron of gravelly colluvial and alluvial deposists in the foreground (Almond, 2020).

Figure 41: Angular clasts of pinkish to creamy-hued cherty material along surface gravels. The "cherts" may be derived from a silcrete-rich zone within the uppermost Elliot Formation redbeds (Almond, 2020).

Figure 42: Downwasted block of porphyritic Karoo dolerite showing large, pale, often blade-like phenocrysts of plagioclase feldspar in a dark brown matrix (Almond, 2020).

Figure 43: Brownish siliceous concretion (possibly septarian) of probable pedogenic origin downwasted from the Elliot Formation (Almond, 2020).

Figure 44: Sparsely gravelly, sandy alluvium mantling the southern sector of the study area, viewed towards the south (Almond, 2020).

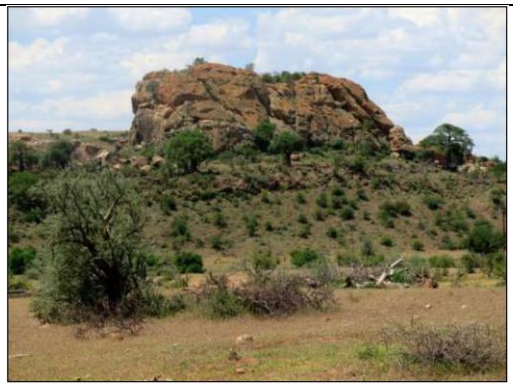

Figure 45: Small isolated, steep-sided *koppie or butte* of Clarens sandstone some 400 m northeast of the study area flanked on the near side by a darker, west-east orientation dolerite dyke (Almond, 2020).

2.5.2.3 SCHRODA ORIENTATION CENTRES

2.5.2.3.1 ARCHAEOLOGICAL FINDINGS

The proposed Schroda Orientation Centre will be located on top of the undisturbed Schroda Archaeological Site deposits. Even though the area is on the eastern section of the site it has a thinner layer of deposits than other areas on the Schroda site, it is still virgin deposit and of great heritage significance. Extensive research has been done on this site and it would be redundant to repeat the available information here. Finds consisted of

undisturbed ash deposits with in-situ potsherds and stone features as well as some LSA microliths and flakes (Figures 46 – 49) (Gaigher, 2020).

Figure 46: LSA Microliths and Flakes (Gaiger, 2020).

Figure 47: In-situ Pottery and LSA Flakes (Gaigher, 2020).

Figure 48: Ash Deposits (Gaigher, 2020).

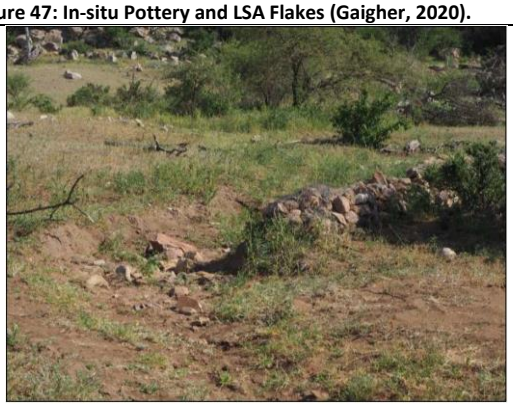

Figure 49: Secondary erosion as a result of the original 2004 anti-erosion measures (Gaigher, 2020).

2.5.2.3.2 PALAEONTOLOGICAL FINDINGS

The proposed Schroda Orientation Centre study area is situated on the Farm Schroda No. 46MS some five hundred metres (500 m) northeast of the Schroda Dam (Figure 59 & 60). It occupies a gently north-sloping sandy area (*c*. 565-545 m amsl.), which is backed in the south by a prominent west-northwest to east-southeast (WNW-ESE) sandstone ridge reaching up to six hundred and three metres (603 m) high (Figures 50 to 52). Pronounced west-northwest to east-southeast (WNW-ESE) lineaments seen on satellite imagery of the region may be normal faults, possibly associated with dolerite dykes, which are shown here on the geological map but not exposed at surface within the project area itself. The Clarens sandstone ridge on the southern edge of the study area has a massive appearance for the most part, although some sandstone units show relict large-scale aeolian cross-bedding (Figure 54). Colluvial fans of large sandstone blocks generated by rock falls occur at intervals. Close to the sandstone cliffs the greyish-brown, sandy to gravelly superficial deposits are deeper and contain local concentrations of archaeological material (Figure 53) (Almond, 2020).

Most of the gently-sloping plateau area to the north is mantled by shallow, orange-brown sandy sediment and superficial gravels that increase in density towards the south. They are composed of clasts of aeolian sandstone, chert-like material (possibly stemming from diagenetic siliceous nodules) and occasional blocks of grey quartzite; these last mentioned may be derived from thermally metamorphosed Clarens sandstone within the metamorphic aureoles of dolerite intrusions. Shallow stream gravels are also encountered on the western edge of the study area (Figure 54). On the northern margins of the sandy plateau rugged bedrocks of Clarens sandstone build a highly dissected, low rocky scarp facing the Limpopo River. The Clarens sandstone here show

local preservation of aeolian cross-sets (southerly palaeocurrents) as well as several karstic weathering features such as case-hardening, surface spalling, surface pitting or honeycomb weathering, polygonal cracking / tessellation and small, steep-sided rock basins or *gnammas* (*cf* Grab et al. 2011) (Figures 55 to 58). Another interesting weathering feature seen here is shallow etching of sandstone surfaces by lichen acids (*ibid*.) (Figure 64). A prominent set of finely- spaced, north-northwest to south-southeast (NNW-SSE) lineation's visible on satellite images of Clarens outcrops in this region might reflect north-easterly migration of large-scale aeolian cross-sets (Almond, 2020).

Figure 50: General view of the Schroda Orientation Centre study area on Farm Schroda No. 46MS, viewed towards the southwest. Note gravelly soils in the foreground (Almond, 2020).

Figure 51: West-east trending ridge of Clarens sandstone on the southern edge of the study area, showing large scale aeolian fore sets along the ridge crest and a major rock fall scree breccia on the right (Almond, 2020).

Figure 52: View northwards across the low-relief, gently sloping study area towards the Limpopo Valley in the distance (Almond, 2020).

Figure 53: Brownish-grey superficial sediments rich in archaeological materials on the northern edge of the study area (Almond, 2020).

Figure 54: Gravelly deposits of mixed alluvial and colluvial origin on the south-western margins of the study area (Almond, 2020).

Figure 55: Weathered Clarens sandstone bedrock exposure and down wasted sandstone surface gravels on the northern margins of the study area (Almond, 2020).

Figure 56: Steep-sided rock basin or gnamma etched by solution weathering into the Clarens sandstone bedrocks on the north-eastern margins of the study area (Almond, 2020)

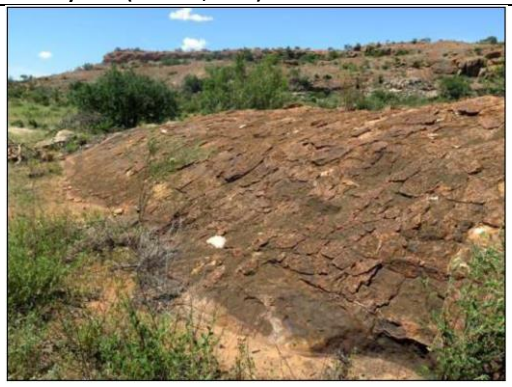

Figure 57: Typical karstic polygonal or "crocodile" weathering on Clarens bedrocks, northern margins of the study area (Almond, 2020).

Figure 58: Large-scale aeolian cross-bedding generated by S-direct wind currents, Clarens sandstone on northern margins of study area (Almond, 2020).

Figure 59: Northern portion of the Farm Schroda No. 46MS showing the study area (orange polygon) for the proposed Schroda Orientation Centre some 500 m northeast of the Schroda Dam. Note the prominent WNW-ESE lineaments in this area (Almond, 2020).

Figure 60: Schroda Orientation Centre showing the locations of the two (2) putative fossil sites within Clarens sandstone bedrock exposure just to the north. Neither site should be directly affected by the proposed development (Almond, 2020).

No fossil remains were recorded within the low-relief, sandy study area for the Schroda Orientation Centre during the short site visit. The Late Caenozoic superficial sediments here are of low palaeontological sensitivity. Two possible fossil sites were noted in the massive to cross-bedded lower Clarens sandstone bedrock exposures just to the north of the study area:

- A concentration or assemblage of straight to gently-curved, simple or possibly branching furrows and subcylindrical hollows up to three centimetres (3 cm) wide with smooth to irregular walls (Figures 64 & 65) (Loc. 455). The hollow structures occur variously on a likely bedding surface or extend obliquely into the bedrock, in some cases with a subparallel orientation. Associated sandstone surfaces locally develop a curious pitted texture picked out in grey. The identity of these probable fossil remains is unclear and requires further investigation; they might be casts of substantial woody plant axes (stems / roots), invertebrate burrows or even a semi-articulated vertebrate skeleton (Almond, 2020).

A prominent-weathering structure some sixty centimetres (60 cm) long embedded within massive sandstone, club- shaped and branching at one end and tapering towards the other (Figures 64 & 65) (Loc. 456). Smaller surface protrusions in the sandstone to one side may or may not be significant. This structure might be of biological rather than concretionary origin but, if so, its identity remains equivocal - perhaps the cast of a plant root or even a vertebrate bone. However, it is noted that vertebrate fossils recorded from the Clarens sandstone are normally preserved as hollow moulds, not casts (Almond, 2020).

These two (2) enigmatic fossil (or, in one case, possibly pseudofossil) sites lie well outside the study area for the proposed Schroda Orientation Centre and should therefore not be directly impacted by the proposed development (See red and yellow triangles in satellite image Figure 60) (Almond, 2020).

Figure 61: Overlapping or branching hollow structures of biological origin within a cross-bedded exposure of aeolian Clarens sandstone just north of the Schroda Orientation Centre study area. The identity of these fossils is equivocal (Almond, 2020).

Figure 62: Different, oblique view of the same fossil occurrence (Almond, 2020).

Figure 63: More inclined view of the same fossil occurrence (Almond, 2020).

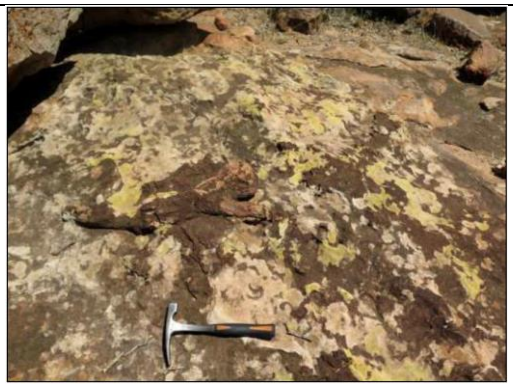

Figure 64: Prominent-weathering, branched structure within Clarens sandstone bedrock exposure just north of the Schroda Orientation Centre study area (Almond, 2020).

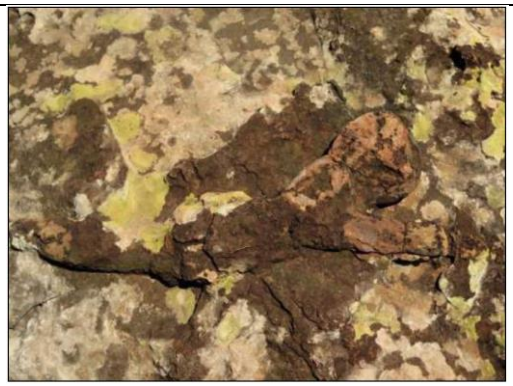

Figure 65: Close-up of the c. 60 cm-long possible fossil structure shown in the previous figure (Almond, 2020).

2.5.3 VISUAL IMPACT ASSESSMENT

The determination of the potential visual impacts is undertaken in terms of nature, extent, duration, magnitude, probability and significance of the construction and operation phases of the proposed project. The study area for the visual assessment encompasses a geographical area of 130 km^2 (extent of the maps) and includes a ten kilometre (10 km) buffer zone from the proposed Orientation centres and overnight facilities. The study area

constitutes of local tourist attractions, the Limpopo River which serves as the border between South Africa and Zimbabwe, staff quarters, lodges and provincial roads. The proposed development will be situated towards the northwest of Mucina (Du Plessis, 2020).

Anticipated issues related to the potential visual impact of the proposed Mapungubwe Upgrades include the following:

- The visibility of the developments to, and potential visual impact on, observers travelling along the Internal Park Roads and the R572;
- The visibility of the facility to, and potential visual impacts on tourists visiting attractions within and near MPNP (Schroda Dam, Mapungubwe Look-out Points, Mapungubwe Museum Complex, Mopane Bush Lodge, Mapesu Private Game Reserve, Mubuyu Safaris Guest Lodge and numerous 4 x 4 trails within the area);
- The visibility of the facilities to, and potential visual impact on observers residing within close proximity of MPNP;
- The visual absorption capacity of natural or planted vegetation as well as man-made topographical features;
- Potential visual impacts associated with the construction- and operational phase; and,
- The potential to mitigate visual impacts (Du Plessis, 2020).

The combined result of the viewshed analysis for the proposed upgrade of the Mapungubwe Orientation Centres and Overnight Facilities are displayed on the map below (Figure 66). The visibility analysis was undertaken at the height of the buildings measuring in at five metres (5 m), in order to simulate the view from the buildings and to indicate prominence of the structures within the landscape. Furthermore; Figure 66 indicates proximity radii from the proposed upgrades as a reference to determine the Visual Absorption Capacity. It must be noted that the Digital Terrain Model (DTM) utilised from the viewshed analysis does not include the effect of vegetation cover and built structures. These features may influence the visual exposure to some degree (Du Plessis, 2020).

2.5.3.1 0-1km (short distance)

As per Figure 66 the overnight facilities will have a moderate visual impact within the short distance zone as it will be situated within close proximity to the R572 (177 m); however, it must be noted that the visual impact will be temporary as motorists will only pass through the area. Although the VAC can be described as moderate the visual impact will be permanent to the staff members residing towards the south and southeast of the proposed development resulting in a moderate visual impact. It is anticipated that the Mapungubwe Hill Complex will have a low visual impact beyond three hundred metres (300 m) of the proposed upgrades due to the high visual absorption capacity as a result of the high vegetation cover and the undulating topography of the study area. As for the Schroda Orientation Centre the visual impact is considered to be high within the short distance zone towards the northwest, north and northeast. The visual impact is lowered to some degree due to the undulating topography of the study area coupled with the moderate vegetation cover (Du Plessis, 2020).

2.5.3.2 1-2km (short to medium distance)

Starting with the overnight facilities the proposed development will be visible from the southeast and east; however, the visual impact will be low to none, due to the distance between the observer and the development; furthermore, the visual impact will be restricted by the dense vegetation cover predominantly consisting of shrubland and trees. As mentioned before the Mapungubwe Hill Complex will have no visual impact beyond three hundred metres (300 m) due to the high visual absorption capacity of the study area. The highest visual impact within the short to medium distance will be experienced from the Schroda Orientation Centre. It must be noted that the visual impact will be low due to the moderate vegetation cover of the study area. It must further be noted that limited observers are present within the area as it predominantly consists of natural areas (Du Plessis, 2020).

2.5.3.3 2-5km (medium to long distance)

Visibility beyond two kilometres (2 km) from the proposed developments is expected to be negligible and low due to the distance between the object and the observer. As per the viewshed analysis the proposed development will be visible within the medium to long distance zone from certain elevated vantage points situated towards the south and southeast of the Mapungubwe Hill Complex. Due to the aforementioned coupled with the high VAC of the study area and the limited observers within these mountainous terrains the visual impact is considered to be very low (Du Plessis, 2020).

2.5.3.4 Conclusion

The visual impact for the Overnight Facilities will be moderate within the short distance zone. The developments planned at Mapungubwe Hill will have a low impact as it will only be visible over a distance of three hundred metres (300 m) due to the high vegetation cover and undulating topography of the study area. The highest visual exposure will occur from Schroda orientation Centre; however, the areas of high viewer incidence primarily consist of natural vegetation with limited observers within this area. The aforementioned will result in a low visual impact over a two-kilometre (2 km) radius. As the proposed upgrades will result in a higher visitors experience and draw more visitors to the park the upgrades will result in a positive visual impact if all mitigation measures are implemented (Du Plessis, 2020).

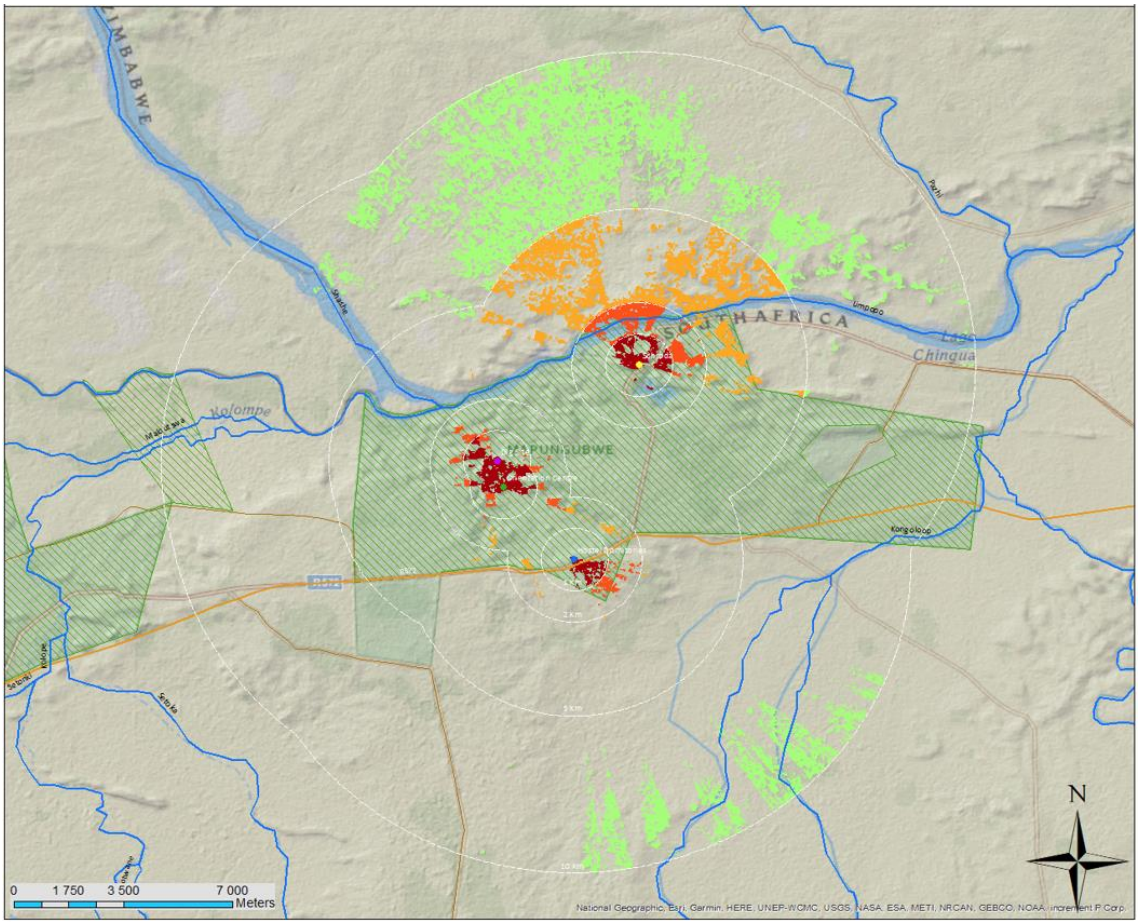

Figure 66: Viewshed Analysis of the Proposed Mapungubwe Upgrades.

2.6 SOCIO-ECONOMIC CHARACTER OF THE AREA

Musina, in the Limpopo Valley, is the northernmost town in South Africa. Situated close to the Beit Bridge border post between South Africa and Zimbabwe, it is the main entry point into the country from countries north of South Africa. The town developed around the copper mining industry in the area. Copper was first (1st) discovered in pre-historic times by the Musina people who named it "musina", meaning "spoiler", as they considered it a poor substitute for iron, which is what they were after (Stats SA, 2011).

The mineral was later rediscovered and mined by twentieth (20th) century miners. Today iron, coal, magnetite, graphite, asbestos, diamonds and copper are mined here. With fascinating attractions and many game farms in the area, tourism and hunting play an important role in the economy of the town. The recently declared World Heritage site of Mapungubwe is one of the richest archaeological sites in the country. Botanical highlights of the region include fine specimens of baobab trees and impala lilies which are both protected species. Agricultural products include citrus, mangoes, tomatoes and dates (Stats SA, 2011).

The socio-economic character of the Musina Local Municipality is summarised below:

1. **Employment Figures:**

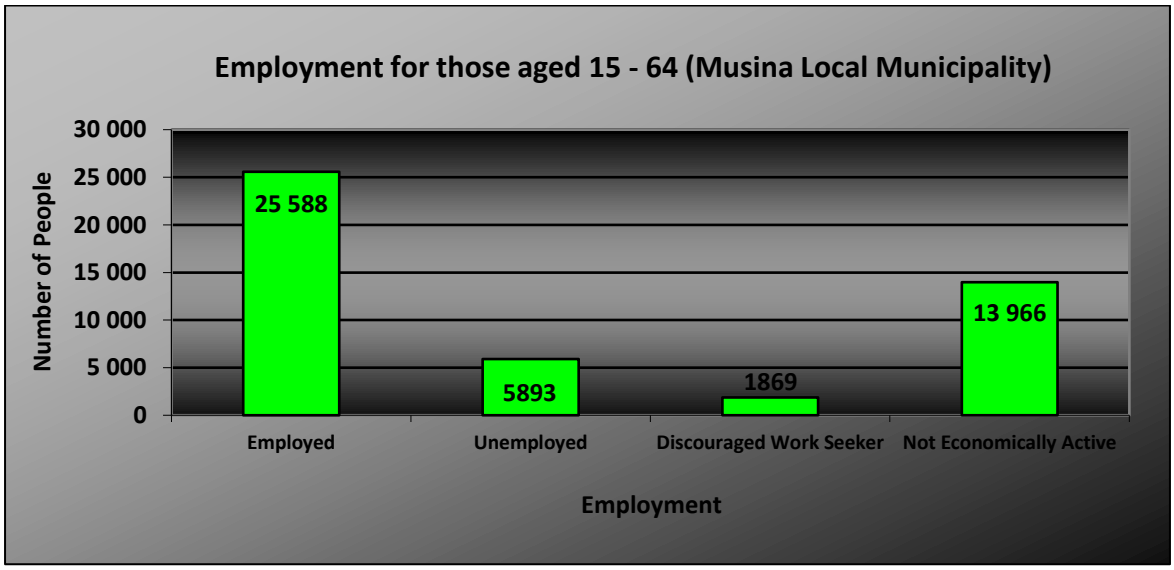

Figure 67: Employment figures for the Musina Local Municipality (Stats SA, 2011).

2. **Economic Profile of Musina Local Municipality:**

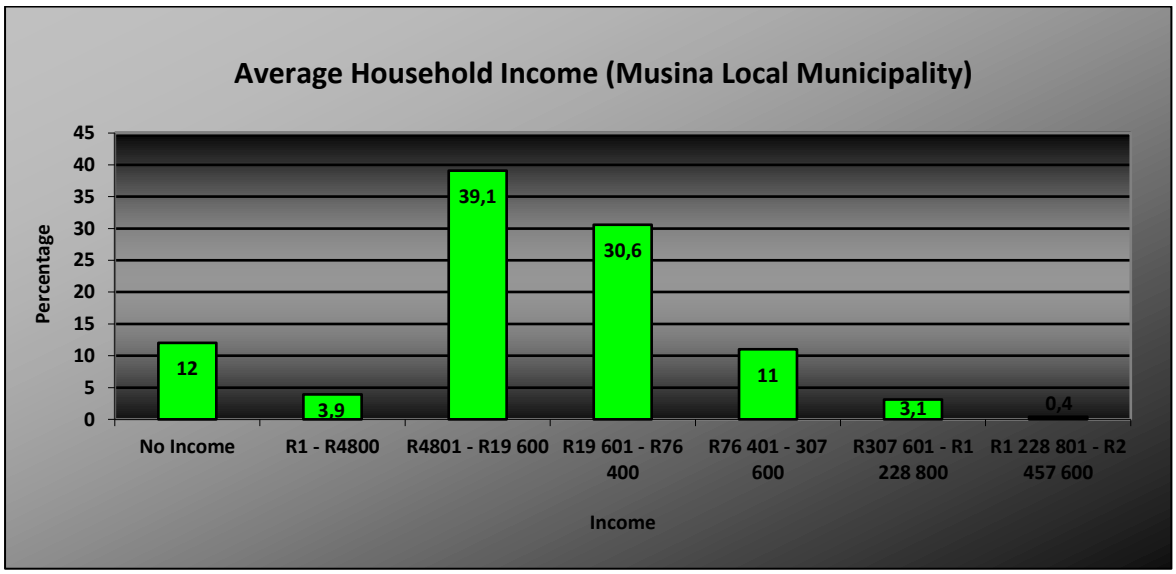

Figure 68: Income figures for the Musina Local Municipality (Stats SA, 2011).

3. **Level of Education within the Musina Local Municipality:**

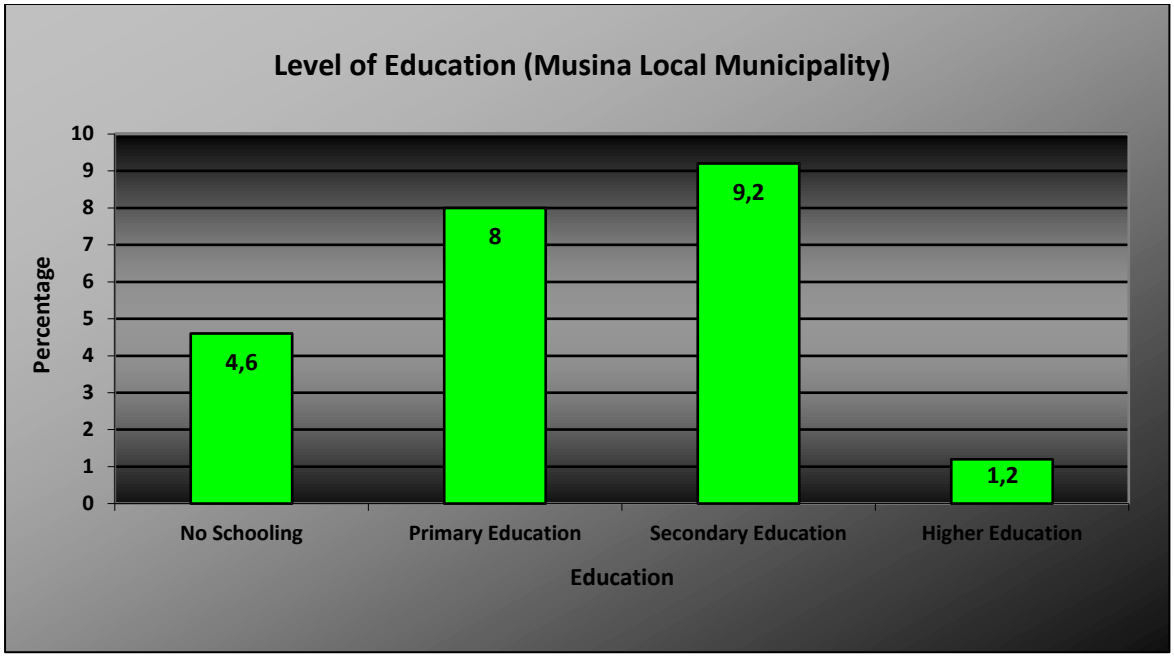

Figure 69: Education figures for the Musina Local Municipality (Stats SA, 2011).

2.6.1 ECONOMIC PROFILE OF THE PROPOSED DEVELOPMENTS

It is foreseen that the construction phase will create employment for one hundred and eighty-two (182) individuals for a duration of three hundred and twenty-five (325) days. The total value of these employment opportunities is estimated at seven million six hundred and fifty-six thousand seven hundred and twenty-eight rands and eighty-six cents (R7 656 728.86). Of the one hundred and eighty-two (182) employment opportunities, one hundred and twenty-seven (127) thereof have been assigned for members of the local community.

3 SECTION C: PUBLIC PARTICIPATION PROCESS

The following Section will provide a summary of the PPP Report (Please refer to Appendix: E) which was undertaken in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

3.1 ADVERTISEMENT AND NOTICES

Table 20: Details of Placement of Advertisements and Site Notices.

Publication Name:	Sunday Times	
Date Published:	28 November 2021	
Site Notice Position:	**Latitude**	**Longitude**
	22° 14' 31.48" S	29° 24' 17.52" E
	24° 14' 36.07" S	29° 24' 02.06" E
	22° 21' 05.34" S	30° 02' 26.19" E
	22° 20' 35.73" S	30° 02' 42.18" E
Date Placed:	29 April 2022	

Please refer to Appendix E1: Proof of Placement of Advertisements and Site Notices.

3.2 INTERESTED AND AFFECTED PARTIES

The table below provides the details of key stakeholders as identified by the Client and which were included in the MPNP Forum as well.

Table 21: Key Stakeholder Details.

NAME AND SURNAME	ORGANISATION	TEL/CELL	EMAIL
Robert Manaka	BaHananwa Traditional Community	073 482 3610	-
George Baloyi	BaHananwa Royal Council	079 377 0311	georgebaloyi@gmail.com
LEMBA CULTURAL ASSOCIATION			
Philemon Balibali	Lemba Cultural Association	082 962 2410	nbalibali@gmail.com
Robert Mbelengwa	Lemba Cultural Association	076 614 9040	mbelengwa@vodamail.co.za
LESHIBA ROYAL FAMILY			
Lucas Leshiba	Leshiba Royal Family	072 425 1523	tsmafukas@gmail.com
GA-MACHETE COMMUNITY PROPERTY ASSOCIATION			
Moloko Sematla	Ga-Machete CPA	073 863 5024	sematla@webmail.co.za
TSHIVHULA ROYAL FAMILY			
M.S Sebola	Tshivhula Royal Council	082 356 9681	sebolams@edu.limpopo.gov.za
Mainganye Nephawe	Nephawe Traditional Authority	079 671 5677	nephawemg@webmail.co.za
Vhutshilo Muthurwana	Mphephu Traditional Council/Advisory	082 212 9388	spear@thepub.co.za
VHANGONA CULTURAL MOVEMENT			
Robert Rakhadani	VhaNgona Cultural Movement	078 602 9271	rotra@webmail.co.za

NAME AND SURNAME	ORGANISATION	TEL/CELL	EMAIL
S.R Matloga	VhaNgona Cultural Movement	083 953 2602	matlogas@vhembe.gov.za
MUCINA LOCAL MUNICIPALITY			
Itani Dzebu	LED Officer	079 692 0055	led@musina.gov.za
Themba Ncube	IDP Manager	083 632 3584	msnaidp@limpopo.co.za
REGIONAL LAND CLAIMS COMMISSIONER: LIMPOPO PROVINCE			
Tele Maphoto	-	082 379 4807	tele.maphoto@drdlr.gov.za
LIMPOPO DEPARTMENT OF ECONOMIC DEVELOPMENT, ENVIRONMENT AND TOURISM			
Seaparo Sekoati	Member of Executive Council	015 291 1168	
Keleabetswe Thlouane	Deputy Director: Environmental Affairs	073 335 4091	TlouaneKC@ledet.gov.za
VHEMBE DISTRICT MUNICIPALITY			
Mukundi Mushaphi	LED Manager	082 453 6209	mukundim@vhembe.gov.za
Selokela Matloga	IDP Manager	083 953 2602	matlogas@vhembe.gov.za
DE BEERS CONSOLIDATED MINES			
AP Barton	Chief Executive Officer	011 575 4363	Gavin.Anderson@debeersgroup.com
Zandile Khumalo	-	011 575 4363	zandile.khumalo@coalofafrica.co.za
Florence Duval	Group Corporate Affairs Manager	010 003 8005	Florence.Duval@coalofafrica.com

Please refer to Appendix E2: Proof of notification to Interested and Affected Parties.

3.3 ORGANS OF STATE

The following Organs of State have been identified by the EAP and the Client as Key Stakeholder.

Table 22: Organs of State Details.

NAME AND SURNAME	ORGANISATION	TEL/CELL	EMAIL
Danie Smit	DFFE: Protected Areas	-	dsmit@environment.gov.za
Case Officer to be assigned	DFFE: Environmental Impact Assessments	T.B.C	T.B.C
Ms Ntloko	DFFE: Protected Areas Multilateral Programmes	-	tntloko@environment.gov.za
Case Officer to be assigned	South African Heritage Resources Agency	T.B.C	T.B.C
Case Officer to be assigned	Department of Water and Sanitation	T.B.C	T.B.C
-	Limpopo Tourism Agency	015 293 3600	info@golimpopo.co.za

Please refer to Appendix E4: Proof of written notification to Organs of State and Stakeholders.

4 SECTION D: IMPACT ASSESSMENT

4.1 IMPACT ASSESSMENT METHODOLOGY

For each potential impact, the EXTENT (Spatial scale), MAGNITUDE (degree of the impact), DURATION (time scale), PROBABILITY (occurrence), IRREPLACEABILITY (loss of resources) and the REVERSIBILITY (degree to which the proposed impact can be reversed) will be assessed by the EAP as well as the Specialists. The assessment of the above criteria will be used to determine the significance of each impact, with and without the implementation of the proposed mitigation measures. The scale to be used to assess these variables and to define the rating categories are tabulated in the Tables below.

Table 23: Evaluation components, ranking scales and descriptions (criteria)

Evaluation component	Ranking scale and description (criteria)
MAGNITUDE of NEGATIVE IMPACT (at the indicated spatial scale)	**10 - Very high**: Bio-physical and/or social functions and/or processes might be *severely* altered. **8 - High**: Bio-physical and/or social functions and/or processes might be *considerably* altered. **6 - Medium**: Bio-physical and/or social functions and/or processes might be *notably* altered. **4 - Low** : Bio-physical and/or social functions and/or processes might be *slightly* altered. **2 - Very Low**: Bio-physical and/or social functions and/or processes might be *negligibly* altered. **0 - Zero**: Bio-physical and/or social functions and/or processes will remain *unaltered.*
MAGNITUDE of POSITIVE IMPACT (at the indicated spatial scale)	**10 - Very high (positive)**: Bio-physical and/or social functions and/or processes might be *substantially* enhanced. **8 - High (positive)**: Bio-physical and/or social functions and/or processes might be *considerably* enhanced. **6 - Medium (positive)**: Bio-physical and/or social functions and/or processes might be *notably* enhanced. **4 - Low (positive)**: Bio-physical and/or social functions and/or processes might be *slightly* enhanced. **2 - Very Low (positive)**: Bio-physical and/or social functions and/or processes might be *negligibly* enhanced. **0 - Zero (positive)**: Bio-physical and/or social functions and/or processes will remain *unaltered.*
DURATION	**5 - Permanent** **4 - Long term**: Impact ceases after operational phase/life of the activity > 60 years. **3 - Medium term**: Impact might occur during the operational phase/life of the activity – 60 years. **2 - Short term**: Impact might occur during the construction phase - < 3 years. **1 - Immediate**
EXTENT (or spatial scale/influence of impact)	**5 - International**: Beyond National boundaries. **4 - National**: Beyond Provincial boundaries and within National boundaries. **3 - Regional**: Beyond 5 km of the proposed development and within Provincial boundaries. **2 - Local**: Within 5 km of the proposed development. **1 - Site-specific**: On site or within 100 m of the site boundary. **0** - None
IRREPLACEABLE loss of resources	**5 – Definite** loss of irreplaceable resources. **4 – High** potential for loss of irreplaceable resources. **3 – Moderate** potential for loss of irreplaceable resources. **2 – Low** potential for loss of irreplaceable resources. **1 – Very low** potential for loss of irreplaceable resources. **0 - None**
REVERSIBILITY of impact	**5 –** Impact **cannot** be reversed. **4 – Low** potential that impact might be reversed. **3 – Moderate** potential that impact might be reversed. **2 – High** potential that impact might be reversed. **1 –** Impact **will be** reversible. **0 –** No impact.
PROBABILITY (of occurrence)	**5 - Definite**: >95% chance of the potential impact occurring. **4 - High probability**: 75% - 95% chance of the potential impact occurring. **3 - Medium probability**: 25% - 75% chance of the potential impact occurring **2 - Low probability**: 5% - 25% chance of the potential impact occurring. **1 - Improbable**: <5% chance of the potential impact occurring.
Evaluation component	**Ranking scale and description (criteria)**
CUMULATIVE impacts	**High**: The activity is one of several similar past, present or future activities in the same geographical area, and might contribute to a very significant combined impact on the natural, cultural, and/or socio-economic resources of local, regional or national concern.

	Medium: The activity is one of a few similar past, present or future activities in the same geographical area, and might have a combined impact of moderate significance on the natural, cultural, and/or socio-economic resources of local, regional or national concern. **Low**: The activity is localised and might have a negligible cumulative impact. **None**: No cumulative impact on the environment.

Once the evaluation components have been ranked for each potential impact, the significance of each potential impact will be assessed (or calculated) using the following formula:

- **SP (Significance Points) = (Magnitude + Duration + Extent + Irreplaceability + Reversibility) x Probability**

The maximum value is 150 SP (Significance Points). The unmitigated and mitigated scenarios for each potential Environmental Impact should be rated as per the Table below.

Table 24: Definition of significance ratings) positive and negative)

Significance Points	Environmental Significance	Description
125 – 150	Very high (VH)	An impact of very high significance will mean that the project cannot proceed, and that impacts are irreversible, regardless of available mitigation options.
100 – 124	High (H)	An impact of high significance which could influence a decision about whether or not to proceed with the proposed project, regardless of available mitigation options.
75 – 99	Moderate-high (MH)	If left unmanaged, an impact of medium-high significance could influence a decision about whether or not to proceed with a proposed project. Mitigation options should be relooked.
40 – 74	Moderate (M)	If left unmanaged, an impact of moderate significance could influence a decision about whether or not to proceed with a proposed project.
<40	Low (L)	An impact of low is likely to contribute to positive decisions about whether or not to proceed with the project. It will have little real effect and is unlikely to have an influence on project design or alternative motivation.
+	Positive impact (+)	A positive impact is likely to result in a positive consequence/effect, and is likely to contribute to positive decisions about whether or not to proceed with the project.

4.2 POTENTIAL IMPACTS DURING PLANNING, DESIGN AND CONSTRUCTION PHASE

4.2.1 MAPUNGUBWE DORMITORIES

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:				
Nature of impact: Negative impact of haphazard placement of infrastructure on the environment.	**Activity:** The establishment of a main site office and storage site during the construction period will ensure that the poor placement of materials and infrastructure will be avoided. This could result in the damage or pollution to surrounding areas caused by construction activities.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• Draw up and submit for approval a Site Layout Master Plan. This plan must show the final positions and extent of all permanent and temporary site structures and infrastructure; • The planning for layout must be done in consultation on-site with the Environmental Control Officer (ECO); • After the final layout has been approved, conduct a thorough footprint investigation to detect and map (by GPS) any protected plant species, heritage sensitive areas and animal burrows;			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:				
	• The contractor may not deface, paint, damage or mark any natural features situated in or around the site for survey or other purposes; • The Contractor must ensure that all construction personnel, labourers and equipment remain within the demarcated construction sites at all times; • No servicing of vehicles must be permitted on site, unless for emergency purposes; • Stockpiles should not be situated such that they obstruct pathways; • Location of storage area must take into account prevailing winds, distance to water bodies and general on-site topography; • Protected Plant Species must be relocated (if possible); • Animal burrows must be monitored by the Environmental Control Officer (ECO) prior to construction for activity/presence of animal species. If detected, such animals must be removed and relocated by a qualified professional/contractor; • Place infrastructure as far as possible on sites that have already been transformed; • Facilities may not be used as staff accommodation; and, • Ensure that traffic flow is not impaired in anyway.			
Nature of impact: Topsoil Removal and Soil Erosion	**Activity:** The clearing of topsoil and excavation for the establishment of building foundations may result in the destruction of fertile topsoil.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• Remove topsoil approximately 300mm deep from establishment area and stockpile areas; • Topsoil stockpiles to be kept free from weeds; • Topsoil stockpiles to be placed on a levelled area and measures to be implemented to safeguard the piles from being washed away in the event of heavy rain/storm water; • Topsoil need to be stored on designated areas only. This need to be planned and indicated in the site-layout plan; • Ensure that topsoil is not mixed with subsoil and/or any other excavated material; • Provide containment and settlement facilities for effluents from concrete mixing and washing facilities; • Temporarily stored topsoil must be re-applied within 6 months, topsoil stored for longer need to be managed according to a detailed Topsoil Management Plan; • Provide spill containment facilities for hazardous materials like fuel and oil; • Areas around the proposed project footprint must be adequately rehabilitated to prevent significant erosion; and, • Topsoil must be used in all rehabilitation activities, and may not be compacted to ensure that its plant support capacity remain of high quality.			
Nature of impact: Surface and groundwater contamination due to construction activities such as the use of hazardous materials on site e.g. fuel and oil.	**Activity:** Spills could possibly occur on site and lead to the contamination of soil and groundwater.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	-	-	-	-

<table>
<tr><th rowspan="2">Planning, design and construction phase</th><th colspan="2">Layout Alternative 1</th><th colspan="2">Layout Alternative 2</th></tr>
<tr><th>Before Mitigation</th><th>After Mitigation</th><th>Before Mitigation</th><th>After Mitigation</th></tr>
<tr><td colspan="5">POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:</td></tr>
<tr><td>Proposed Mitigation:</td><td colspan="4">• Concrete can be mixed on mixing trays only and not on exposed soil. Concrete must be mixed only in areas which have been specially demarcated for this purpose (preferable where no natural vegetation occur);
• Concrete mixing to be carried out away from sensitive areas and on impermeable surfaces;
• Material Safety Data Sheets (MSDSs) should be available on site for all chemicals and hazardous substances to be used on-site, including information on their ecological impacts and how to minimise the impacts in case of leakage;
• All spillage must be cleaned up immediately after they have occurred;
• Spillage of petrochemical products must be avoided. In the case of accidental spillage, contaminated soil must be removed for bio-remediation or disposed of at a facility for the substance concerned. Disturbed land must be rehabilitated and seeded with vegetation seed naturally occurring on site;
• Do not locate any ablution facilities, sanitary convenience, septic tank or French drain within the 1:100 year flood line, or within a horizontal distance of 100m (whichever is greater) of a watercourse or drainage line;
• Vehicles and machinery must be regularly serviced to avoid leakages;
• No uncontrolled discharges from the site or working area to depressions may be permitted. All discharge points will require approval from the Environmental Site Agent (ESA);
• No water courses may be used to clean equipment, or for bathing. All cleaning operations should take place off site at a location where wastewater can be disposed of correctly;
• The discharge of any pollutants such as cement, concrete, lime, chemicals, etc. into the natural environment and the storm water system must strictly be prohibited;
• Storm water and run-off must be managed and diverted to not be in contact with waste;
• Fuel and chemical storage should be done within a designated area only, which is properly bund and able to contain 110% of the capacity of fuel or chemicals stored within;
• Construction vehicles must be inspected every morning before work commence to ensure that no leakages do occur;
• All personnel must receive induction on how to report spillages, contain them and treat them accordingly;
• Spill kits must be available at each working station;
• Drip trays must be placed beneath all construction equipment that is stationary on site or within the site camp; and,
• Hazardous waste must be stored in bins with a lid in a demarcated waste area, and must be disposed of at a hazardous treatment facility with records readily available on file.</td></tr>
<tr><td>Nature of impact:
Handling of general waste materials on the development site.</td><td colspan="4">Activity:
The presence of personnel and construction operations on site will increase the likelihood of littering and the dumping of solid waste.</td></tr>
<tr><td>Significance rating:</td><td>Moderate</td><td>Low</td><td>Moderate</td><td>Low</td></tr>
<tr><td>Cumulative impact:</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Proposed Mitigation:</td><td colspan="4">• An adequate number of scavenger proof litter bins are to be placed throughout the site. Two waste bins at least must be present, one (1) for hazardous waste and one (1) for non-hazardous waste at each working site. Dumping of waste on site is prohibited;
• Waste sorting and separation should form part of the environmental induction and awareness programme, to encourage personnel to collect waste paper, glass and metal waste separately;
• Keep all work sites including storage areas, offices and workshops neat and tidy;</td></tr>
</table>

<table>
<tr><th rowspan="2">Planning, design and construction phase</th><th colspan="2">Layout Alternative 1</th><th colspan="2">Layout Alternative 2</th></tr>
<tr><th>Before Mitigation</th><th>After Mitigation</th><th>Before Mitigation</th><th>After Mitigation</th></tr>
<tr><td colspan="5">POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:</td></tr>
<tr><td></td><td colspan="4">• Dedicate a demarcated and signposted storage area on site for the collection of construction waste;
• All domestic waste is to be removed from site and disposed of at a registered solid waste landfill site (Musina Landfill site) as mentioned in the BAR;
• Care should be taken to ensure that no waste fall off disposal vehicles on-route to the landfill. If needed, a tarpaulin can be utilised;
• The burning or burying of solid waste on site is prohibited. Do not burn PVC pipes or other plastic materials, as this is regarded as hazardous waste;
• Littering by construction workers shall not be permitted;
• Workers from the immediate area need to be encouraged to take their waste with them at the end of each day;
• General refuse/rubbish shall be removed from site on a weekly basis to an approved registered landfill site or as soon as the waste bins are reaching full capacity;
• Minimise waste by sorting wastes into recyclable and non-recyclable waste;
• Ablution facilities must be serviced by a registered service provider, cleaned at least once a week, and safe disposal slips must be on file at the site office;
• A bi-weekly (twice a week) litter patrol of the entire site shall be conducted by the Contractors Designated Environmental Officer (DEO);
• Hazardous waste must be sorted from non-hazardous waste and disposed of at a hazardous treatment facility, records and proof of disposal must be kept; and,
• A register must be kept of the quantities of waste disposed and proof of disposal must be available at the site office.</td></tr>
<tr><td>Nature of impact:
Increased risk of veld fires.</td><td colspan="4">Activity:
Due to the presence of construction personnel in natural areas, fires can occur if not managed to the correct standard.</td></tr>
<tr><td>Significance rating:</td><td>Moderate-High</td><td>Low</td><td>Moderate-High</td><td>Low</td></tr>
<tr><td>Cumulative impact:</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Proposed Mitigation:</td><td colspan="4">• The potential risk of veld fires is heightened by windy conditions in the area, specifically during the dry, windy winter months;
• Assume acceptable pre-cautions to guarantee that fires are not started as a result of works on site as specified below: the Contractor will be held responsible for any damage to structures or property on or neighbouring the Site as a result of any fire caused by personnel;
• The Contractor must ensure that construction related activities that pose a potential fire risk, such as welding etc., are properly managed and confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater. In this regard special care must be taken during the high risk dry, windy winter months;
• The Contractor must provide fire-fighting training to selected construction staff and take cognisance of the Veld and Forest Fire Act, Act No. 101, 1998;
• As per the conditions of the Code of Conduct, in the event of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor must compensate the fire-fighting costs borne by farmers and Local Authorities;
• Equip vehicles and site structures with fire extinguishers. Rubber beaters must be stored on site;
• No open fires are allowed anywhere on site;
• Storage of fuel or chemicals under trees is not permitted;</td></tr>
</table>

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:				
	• Gas and liquid fuel are not to be stored in the same place; • Smoking may only occur within a 3m radius from designated areas; • Personnel must be adequately trained in the handling of firefighting equipment; and, • Fuel, diesel, oil, or any other flammable substance must be stored 6m away from the smoking area.			
Nature of impact: Traffic impacts associated with the movement of construction vehicles on site.	**Activity:** The movement of vehicles on site may result in the destruction of biodiversity, compaction of valuable topsoil and mortalities of fauna on site.			
Significance rating:	Low	Low	Low	Low
Cumulative impact:	Low	-	Low	-
Proposed Mitigation:	• After the final layout has been approved, conduct a thorough footprint investigation (walk-through) to detect and map (by GPS) all protected plant species, which have to be removed and animal burrows present within the project site. • Animal burrows must be monitored by the ECO prior to construction for activity/presence of animal species. If detected, such animals must be removed and relocated by a qualified professional/contractor; • During construction create designated turning areas and strictly prohibit any off-road driving or parking of vehicles and machinery outside designated areas; • Ensure that runoff from compacted or sealed surfaces is slowed down and dispersed sufficiently to prevent accelerated erosion from being initiated (storm water and erosion management plan required). • Ensure adequate drainage where roads cross drainage lines or ephemeral tributaries; • Monitor the establishment of (alien) invasive species and remove as soon as detected, before regenerative material can be formed; • Abnormal loads and machinery should avoid movement over gravel roads during and immediately after rainfall events, so as to limit destruction of road surfaces and sedimentation of downhill rivers/streams; • All vehicles must be road-worthy, be maintained to prevent fuel or oil leaks and drivers are to the licensed appropriately for the driving of their assigned vehicle. Drivers responsible for the transportation of personnel must be specifically licensed to do so; • Construction vehicles may not leave the designated roads and tracks, whilst U-Turns are prohibited on all roads; • Signage is to be placed on vehicles at all times; • All construction vehicles should adhere to construction sites and avoid off road to minimise impact on vegetation and soil; • After decommissioning, if access roads or portions thereof will not be of further use to the landowner, remove all foreign material and rip area to facilitate the establishment of vegetation, followed by a suitable revegetation program; and, • Construction-related vehicles and machinery may not operate on site without reflective safety signage, car-top lights and reflective personnel gear.			
Nature of impact: Traffic impacts associated with the	Activity: The movement of vehicles in the vicinity of the construction site may cause damage to road surfaces as well as increase in the traffic volume of the R572.			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:				
movement of construction vehicle.				
Significance rating:	Moderate	Moderate	Moderate	Moderate
Cumulative impact:	Low	Low	Low	Low
Proposed Mitigation:	• Abnormal loads should be timed to avoid times of year when traffic volumes are likely to be higher, as would be expected over national holidays, weekends and school holiday periods; • Vehicles used for transport of materials and sand must be fitted with tarpaulins to prevent the release of such material or items onto road surfaces; • Any damage to public roads is to be reported to the management authority and repaired to its original condition; • Transport of materials should be limited to the least amount of trips possible; and, • Abnormal loads should not be transported after dark.			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON BIOLOGICAL ASPECTS:				
Nature of impact: Direct impact on vegetation during construction and loss of species.	**Activity:** The construction of several permanent structures on site will result in the loss of vegetation due to foundation excavation.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• After the final layout has been approved, conduct a thorough footprint investigation to detect and map (by GPS) any protected plant species and active animal burrows; • Protected plant species must be relocated where possible; • Keep areas affected to a minimum, strictly prohibit any disturbance outside the demarcated foundation footprint area; • Clear as little indigenous vegetation as possible, aim to maintain vegetation where it will not interfere with the construction or operation of the development, rehabilitate an acceptable vegetation layer according to rehabilitation recommendations of the relevant EMP'r, if possible; • Indigenous vegetation unique to the area must be used during landscaping activities; • There must be a pre-construction environmental induction for all construction staff on site to ensure that basic environmental biodiversity principles are adhered to; • Where the ECO deems it necessary (e.g. sensitive, natural areas) the ecologist appointed to do the vegetation study will be utilized; • Restoration measures will be required to reinstate functionality in the disturbed soil and vegetation; • Impacts to sensitive sites (drainage lines) should be avoided; • No vegetation may be gathered for the purpose of creating fire; • Movement of vehicles and construction personnel should be restricted to the road and within the development footprint as far as possible to limit trampling of indigenous species and further disturbance to the surrounding vegetation; • SANParks must be consulted with prior to construction to identify and demarcate biodiversity conservation areas within close vicinity of the site; and, • No fires are allowed on site.			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON BIOLOGICAL ASPECTS:				
Nature of impact: Dust nuisance generated by the operation of machinery and vehicles.	**Activity:** The frequent upwelling of dust as consequence of the movement of vehicles and machinery on site may impact on worker health causing asthma and other respiratory conditions. Stockpiles are susceptible to the upwelling of fine particulate matter. Several ambient factors, the terrain characteristics, soil type and land use forms can attribute to the degree of loss and susceptibility of stockpiles towards the generation of dust. Regular watering of exposed surfaces may result in the reduction of wind-generated dust from stockpiles.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• Implement dust suppression measures by watering areas to be cleared as well as already exposed surfaces with damaged soil particles, particularly during dry, windy periods; • Ensure all vehicles remain on designated roads and avoid the opening of detour or by-pass tracks; • Implement speed restrictions for vehicles on gravel roads; • Manage and maintain roadside vegetation to allow for absorption of runoff from road surfaces during and after rainy periods; and, • After construction decommissioning, if access roads or portions thereof will not be of further use to the landowner, remove all foreign material and rip area to facilitate the establishment of vegetation, followed by a suitable revegetation program.			
Nature of impact: Fauna will be directly impacted as a result of construction activities and human presence at the site.	**Activity:** The construction of facilities will result in some habitat loss for resident fauna, as some species will occur within the affected areas. In addition, increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to resident fauna. Sensitive and shy fauna may move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species (such as mole rats or blind snakes) would not be able to avoid the construction activities and might be killed.			
Significance rating:	Low	Low	Low	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• No hunting, snaring, shooting, nest raiding or egg collection by the construction staff should be allowed; • Holes and trenches should not be left open for extended periods of time and should only be dug when needed for immediate construction. Trenches that may stand open for some days should have places where the loose material have been returned to the trench to form an escape ramp present at regular intervals to allow any fauna that fall in to escape; • No open fires are allowed on site; • Ensure that the construction area is fenced off from adjacent areas which may harbour wild animals; • Posters of species of conservation concern must be kept on site where they will be visible to construction workers; • Do not store building materials and excess stockpiled soils within riparian zones or within areas where natural vegetation occur; and • Should any fauna be discovered it should be relocated to an area outside the development footprint by a trained professional.			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON SOCIO-ECONOMIC ASPECTS:				
Nature of impact:	**Activity:**			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON SOCIO-ECONOMIC ASPECTS:				
The creation of job opportunities during the construction phase.	The construction period will create a few job opportunities for individuals residing in the area of the MPNP.			
Significance rating:	Moderate (+)	Moderate (+)	Moderate (+)	Moderate (+)
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• Where reasonable and practical the contractors appointed by the Applicant must appoint local contractors and implement a "local first" policy, especially for semi and low-skilled job categories. However; due to the low skill levels in the area, the majority of skilled posts are likely to be filled by personnel from outside the area; • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible, particularly for less labour-intensive work such as flag bearing and supervision; and, • The ongoing presence of semi and high skilled personnel involved in the project construction phase will generate sustained clientele to a portion of the guest house industry within the vicinity of the development.			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON CULTURAL-HISTORICAL ASPECTS:				
Nature of impact: Damage and destruction of vertebrate fossils during excavation activities.	**Activity:** Excavation activities can result in the discovery of cultural and historical artefacts beneath the earth surface. Damage or loss can occur if the correct procedures are not followed.			
Significance rating:	Low	Low	Low	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• Should any heritage resources (including but not limited to fossil bones, coins, indigenous and/or colonial ceramics, any articles of value or antiquity, stone artefacts or bone remains, structures and other built features, rock art and rock engravings) be exposed during excavation for the purpose of construction, construction in the vicinity of the finding must be stopped. A trained Palaeontologist or Heritage Specialist must be notified to assess the finds, and this must then be reported to the applicable Heritage Authority and the following details must be provided: ➢ Date; ➢ Position of the excavation (GPS) and depth; ➢ A description of the nature of the find; ➢ Digital images of the excavation showing vertical sections (sides) and the position of the find showing its depth/location in the excavation; ➢ A reference scale must be included in the images (tape measure, ranging rod, or object of recorded dimensions); and, ➢ Close-up, detailed images of the find (with the scale included). • Heritage remains uncovered or disturbed during earthworks must not be disturbed further until the necessary approval has been obtained from the Heritage Authority. A registered Heritage Specialist must be called to the site for inspection and removal once Authority to do so, has been given; • Excavations must be limited to the footprint area and be maintained in a narrow corridor;			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON CULTURAL-HISTORICAL ASPECTS:				
	• All operations of excavation equipment must be made aware of the possibility of the occurrence of sub-surface heritage features and the following procedures must be followed: o All construction in the immediate 50 m vicinity radius of the site must cease; o The Heritage Practitioner must be informed as soon as possible; o In the event of obvious human remains SAPS must be notified; o Mitigation measures (such as refilling, etc.) must not be attempted; o The area in a 50 m radius of the find must be cordoned off with hazard tape; and, • Public access must be limited and the area must be placed under guard.			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL VISUAL IMPACTS:				
Nature of impact: Impact on the sense of place for surrounding users.	**Activity:** The movement of construction vehicles, machinery and personnel on site shall result in a visual impact on surrounding users. Furthermore to this, the storage of materials and excavation shall result in disturbance and an unsightly character.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	Moderate	Low	Moderate	Low
Proposed Mitigation:	• Access roads are to be kept clean and dust suppression techniques should be implemented to minimise impacts of vehicle movement; • Site offices and structures should be limited to one location and carefully situated to reduce visual intrusions. Roofs should be grey and non-reflective; • Construction camps as well as development areas should be screened with netting; • Lights within the construction camp should face directly down (angle of 90˚); • Minimum vegetation should be removed to ensure the visual absorption capacity remain high; • Litter should be strictly controlled, as the spread thereof through wind could have a very negative visual impact; • Avoid shiny materials in structures. Where possible shiny metal structures should be darkened or screened to prevent glare; and, • Mitigation of visual impacts associated with the construction phase would entail proper planning, management and rehabilitation of the construction site. Mitigation measures include the following: ➢ Reduce the time of construction through careful planning of logistics and ensure the productive implementation of resources; ➢ Limit disturbance of the environment to the development footprint; and, ➢ Rehabilitate all disturbed areas immediately after construction through cut and shape and possible revegetation should it be required.			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON NOISE ASPECTS:				
Nature of impact: Noise nuisance generated by construction works,	**Activity:** The operating of vehicles and machinery on site results in the generation of noise disturbing users of the surrounding area.			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON NOISE ASPECTS:				
vehicles and personnel.				
Significance rating:	Moderate	Moderate	Moderate	Moderate
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• Limit working hours of noisy equipment to daylight; • All stationary noisy equipment such as compressors and pumps should be contained behind acoustic covers, screens or sheds where possible; • The regular inspection and maintenance of equipment must be undertaken to ensure that all components are functioning optimally; • Where recurrent use of machinery is frequent, machines should be shut down during intermediate periods; • Fit silencers to equipment; • Unless otherwise specified by the Contractors DEO, normal work hours will apply (i.e. from 06:30 to 17:00, Mondays to Fridays); • Ensure that Employees and staff conduct themselves in an acceptable manner while on site, both during work hours and after hours; and, • No loud music is permitted on site or in the Camp.			

4.2.2 MAPUNGUBWE HILL COMPLEX

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:				
Nature of impact: Negative impact of haphazard placement of infrastructure on the environment.	**Activity:** The establishment of a main site office and storage site during the construction period will ensure that the poor placement of materials and infrastructure will be avoided. This could result in the damage or pollution to surrounding areas caused by construction activities.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• Draw up and submit for approval a Site Layout Master Plan. This plan must show the final positions and extent of all permanent and temporary site structures and infrastructure; • The planning for layout must be done in consultation on-site with the Environmental Control Officer (ECO); • After the final layout has been approved, conduct a thorough footprint investigation to detect and map (by GPS) any protected plant species and animal burrows; • The contractor may not deface, paint, damage or mark any natural features situated in or around the site for survey or other purposes; • The Contractor must ensure that all construction personnel, labourers and equipment remain within the demarcated construction sites at all times; • No servicing of vehicles must be permitted on site, unless for emergency purposes; • Stockpiles should not be situated such that they obstruct pathways; • Location of storage area must take into account prevailing winds, distance to water bodies and general on-site topography; • Protected Plant Species must be relocated (if possible); • Animal burrows must be monitored by the Environmental Control Officer (ECO) prior to construction for activity/presence of animal species. If detected, such animals must be removed and relocated by a qualified professional/contractor; • Place infrastructure as far as possible on sites that have already been transformed;			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:				
	• One construction camp must be utilised for the construction of the Mapungubwe Hill Orientation Centre and Dig Site Facility; • Facilities may not be used as staff accommodation; and, • Ensure that traffic flow is not impaired in anyway.			
Nature of impact: Topsoil Removal and Soil Erosion	**Activity:** The clearing of topsoil and excavation for the establishment of building foundations may result in the destruction of fertile topsoil.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• Remove topsoil approximately 300mm deep from establishment area and stockpile areas; • Topsoil stockpiles to be kept free from weeds; • Topsoil stockpiles to be placed on a levelled area and measures to be implemented to safeguard the piles from being washed away in the event of heavy rain/storm water; • Topsoil need to be stored on designated areas only. This need to be planned and indicated in the site-layout plan; • Ensure that topsoil is not mixed with subsoil and/or any other excavated material; • Provide containment and settlement facilities for effluents from concrete mixing and washing facilities; • Temporarily stored topsoil must be re-applied within 6 months, topsoil stored for longer need to be managed according to a detailed Topsoil Management Plan; • Areas around the proposed project footprints must be adequately rehabilitated to prevent significant erosion; • Adequate storm water management measures must be implemented on site in order to sufficiently manage storm water runoff and clean/dirty water separation during the construction phase. This must be done to ensure that no significant contamination of the surrounding area occurs; • Provide spill containment facilities for hazardous materials like fuel and oil; and, • Topsoil must be used in all rehabilitation activities and may not be compacted to ensure that its plant support capacity remain of high quality.			
Nature of impact: Surface and groundwater contamination due to construction activities such as the use of hazardous materials on site e.g. fuel and oil.	**Activity:** Spills could possibly occur on site and lead to the contamination of soil and groundwater.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• Concrete can be mixed on mixing trays only and not on exposed soil. Concrete must be mixed only in areas which have been specially demarcated for this purpose (preferable where no natural vegetation occur); • Concrete mixing to be carried out away from sensitive areas and on impermeable surfaces; • Material Safety Data Sheets (MSDSs) should be available on site for all chemicals and hazardous substances to be used on-site, including information on their ecological impacts and how to minimise the impacts in case of leakage; • All spillage must be cleaned up immediately after they have occurred;			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:				
	• Spillage of petrochemical products must be avoided. In the case of accidental spillage, contaminated soil must be removed for bio-remediation or disposed of at a facility for the substance concerned. Disturbed land must be rehabilitated and seeded with vegetation seed naturally occurring on site; • Do not locate any ablution facilities, sanitary convenience, septic tank or French drain within the 1:100 year flood line, or within a horizontal distance of 100m (whichever is greater) of a watercourse or drainage line; • Vehicles and machinery must be regularly serviced to avoid leakages; • No uncontrolled discharges from the site or working area to depressions may be permitted. All discharge points will require approval from the Environmental Site Agent (ESA); • No water courses may be used to clean equipment, or for bathing. All cleaning operations should take place off site at a location where wastewater can be disposed of correctly; • The discharge of any pollutants such as cement, concrete, lime, chemicals, etc. into the natural environment and the storm water system must strictly be prohibited; • Storm water and run-off must be managed and diverted to not be in contact with waste; • Fuel and chemical storage should be done within a designated area only, which is properly bund and able to contain 110% of the capacity of fuel or chemicals stored within; • Construction vehicles must be inspected every morning before work commence to ensure that no leakages do occur; • All personnel must receive induction on how to report spillages, contain them and treat them accordingly; • Spill kits must be available at each working station; • Drip trays must be placed beneath all construction equipment that is stationary on site or within the site camp; and, • Hazardous waste must be stored in bins with a lid in a demarcated waste area and must be disposed of at a hazardous treatment facility with records on file.			
Nature of impact: Handling of general waste materials on the development site.	**Activity:** The presence of personnel and construction operations on site will increase the likelihood of littering and the dumping of solid waste.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• An adequate number of scavenger proof litter bins are to be placed throughout the site. Two waste bins at least must be present, one (1) for hazardous waste and one (1) for non-hazardous waste at each working site. Dumping of waste on site is prohibited; • Where a skip is utilised, it must be ensured that the skip is covered with a lid; • Waste sorting and separation should form part of the environmental induction and awareness programme, to encourage personnel to collect wastepaper, glass and metal waste separately; • Keep all work sites including storage areas, offices and workshops neat and tidy; • Dedicate a demarcated and signposted storage area on site for the collection of construction waste; • All domestic waste is to be removed from site and disposed of at a registered solid waste landfill site (Musina Landfill site) as mentioned in the BAR; • Care should be taken to ensure that no waste fall off disposal vehicles on-route to the landfill. If needed, a tarpaulin can be utilised;			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:				
	• The burning or burying of solid waste on site is prohibited. Do not burn PVC pipes or other plastic materials, as this is regarded as hazardous waste; • Littering by construction workers shall not be permitted; • Workers from the immediate area need to be encouraged to take their waste with them at the end of each day; • General refuse/rubbish shall be removed from site on a weekly basis to an approved registered landfill site or as soon as the waste bins are reaching full capacity; • Minimise waste by sorting wastes into recyclable and non-recyclable waste; • Ablution facilities must be serviced by a registered service provider, cleaned at least once a week, and safe disposal slips must be on file at the site office; • A bi-weekly (twice a week) litter patrol of the entire site shall be conducted by the designated Environmental Officer (EO); • Hazardous waste must be sorted from non-hazardous waste and disposed of at a hazardous treatment facility, records and proof of disposal must be kept; and, • A register must be kept of the quantities of waste disposed and proof of disposal must be available at the site office.			
Nature of impact: Increased risk of veld fires.	**Activity:** Due to the presence of construction personnel in natural areas, fires can occur if not managed to the correct standard.			
Significance rating:	Moderate-High	Moderate	Moderate-High	Moderate
Cumulative impact:	Moderate	Low	Moderate	Low
Proposed Mitigation:	• The potential risk of veld fires is heightened by windy conditions in the area, specifically during the dry, windy winter months; • Assume acceptable pre-cautions to guarantee that fires are not started as a result of works on site as specified below: the Contractor will be held responsible for any damage to structures or property on or neighbouring the Site as a result of any fire caused by personnel; • The Contractor must ensure that construction related activities that pose a potential fire risk, such as welding etc., are properly managed and confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater. In this regard special care must be taken during the high risk dry, windy winter months; • The Contractor must provide fire-fighting training to selected construction staff and take cognisance of the Veld and Forest Fire Act, Act No. 101, 1998; • As per the conditions of the Code of Conduct, in the event of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor must compensate the fire-fighting costs borne by farmers and Local Authorities; • Equip vehicles and site structures with fire extinguishers. Rubber beaters must be stored on site; • No open fires are allowed anywhere on site; • Storage of fuel or chemicals under trees is not permitted; • Gas and liquid fuel are not to be stored in the same place; • Smoking may only occur within a 3m radius from designated areas; • Personnel must be adequately trained in the handling of firefighting equipment; and, • Fuel, diesel, oil, or any other flammable substance must be stored 6m away from the smoking area.			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:				
Nature of impact: Traffic impacts associated with the movement of construction vehicles on site.	**Activity:** The movement of vehicles on site may result in the destruction of biodiversity, compaction of valuable topsoil and mortalities of fauna on site.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• After the final layout has been approved, conduct a thorough footprint investigation (walk-through) to detect and map (by GPS) all protected plant species, which have to be removed and animal burrows must be present within the project site. • Animal burrows must be monitored by the ECO prior to construction for activity/presence of animal species. If detected, such animals must be removed and relocated by a qualified professional/contractor; • During construction create designated turning areas and strictly prohibit any off-road driving or parking of vehicles and machinery outside designated areas; • Ensure that runoff from compacted or sealed surfaces is slowed down and dispersed sufficiently to prevent accelerated erosion from being initiated (storm water and erosion management plan required). • Ensure adequate drainage where roads cross drainage lines or ephemeral tributaries; • Monitor the establishment of (alien) invasive species and remove as soon as detected, before regenerative material can be formed; • Abnormal loads and machinery should avoid movement over gravel roads during and immediately after rainfall events, so as to limit destruction of road surfaces and sedimentation of downhill rivers/streams; • All vehicles must be road-worthy, be maintained to prevent fuel or oil leaks and drivers are to the licensed appropriately for the driving of their assigned vehicle. Drivers responsible for the transportation of personnel must be specifically licensed to do so; • Construction vehicles may not leave the designated roads and tracks, whilst U-Turns are prohibited on all roads; • Signage is to be placed on vehicles at all times; • All construction vehicles should adhere to construction sites and avoid off road to minimise impact on vegetation and soil; • All construction vehicles must adhere to the Mapungubwe National Park Speed Limit. • After decommissioning, if access roads or portions thereof will not be of further use to the landowner, remove all foreign material and rip area to facilitate the establishment of vegetation, followed by a suitable revegetation program; and, • Construction-related vehicles and machinery may not operate on site without reflective safety signage, car-top lights and reflective personnel gear.			
Nature of impact: Traffic impacts associated with the movement of construction vehicle.	**Activity:** The movement of vehicles in the vicinity of the construction site may cause damage to road surfaces as well as increase in the traffic volume of the R572.			
Significance rating:	Moderate	Moderate	Moderate	Moderate
Cumulative impact:	Low	Low	Low	Low

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:				
Proposed Mitigation:	• Abnormal loads should be timed to avoid times of year when traffic volumes are likely to be higher, as would be expected over national holidays, weekends and school holiday periods; • Vehicles used for transport of materials and sand must be fitted with tarpaulins to prevent the release of such material or items onto road surfaces; • Any damage to public roads is to be reported to the management authority and repaired to its original condition; • Transport of materials should be limited to the least amount of trips possible; and, • Abnormal loads should not be transported after dark.			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON BIOLOGICAL ASPECTS:				
Nature of impact: Direct impact on vegetation during construction and loss of species.	**Activity:** The construction of several permanent structures on site will result in the loss of vegetation due to foundation excavation.			
Significance rating:	Moderate-High	Low	Moderate-High	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• After the final layout has been approved, conduct a thorough footprint investigation to detect and map (by GPS) any protected plant species and active animal burrows; • Protected plant species must be relocated where possible; • Keep areas affected to a minimum, strictly prohibit any disturbance outside the demarcated foundation footprint area; • Clear as little indigenous vegetation as possible, aim to maintain vegetation where it will not interfere with the construction or operation of the development, rehabilitate an acceptable vegetation layer according to rehabilitation recommendations of the relevant EMP'r, if possible; • Indigenous vegetation unique to the area must be used during landscaping activities; • There must be a pre-construction environmental induction for all construction staff on site to ensure that basic environmental biodiversity principles are adhered to; • Where the ECO deems it necessary (e.g. sensitive, natural areas) the ecologist appointed to do the vegetation study will be utilized; • Restoration measures will be required to reinstate functionality in the disturbed soil and vegetation; • Impacts to sensitive sites (drainage lines) should be avoided; • No vegetation may be gathered for the purpose of creating fire; • SANParks must be consulted with prior to construction to identify and demarcate biodiversity conservation areas within close vicinity of the site; and, • No fires are allowed on site.			
Nature of impact: Dust nuisance generated by the operation of machinery and vehicles.	**Activity:** The frequent upwelling of dust as consequence of the movement of vehicles and machinery on site may impact on worker health causing asthma and other respiratory conditions. Stockpiles are susceptible to the upwelling of fine particulate matter. Several ambient factors, the terrain characteristics, soil type and land use forms can attribute to the degree of loss and susceptibility of stockpiles towards the generation of dust. Regular watering of exposed surfaces may result in the reduction of wind-generated dust from stockpiles.			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON BIOLOGICAL ASPECTS:				
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• Implement dust suppression measures by watering areas to be cleared as well as already exposed surfaces with damaged soil particles, particularly during dry, windy periods; • Ensure all vehicles remain on designated roads and avoid the opening of detour or by-pass tracks; • All vehicles must adhere to the Mapungubwe National Park speed limit; • Areas around the proposed project footprint must be adequately rehabilitated to prevent significant dust emissions; • Manage and maintain roadside vegetation to allow for absorption of runoff from road surfaces during and after rainy periods; and, After construction decommissioning, if access roads or portions thereof will not be of further use to the landowner, remove all foreign material and rip area to facilitate the establishment of vegetation, followed by a suitable revegetation program.			
Nature of impact: Fauna will be directly impacted as a result of construction activities and human presence at the site.	**Activity:** The construction of facilities will result in some habitat loss for resident fauna, as some species will occur within the affected areas. In addition, increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to resident fauna. Sensitive and shy fauna may move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species (such as mole rats or blind snakes) would not be able to avoid the construction activities and might be killed.			
Significance rating:	Low	Low	Low	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• No hunting, snaring, shooting, nest raiding or egg collection by the construction staff should be allowed; • Holes and trenches should not be left open for extended periods of time and should only be dug when needed for immediate construction. Trenches that may stand open for some days should have places where the loose material has been returned to the trench to form an escape ramp present at regular intervals to allow any fauna that fall in to escape; • No open fires will be allowed on site; • Posters of species of conservation concern must be kept on site where they will be visible to construction personnel; • Ensure that the construction area is fenced off from adjacent areas which may harbour wild animals; • Do not store building materials and excess stockpiled soils within riparian zones or within areas where natural vegetation occur; and • Should any fauna be discovered it should be relocated to an area outside the development footprint by a trained professional.			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON SOCIO-ECONOMIC ASPECTS:				
Nature of impact: The creation of job opportunities during the construction phase.	**Activity:** The construction period will create a few job opportunities for individuals residing in the area of the MPNP.			
Significance rating:	Moderate (+)	Moderate (+)	Moderate (+)	Moderate (+)

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON SOCIO-ECONOMIC ASPECTS:				
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• Where reasonable and practical the contractors appointed by the Applicant must appoint local contractors and implement a "local first" policy, especially for semi and low-skilled job categories. However; due to the low skill levels in the area, the majority of skilled posts are likely to be filled by personnel from outside the area; • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible, particularly for less labour-intensive work such as flag bearing and supervision; and, • The ongoing presence of semi and high skilled personnel involved in the project construction phase will generate sustained clientele to a portion of the guest house industry within the vicinity of the development.			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON CULTURAL-HISTORICAL ASPECTS:				
Nature of impact: Damage and destruction of vertebrate fossils during excavation activities.	**Activity:** Excavation activities can result in the discovery of cultural and historical artefacts beneath the earth surface. Damage or loss can occur if the correct procedures are not followed.			
Significance rating:	Moderate-High	Moderate	Moderate-High	Moderate
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• Should any heritage resources (including but not limited to fossil bones, coins, indigenous and/or colonial ceramics, any articles of value or antiquity, stone artefacts or bone remains, structures and other built features, rock art and rock engravings) be exposed during excavation for the purpose of construction, construction in the vicinity of the finding must be stopped. A trained Palaeontologist or Heritage Specialist must be notified to assess the finds, and this must then be reported to the applicable Heritage Authority and the following details must be provided: ➢ Date; ➢ Position of the excavation (GPS) and depth; ➢ A description of the nature of the find; ➢ Digital images of the excavation showing vertical sections (sides) and the position of the find showing its depth/location in the excavation; ➢ A reference scale must be included in the images (tape measure, ranging rod, or object of recorded dimensions); and, ➢ Close-up, detailed images of the find (with the scale included). • Heritage remains uncovered or disturbed during earthworks must not be disturbed further until the necessary approval has been obtained from the Heritage Authority. A registered Heritage Specialist must be called to the site for inspection and removal once Authority to do so, has been given; • Excavations must be limited to the footprint area and be maintained in a narrow corridor; • All operations of excavation equipment must be made aware of the possibility of the occurrence of sub-surface heritage features and the following procedures must be followed: o All construction in the immediate 50 m vicinity radius of the site must cease; o The Heritage Practitioner must be informed as soon as possible;			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON CULTURAL-HISTORICAL ASPECTS:				
	○ In the event of obvious human remains SAPS must be notified; ○ Mitigation measures (such as refilling, etc.) must not be attempted; ○ The area in a 50 m radius of the find must be cordoned off with hazard tape; • Public access must be limited and the area must be placed under guard; • All areas that are to be excavated should undergo a comprehensive archaeological excavation and documentation upheld by a permit issued by SAHRA before any construction can commence; and, • A monitoring plan should be put in place to monitor the effects of unforeseen secondary impacts during the construction phase of the project.			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL VISUAL IMPACTS:				
Nature of impact: Impact on the sense of place for surrounding users.	**Activity:** The movement of construction vehicles, machinery and personnel on site shall result in a visual impact on surrounding users. Furthermore to this, the storage of materials and excavation shall result in disturbance and an unsightly character.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	Moderate	Low	Moderate	Low
Proposed Mitigation:	• Access roads are to be kept clean and dust suppression techniques should be implemented to minimise impacts of vehicle movement; • Site offices and structures should be limited to one location and carefully situated to reduce visual intrusions. Roofs should be grey and non-reflective; • Construction camps as well as development areas should be screened with netting; • Lights within the construction camp should face directly down (angle of 90˚); • Minimum vegetation should be removed to ensure the visual absorption capacity remain high; • Litter should be strictly controlled, as the spread thereof through wind could have a very negative visual impact; • Avoid shiny materials in structures. Where possible shiny metal structures should be darkened or screened to prevent glare; and, • Mitigation of visual impacts associated with the construction phase would entail proper planning, management and rehabilitation of the construction site. Mitigation measures include the following: ➢ Reduce the time of construction through careful planning of logistics and ensure the productive implementation of resources; ➢ Limit disturbance of the environment to the development footprint; and, ➢ Rehabilitate all disturbed areas immediately after construction through cut and shape and possible revegetation should it be required.			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON NOISE ASPECTS:				
Nature of impact: Noise nuisance generated by construction works,	**Activity:** The operating of vehicles and machinery on site results in the generation of noise, disturbing users of the surrounding area.			

Planning, design and construction phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON NOISE ASPECTS:				
vehicles and personnel.				
Significance rating:	Moderate	Moderate	Moderate	Moderate
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• Limit working hours of noisy equipment to daylight; • All stationary noisy equipment such as compressors and pumps should be contained behind acoustic covers, screens or sheds where possible; • The regular inspection and maintenance of equipment must be undertaken to ensure that all components are functioning optimally; • Where recurrent use of machinery is frequent, machines should be shut down during intermediate periods; • Fit silencers to equipment; • Unless otherwise specified by the ESA, normal work hours will apply (i.e. from 06:30 to 17:00, Mondays to Fridays); • Ensure that Employees and staff conduct themselves in an acceptable manner while on site, both during work hours and after hours; and, • No loud music is permitted on site or in the Camp.			

4.2.3 SCHRODA ORIENTATION CENTRE

Planning, design and construction phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:		
Nature of impact: Negative impact of haphazard placement of infrastructure on the environment.	**Activity:** The establishment of a main site office and storage site during the construction period will ensure that the poor placement of materials and infrastructure will be avoided. This could result in the damage or pollution to surrounding areas caused by construction activities.	
Significance rating:	Moderate	Low
Cumulative impact:	-	-
Proposed Mitigation:	• Draw up and submit for approval a Site Layout Master Plan. This plan must show the final positions and extent of all permanent and temporary site structures and infrastructure; • The planning for layout must be done in consultation on-site with the Environmental Control Officer (ECO); • After the final layout has been approved, conduct a thorough footprint investigation to detect and map (by GPS) any protected plant species and animal burrows; • The contractor may not deface, paint, damage or mark any natural features situated in or around the site for survey or other purposes; • The Contractor must ensure that all construction personnel, labourers and equipment remain within the demarcated construction sites at all times; • No servicing of vehicles must be permitted on site, unless for emergency purposes; • Stockpiles should not be situated such that they obstruct pathways; • Location of storage area must take into account prevailing winds, distance to water bodies and general on-site topography; • Protected Plant Species must be relocated (if possible); • Animal burrows must be monitored by the Environmental Control Officer (ECO) prior to construction for activity/presence of animal species. If detected, such animals must be removed and relocated by a qualified professional/contractor; • Place infrastructure as far as possible on sites that have already been transformed;	

Planning, design and construction phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:		
	• Facilities may not be used as staff accommodation; and, • Ensure that traffic flow is not impaired in anyway.	
Nature of impact: Topsoil Removal and Soil Erosion	**Activity:** The clearing of topsoil and excavation for the establishment of building foundations may result in the destruction of fertile topsoil.	
Significance rating:	Moderate	Low
Cumulative impact:	-	-
Proposed Mitigation:	• Remove topsoil approximately 300mm deep from establishment area and stockpile areas; • Topsoil stockpiles to be kept free from weeds; • Topsoil stockpiles to be placed on a levelled area and measures to be implemented to safeguard the piles from being washed away in the event of heavy rain/storm water; • Topsoil need to be stored on designated areas only. This need to be planned and indicated in the site-layout plan; • Ensure that topsoil is not mixed with subsoil and/or any other excavated material; • Provide containment and settlement facilities for effluents from concrete mixing and washing facilities; • Temporarily stored topsoil must be re-applied within 6 months, topsoil stored for longer need to be managed according to a detailed Topsoil Management Plan; • Adequate storm water management measures must be implemented on site in order to sufficiently manage storm water runoff and clean/dirty separation during the construction phases. This must be done to ensure that no significant contamination of the surrounding areas occurs; • Areas around the proposed project footprint must be adequately rehabilitated to prevent significant erosion; • Provide spill containment facilities for hazardous materials like fuel and oil; and, • Topsoil must be used in all rehabilitation activities and may not be compacted to ensure that its plant support capacity remain of high quality.	
Nature of impact: Surface and groundwater contamination due to construction activities such as the use of hazardous materials on site e.g. fuel and oil.	**Activity:** Spills could possibly occur on site and lead to the contamination of soil and groundwater.	
Significance rating:	Low	Low
Cumulative impact:	-	-
Proposed Mitigation:	• Concrete can be mixed on mixing trays only and not on exposed soil. Concrete must be mixed only in areas which have been specially demarcated for this purpose (preferable where no natural vegetation occur); • Concrete mixing to be carried out away from sensitive areas and on impermeable surfaces; • Material Safety Data Sheets (MSDSs) should be available on site for all chemicals and hazardous substances to be used on-site, including information on their ecological impacts and how to minimise the impacts in case of leakage; • All spillage must be cleaned up immediately after they have occurred; • Spillage of petrochemical products must be avoided. In the case of accidental spillage, contaminated soil must be removed for bio-remediation or disposed of at a facility for the	

Planning, design and construction phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:		
	substance concerned. Disturbed land must be rehabilitated and seeded with vegetation seed naturally occurring on site; • Do not locate any ablution facilities, sanitary convenience, septic tank or French drain within the 1:100 year flood line, or within a horizontal distance of 100m (whichever is greater) of a watercourse or drainage line; • Vehicles and machinery must be regularly serviced to avoid leakages; • No uncontrolled discharges from the site or working area to depressions may be permitted. All discharge points will require approval from the Environmental Site Agent (ESA); • No water courses may be used to clean equipment, or for bathing. All cleaning operations should take place off site at a location where wastewater can be disposed of correctly; • The discharge of any pollutants such as cement, concrete, lime, chemicals, etc. into the natural environment and the storm water system must strictly be prohibited; • Fuel and chemical storage should be done within a designated area only, which is properly bund and able to contain 110% of the capacity of fuel or chemicals stored within; • Construction vehicles must be inspected every morning before work commence to ensure that no leakages do occur; • All personnel must receive induction on how to report spillages, contain them and treat them accordingly; • Spill kits must be available at each working station; • Storm water and run-off should be managed and diverted to not be in contact with waste; • Drip trays must be placed beneath all construction equipment that is stationary on site or within the site camp; and, • Hazardous waste must be stored in bins with a lid in a demarcated waste area and must be disposed of at a hazardous treatment facility with records on file.	
Nature of impact: Handling of general waste materials on the development site.	**Activity:** The presence of personnel and construction operations on site will increase the likelihood of littering and the dumping of solid waste.	
Significance rating:	Moderate	Low
Cumulative impact:		
Proposed Mitigation:	• An adequate number of scavenger proof litter bins are to be placed throughout the site. Two waste bins at least must be present, one (1) for hazardous waste and one (1) for non-hazardous waste at each working site. Dumping of waste on site is prohibited; • When a skip is utilised it must be ensured that the skip is covered to prevent windblown waste; • Waste sorting and separation should form part of the environmental induction and awareness programme, to encourage personnel to collect wastepaper, glass and metal waste separately; • Keep all work sites including storage areas, offices and workshops neat and tidy; • Dedicate a demarcated and signposted storage area on site for the collection of construction waste; • All domestic waste is to be removed from site and disposed of at a registered solid waste landfill site (Musina Landfill site) as mentioned in the BAR; • Care should be taken to ensure that no waste fall off disposal vehicles on-route to the landfill. If needed, a tarpaulin can be utilised; • The burning or burying of solid waste on site is prohibited. Do not burn PVC pipes or other plastic materials, as this is regarded as hazardous waste;	

Planning, design and construction phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:		
	• Littering by construction workers shall not be permitted; • Workers from the immediate area need to be encouraged to take their waste with them at the end of each day; • General refuse/rubbish shall be removed from site on a weekly basis to an approved registered landfill site or as soon as the waste bins are reaching full capacity; • Minimise waste by sorting wastes into recyclable and non-recyclable waste; • Ablution facilities must be serviced by a registered service provider, cleaned at least once a week, and safe disposal slips must be on file at the site office; • A bi-weekly (twice a week) litter patrol of the entire site shall be conducted by the designated Environmental Officer (EO); • Hazardous waste must be sorted from non-hazardous waste and disposed of at a hazardous treatment facility, records and proof of disposal must be kept; and, • A register must be kept of the quantities of waste disposed and proof of disposal must be available at the site office.	
Nature of impact: Increased risk of veld fires.	**Activity:** Due to the presence of construction personnel in natural areas, fires can occur if not managed to the correct standard.	
Significance rating:	Moderate-High	Low
Cumulative impact:	-	-
Proposed Mitigation:	• The potential risk of veld fires is heightened by windy conditions in the area, specifically during the dry, windy winter months; • Assume acceptable pre-cautions to guarantee that fires are not started as a result of works on site as specified below: the Contractor will be held responsible for any damage to structures or property on or neighbouring the Site as a result of any fire caused by personnel; • The Contractor must ensure that construction related activities that pose a potential fire risk, such as welding etc., are properly managed and confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include clearing working areas and avoiding working in high wind conditions when the risk of fires is greater. In this regard special care must be taken during the high risk dry, windy winter months; • The Contractor must provide fire-fighting training to selected construction staff and take cognisance of the Veld and Forest Fire Act, Act No. 101, 1998; • As per the conditions of the Code of Conduct, in the event of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor must compensate the fire-fighting costs borne by farmers and Local Authorities; • Equip vehicles and site structures with fire extinguishers. Rubber beaters must be stored on site; • No open fires are allowed anywhere on site; • Storage of fuel or chemicals under trees is not permitted; • Gas and liquid fuel are not to be stored in the same place; • Smoking may only occur within a 3m radius from designated areas; • Personnel must be adequately trained in the handling of firefighting equipment; and, • Fuel, diesel, oil, or any other flammable substance must be stored 6m away from the smoking area.	
Nature of impact: Traffic impacts associated with the	**Activity:** The movement of vehicles on site may result in the destruction of biodiversity, compaction of valuable topsoil and mortalities of fauna on site.	

Planning, design and construction phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:		
movement of construction vehicles on site.		
Significance rating:	Moderate	Low
Cumulative impact:	Low	Low
Proposed Mitigation:	• After the final layout has been approved, conduct a thorough footprint investigation (walk-through) to detect and map (by GPS) all protected plant species, which have to be removed and animal burrows present within the project site. • Animal burrows must be monitored by the ECO prior to construction for activity/presence of animal species. If detected, such animals must be removed and relocated by a qualified professional/contractor; • During construction create designated turning areas and strictly prohibit any off-road driving or parking of vehicles and machinery outside designated areas; • Ensure that runoff from compacted or sealed surfaces is slowed down and dispersed sufficiently to prevent accelerated erosion from being initiated (storm water and erosion management plan required); • Ensure adequate drainage where roads cross drainage lines or ephemeral tributaries; • Monitor the establishment of (alien) invasive species and remove as soon as detected, before regenerative material can be formed; • Abnormal loads and machinery should avoid movement over gravel roads during and immediately after rainfall events, so as to limit destruction of road surfaces and sedimentation of downhill rivers/streams; • All vehicles must be road-worthy, be maintained to prevent fuel or oil leaks and drivers are to the licensed appropriately for the driving of their assigned vehicle. Drivers responsible for the transportation of personnel must be specifically licensed to do so; • Construction vehicles may not leave the designated roads and tracks, whilst U-Turns are prohibited on all roads; • Signage is to be placed on vehicles at all times; • All construction vehicles should adhere to construction sites and avoid off-road to minimise impact on vegetation and soil; • After decommissioning, if access roads or portions thereof will not be of further use to the landowner, remove all foreign material and rip area to facilitate the establishment of vegetation, followed by a suitable revegetation program; and, • Construction-related vehicles and machinery may not operate on site without reflective safety signage, car-top lights and reflective personnel gear.	
Nature of impact: Traffic impacts associated with the movement of construction vehicle.	**Activity**: The movement of vehicles in the vicinity of the construction site may cause damage to road surfaces as well as increase in the traffic volume of the R572.	
Significance rating:	Moderate	Moderate
Cumulative impact:	Low	Low
Proposed Mitigation:	• Abnormal loads should be timed to avoid times of year when traffic volumes are likely to be higher, as would be expected over national holidays, weekends and school holiday periods; • Vehicles used for transport of materials and sand must be fitted with tarpaulins to prevent the release of such material or items onto road surfaces;	

Planning, design and construction phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:		
	• Any damage to public roads is to be reported to the management authority and repaired to its original condition; • Transport of materials should be limited to the least amount of trips possible; and, • Abnormal loads should not be transported after dark.	

Planning, design and construction phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON BIOLOGICAL ASPECTS:		
Nature of impact: Direct impact on vegetation during construction and loss of species.	**Activity:** The construction of several permanent structures on site will result in the loss of vegetation due to foundation excavation.	
Significance rating:	Low	Low
Cumulative impact:	-	-
Proposed Mitigation:	• After the final layout has been approved, conduct a thorough footprint investigation to detect and map (by GPS) any protected plant species and active animal burrows; • Protected plant species must be relocated where possible; • Keep areas affected to a minimum, strictly prohibit any disturbance outside the demarcated foundation footprint area; • Clear as little indigenous vegetation as possible, aim to maintain vegetation where it will not interfere with the construction or operation of the development, rehabilitate an acceptable vegetation layer according to rehabilitation recommendations of the relevant EMP'r, if possible; • Indigenous vegetation unique to the area must be used during landscaping activities; • There must be a pre-construction environmental induction for all construction staff on site to ensure that basic environmental biodiversity principles are adhered to; • Where the ECO deems it necessary (e.g. sensitive, natural areas) the ecologist appointed to do the vegetation study will be utilized; • Restoration measures will be required to reinstate functionality in the disturbed soil and vegetation; • Impacts to sensitive sites (drainage lines) must be avoided; • No vegetation may be gathered for the purpose of creating fire; • SANParks must be consulted with prior to construction to identify and demarcate biodiversity conservation areas within close vicinity of the site; and, • No fires are allowed on site.	
Nature of impact: Dust nuisance generated by the operation of machinery and vehicles.	**Activity:** The frequent upwelling of dust as consequence of the movement of vehicles and machinery on site may impact on worker health causing asthma and other respiratory conditions. Stockpiles are susceptible to the upwelling of fine particulate matter. Several ambient factors, the terrain characteristics, soil type and land use forms can attribute to the degree of loss and susceptibility of stockpiles towards the generation of dust. Regular watering of exposed surfaces may result in the reduction of wind-generated dust from stockpiles.	
Significance rating:	Low	Low
Cumulative impact:	-	-
Proposed Mitigation:	• Implement dust suppression measures by watering areas to be cleared as well as already exposed surfaces with damaged soil particles, particularly during dry, windy periods;	

Planning, design and construction phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON BIOLOGICAL ASPECTS:		
	• Ensure all vehicles remain on designated roads and avoid the opening of detour or by-pass tracks; • Implement speed restrictions for vehicles on gravel roads; • Manage and maintain roadside vegetation to allow for absorption of runoff from road surfaces during and after rainy periods; • Areas around the proposed project footprint must be adequately rehabilitated to prevent significant dust emissions; and, • After construction decommissioning, if access roads or portions thereof will not be of further use to the landowner, remove all foreign material and rip area to facilitate the establishment of vegetation, followed by a suitable revegetation program.	
Nature of impact: Fauna will be directly impacted as a result of construction activities and human presence at the site.	**Activity:** The construction of facilities will result in some habitat loss for resident fauna, as some species will occur within the affected areas. In addition, increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to resident fauna. Sensitive and shy fauna may move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species (such as mole rats or blind snakes) would not be able to avoid the construction activities and might be killed.	
Significance rating:	Moderate	Low
Cumulative impact:	-	-
Proposed Mitigation:	• No hunting, snaring, shooting, nest raiding or egg collection by the construction staff should be allowed; • Holes and trenches should not be left open for extended periods of time and should only be dug when needed for immediate construction. Trenches that may stand open for some days should have places where the loose material has been returned to the trench to form an escape ramp present at regular intervals to allow any fauna that fall in to escape; • No open fires are allowed on site; • Posters of species of conservation concern must be kept on site where they will be visible to construction personnel; • Ensure that the construction area is fenced off from adjacent areas which may harbour wild animals; • Do not store building materials and excess stockpiled soils within riparian zones or within areas where natural vegetation occur; and, • Should any fauna be discovered it should be relocated to an area outside the development footprint by a trained professional.	

Planning, design and construction phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON SOCIO-ECONOMIC ASPECTS:		
Nature of impact: The creation of job opportunities during the construction phase.	**Activity:** The construction period will create a few job opportunities for individuals residing in the area of the MPNP.	
Significance rating:	Moderate (+)	Moderate (+)
Cumulative impact:	-	-
Proposed Mitigation:	• Where reasonable and practical the contractors appointed by the Applicant must appoint local contractors and implement a “local first” policy, especially for semi and low-skilled	

Planning, design and construction phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON SOCIO-ECONOMIC ASPECTS:		
	job categories. However; due to the low skill levels in the area, the majority of skilled posts are likely to be filled by personnel from outside the area; • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible, particularly for less labour-intensive work such as flag bearing and supervision; and, • The ongoing presence of semi and high skilled personnel involved in the project construction phase will generate sustained clientele to a portion of the guest house industry within the vicinity of the development.	

Planning, design and construction phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON CULTURAL-HISTORICAL ASPECTS:		
Nature of impact: Damage and destruction of vertebrate fossils during excavation activities.	**Activity:** Excavation activities can result in the discovery of cultural and historical artefacts beneath the earth surface. Damage or loss can occur if the correct procedures are not followed.	
Significance rating:	Moderate	Moderate
Cumulative impact:	-	-
Proposed Mitigation:	• Should any heritage resources (including but not limited to fossil bones, coins, indigenous and/or colonial ceramics, any articles of value or antiquity, stone artefacts or bone remains, structures and other built features, rock art and rock engravings) be exposed during excavation for the purpose of construction, construction in the vicinity of the finding must be stopped. A trained Palaeontologist or Heritage Specialist must be notified to assess the finds, and this must then be reported to the applicable Heritage Authority and the following details must be provided: ➢ Date; ➢ Position of the excavation (GPS) and depth; ➢ A description of the nature of the find; ➢ Digital images of the excavation showing vertical sections (sides) and the position of the find showing its depth/location in the excavation; ➢ A reference scale must be included in the images (tape measure, ranging rod, or object of recorded dimensions); and, ➢ Close-up, detailed images of the find (with the scale included). • Heritage remains uncovered or disturbed during earthworks must not be disturbed further until the necessary approval has been obtained from the Heritage Authority. A registered Heritage Specialist must be called to the site for inspection and removal once Authority to do so, has been given; • Excavations must be limited to the footprint area and be maintained in a narrow corridor; • All operations of excavation equipment must be made aware of the possibility of the occurrence of sub-surface heritage features and the following procedures must be followed: o All construction in the immediate 50 m vicinity radius of the site must cease; o The Heritage Practitioner must be informed as soon as possible; o In the event of obvious human remains SAPS must be notified; o Mitigation measures (such as refilling, etc.) must not be attempted; o The area in a 50 m radius of the find must be cordoned off with hazard tape; and,	

Planning, design and construction phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON CULTURAL-HISTORICAL ASPECTS:		
	• Public access must be limited and the area must be placed under guard.	

Planning, design and construction phase	Before Mitigation	After Mitigation
POTENTIAL VISUAL IMPACTS		
Nature of impact: Impact on the sense of place for surrounding users.	**Activity:** The movement of construction vehicles, machinery and personnel on site shall result in a visual impact on surrounding users. Furthermore to this, the storage of materials and excavation shall result in disturbance and an unsightly character.	
Significance rating:	Moderate	Moderate
Cumulative impact:	-	-
Proposed Mitigation:	• Access roads are to be kept clean and dust suppression techniques should be implemented to minimise impacts of vehicle movement; • Site offices and structures should be limited to one location and carefully situated to reduce visual intrusions. Roofs should be grey and non-reflective; • Construction camps as well as development areas should be screened with netting; • Lights within the construction camp should face directly down (angle of 90˚); • Minimum vegetation should be removed to ensure the visual absorption capacity remain high; • Litter should be strictly controlled, as the spread thereof through wind could have a very negative visual impact; • Avoid shiny materials in structures. Where possible shiny metal structures should be darkened or screened to prevent glare; and, • Mitigation of visual impacts associated with the construction phase would entail proper planning, management and rehabilitation of the construction site. Mitigation measures include the following: ➢ Reduce the time of construction through careful planning of logistics and ensure the productive implementation of resources; ➢ Limit disturbance of the environment to the development footprint; and, ➢ Rehabilitate all disturbed areas immediately after construction through cut and shape and possible revegetation should it be required.	

Planning, design and construction phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON NOISE ASPECTS:		
Nature of impact: Noise nuisance generated by construction works, vehicles and personnel.	**Activity:** The operating of vehicles and machinery on site results in the generation of noise, disturbing users of the surrounding area.	
Significance rating:	Moderate	Moderate
Cumulative impact:	-	-
Proposed Mitigation:	• Limit working hours of noisy equipment to daylight; • All stationary noisy equipment such as compressors and pumps should be contained behind acoustic covers, screens or sheds where possible; • The regular inspection and maintenance of equipment must be undertaken to ensure that all components are functioning optimally;	

Planning, design and construction phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON NOISE ASPECTS:		
	• Where recurrent use of machinery is frequent, machines should be shut down during intermediate periods; • Fit silencers to equipment; • Unless otherwise specified by the ESA, normal work hours will apply (i.e. from 06:30 to 17:00, Mondays to Fridays); • Ensure that Employees and staff conduct themselves in an acceptable manner while on site, both during work hours and after hours; and, • No loud music is permitted on site or in the Camp.	

4.3 POTENTIAL OPERATIONAL PHASE IMPACTS

4.3.1 MAPUNGUBWE DORMITORIES

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:				
Nature of impact: Handling of general waste materials on the development site.	**Activity:** The presence of visitors on site will increase the likelihood of littering and the dumping of solid waste.			
Significance rating:	Low	Low	Low	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• It must be ensured that a dedicated waste area is developed on site. The waste area must consist of a roof structure, lockable gate, impermeable surface and a bund area; • An adequate number of scavenger proof litter bins are to be placed throughout the site (preferably within the buildings. If stored outside it might attract baboons); • Waste sorting and separation bins should be placed at all public facilities, to encourage visitors to dispose wastepaper, glass and general waste separately; • Keep all work sites including storage areas, offices and workshops neat and tidy; • All domestic waste is to be removed from site and disposed of at a registered solid waste landfill site (Musina Landfill site) as mentioned in the BAR; • Care should be taken to ensure that no waste fall of disposal vehicles on-route to the landfill. If needed, a tarpaulin can be utilised; • The burning or burying of solid waste on site is prohibited. Do not burn PVC pipes or other plastic materials, as this is regarded as hazardous waste; • Minimise waste by sorting wastes into recyclable and non-recyclable waste; and, • A bi-weekly litter patrol of the entire site shall be conducted by the designated Park Ranger.			
Nature of impact: Traffic impacts associated with the movement of vehicles on site.	**Activity:** An increase in traffic flow can increase mortalities within the park if not mitigated properly.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• Day visitor vehicles may not leave the designated roads and tracks, whilst U-Turns are prohibited on all roads;			

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON GEOGRAPHICAL AND PHYSICAL ASPECTS:				
	• Any damage to public roads is to be reported to the management authority and repaired to its original condition; and, • Speed restrictions must be enforced within the park boundaries (40 kph).			

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON BIOLOGICAL ASPECTS:				
Nature of impact: Infestation of the area with Alien and Invasive Species.	**Activity:** Implementation of the MPNP Alien Species programme to control invasive alien plants.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	Low	-	Low	-
Proposed Mitigation:	***Clearing and Guiding Principles*** • Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of the cleared area; • The lighter infested areas should be cleared first to prevent seed build-up; • Pre-existing dense areas should be left for last, as they probably will not increase in density or pose a greater threat than they are currently; and, • All clearing actions should be monitored and documented to keep track of which are due for follow-up clearing. ***Clearing Methods*** • Different species require different control methods such as manual, chemical or biological methods or a combination of the two; • Care should be taken to ensure that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, soil disturbance should be kept to a minimum. The vegetative stage of the plants should also be considered before clearing; • Fire is not a natural phenomenon in the area and should not be used in general for alien control or vegetation management at the site. Only *Cylindropuntia sp* should be destroyed by burning after removal, since these plants can spread vegetative as well as with seed; and, • The best-practice clearing method for each species identified should be used. The preferred clearing methods for most alien species can be obtained from the Department of Water and Agricultural Affairs (DWAF) Working for Water website: http://www.dwaf.gov.za/wfw/Control/. ***Use of Herbicides for Alien Control*** Although it is usually preferable to use manual clearing methods where possible, such methods may create additional mechanical disturbance which may stimulate alien invasion and may also be ineffective for many woody species which re-sprout. Where herbicides are to be used, the impact of the eradication program on the natural environment should be minimised be observing the following: • Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control;			

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON BIOLOGICAL ASPECTS:				
	• Care must be taken to prevent contamination of water bodies. This includes special care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures; • Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable place; • To avoid damage to indigenous or other desirable vegetation, herbicides that would have the least effect on the indigenous vegetation should be used; • Droplet nozzles with a course spray pattern should be fitted to avoid drift of herbicides onto neighbouring vegetation; • The appropriate health and safety precautions should be followed regarding the storage, handling and disposal of herbicides; and, • The DFFE must be contacted prior to the clearing of Alien and Invasive Species to ensure that the clearing does not trigger any listed activities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998).			

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON SOCIO-ECONOMIC ASPECTS:				
Nature of impact: Business/Tourism Opportunities	**Activity:** Job creation for Local Communities residing within the area.			
Significance rating:	Moderate (+)	Moderate (+)	Moderate (+)	Moderate (+)
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• Where reasonable and practical the Applicant must appoint local contractors and implement a "local first" policy, especially for semi and low-skilled job categories. However; due to the low skill levels in the area, the majority of skilled posts are likely to be filled by personnel from outside the area; and, • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible, particularly for less labour-intensive work such as receptionist, tour guides and cleaners.			
Nature of impact: Business/Tourism Opportunities	**Activity:** Enhancement of visitor experience within the Mapungubwe National Park.			
Significance rating:	Moderate (+)	-	Moderate (+)	-
Cumulative impact:	-	-		-
Proposed Mitigation:	N/A			

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON VISUAL:				
Nature of impact: Visual Impact on the surrounding areas.	**Activity:** The proposed development will have a Visual Impact on surrounding tourist as the development will include permanent structures.			
Significance rating:	Moderate	Low	Moderate	Moderate
Cumulative impact:	Low	Low	Low	Low

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON VISUAL:				

Proposed Mitigation:	• Avoid shiny materials in structures. Where possible shiny metal structures should be darkened or screened to prevent glare;
	• Mitigation to minimise lighting impacts include the following:
	  • Shielding the sources of light by physical barriers (walls, vegetation or structures itself);
	  • Limit mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights);
	  • Make use of downward directional lighting fixtures;
	  • Make use of minimum lumen or wattage in lights;
	  • Ensure that no spot lights are on at night;
	  • Use motion sensors to activate lighting ensuring light is available when needed.
	• The colour scheme should be in line with the Mapungubwe National Park Museum Complex;
	• The height of buildings must be kept as stipulated within the building plans;
	• No open fires will be allowed on site;
	• Adequate waste bins must be placed through-out the site;
	• Waste collection areas must be properly screened by brick walls or similar materials;
	• Rehabilitation and Post-closure measures:
	  • All above-ground structures should be removed, safely disposed of or possibly recycled for use elsewhere; and,
	  • The affected area should be regraded to pre-development topographic conditions, unless the area is required for new specific uses.			

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON NOISE LEVELS:				
Nature of impact: Noise Impact on surrounding properties	**Activity:** Increased activities and visitors may contribute to noise levels within the area.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• No loud music to be permitted on site; • Machinery such as aircon motors need to be placed behind acoustic screens in order to minimise noise; and, • All equipment must be well maintained in order to ensure that noise levels are kept to a minimum.			

4.3.2 MAPUNGUBWE HILL COMPLEX

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON GEOGRAPHICAL AND PHYSICAL ASPECTS:				
Nature of impact: Handling of general waste materials on the development site.	**Activity:** The presence of visitors on site will increase the likelihood of littering and the dumping of solid waste.			
Significance rating:	Low	Low	Low	Low
Cumulative impact:	-	-	-	-

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON GEOGRAPHICAL AND PHYSICAL ASPECTS:				
Proposed Mitigation:	• An adequate number of scavenger proof litter bins are to be placed within the visitor Orientation centres (If placed outside it might attract scavenger animals); • Waste sorting and separation bins should be placed at all public facilities, to encourage visitors to dispose wastepaper, glass and general waste separately; • Keep all work sites including storage areas, offices and workshops neat and tidy; • All domestic waste is to be removed from site and disposed of at a registered solid waste landfill site (Musina Landfill site) as mentioned in the BAR; • Care should be taken to ensure that no waste fall of disposal vehicles on-route to the landfill. If needed, a tarpaulin can be utilised; • The burning or burying of solid waste on site is prohibited. Do not burn PVC pipes or other plastic materials, as this is regarded as hazardous waste; • Minimise waste by sorting wastes into recyclable and non-recyclable waste; and, • A bi-weekly litter patrol of the entire site shall be conducted by the designated Park Ranger.			

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON BIOLOGICAL ASPECTS:				
Nature of impact: Infestation of the area with Alien and Invasive Species.	**Activity:** Implementation of the MPNP Alien Species programme to control invasive alien plants.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	Low	-	Low	-
Proposed Mitigation:	***Clearing and Guiding Principles*** • Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of the cleared area; • The lighter infested areas should be cleared first to prevent seed build-up; • Pre-existing dense areas should be left for last, as they probably will not increase in density or pose a greater threat than they are currently; and, • All clearing actions should be monitored and documented to keep track of which are due for follow-up clearing. ***Clearing Methods*** • Different species require different control methods such as manual, chemical or biological methods or a combination of the two; • Care should be taken to ensure that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, soil disturbance should be kept to a minimum. The vegetative stage of the plants should also be considered before clearing; • Fire is not a natural phenomenon in the area and should not be used in general for alien control or vegetation management at the site. Only *Cylindropuntia sp* should be destroyed by burning after removal, since these plants can spread vegetative as well as with seed; and, • The best-practice clearing method for each species identified should be used. The preferred clearing methods for most alien species can be obtained from the Department of Water and Agricultural Affairs (DWAF) Working for Water website: http://www.dwaf.gov.za/wfw/Control/.			

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON BIOLOGICAL ASPECTS:				
	Use of Herbicides for Alien Control Although it is usually preferable to use manual clearing methods where possible, such methods may create additional mechanical disturbance which may stimulate alien invasion and may also be ineffective for many woody species which re-sprout. Where herbicides are to be used, the impact of the eradication program on the natural environment should be minimised be observing the following: • Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control; • Care must be taken to prevent contamination of water bodies. This includes special care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures; • Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable place; • To avoid damage to indigenous or other desirable vegetation, herbicides that would have the least effect on the indigenous vegetation should be used; • Droplet nozzles with a course spray pattern should be fitted to avoid drift of herbicides onto neighbouring vegetation; • The appropriate health and safety precautions should be followed regarding the storage, handling and disposal of herbicides; and, • The DFFE must be consulted prior to the clearance of Alien and Invasive Species to ensure that no listed activities are triggered in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998).			

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON SOCIO-ECONOMIC ASPECTS:				
Nature of impact: Business/Tourism Opportunities	**Activity:** Job creation for Local Communities residing within the area.			
Significance rating:	Moderate (+)	Moderate (+)	Moderate (+)	Moderate (+)
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• Where reasonable and practical the Applicant must appoint local contractors and implement a "local first" policy, especially for semi and low-skilled job categories. However; due to the low skill levels in the area, the majority of skilled posts are likely to be filled by personnel from outside the area; • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible, particularly for less labour-intensive work such as receptionist, tour guides and cleaners; and, • The ongoing presence of semi and high skilled personnel involved in the project construction phase will generate sustained clientele to a portion of the commercial industry within the vicinity of the development.			
Nature of impact: Business/Tourism Opportunities	**Activity:** Enhancement of visitor experience within the Mapungubwe National Park.			
Significance rating:	Moderate (+)	-	Moderate (+)	-

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON SOCIO-ECONOMIC ASPECTS:				
Cumulative impact:	-	-	-	-
Proposed Mitigation:	N/A			

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON VISUAL:				
Nature of impact: Visual Impact on the surrounding areas.	**Activity:** The proposed development will have a Visual Impact on surrounding tourist as the development will include permanent structures.			
Significance rating:	Moderate	Low	Moderate	Low
Cumulative impact:	Low	-	Low	-

Proposed Mitigation:	• Avoid shiny materials in structures. Where possible shiny metal structures should be darkened or screened to prevent glare;
	• Mitigation to minimise lighting impacts include the following:
	  • Shielding the sources of light by physical barriers (walls, vegetation or structures itself);
	  • Limit mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights);
	  • Make use of downward directional lighting fixtures;
	  • Make use of minimum lumen or wattage in lights;
	  • Ensure that no spotlights are on at night;
	  • Use motion sensors to activate lighting ensuring light is available when needed.
	• The aesthetic value should not be changed from those as illustrated within the building plans;
	• The height of buildings must be kept as stipulated within the building plans;
	• No open fires will be allowed on site;
	• Adequate waste bins must be placed through-out the site;
	• Should formal footpaths be developed it must be constructed from materials found within the study area;
	• Rehabilitation and Post-closure measures:
	  • All above-ground structures should be removed, safely disposed of or possibly recycled for use elsewhere; and,
	  • The affected area should be regarded to pre-development topographic conditions, unless the area is required for new specific uses.			

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON NOISE LEVELS				
Nature of impact: Noise Impact on surrounding properties	**Activity:** Increased activities and visitors may contribute to noise levels within the area.			
Significance rating:	Low	Low	Low	Low
Cumulative impact:	-	-	-	-
Proposed Mitigation:	• No loud music to be permitted on site; • Machinery such as aircon motors need to be placed behind acoustic screens in order to minimise noise; and,			

Operational Phase	Layout Alternative 1		Layout Alternative 2	
	Before Mitigation	After Mitigation	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON NOISE LEVELS				
	• All equipment must be well maintained in order to ensure that noise levels are kept to a minimum.			

Operational Phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON CULTURAL-HISTORICAL ASPECTS:		
Nature of impact: Damage and destruction of vertebrate fossils during tours.	**Activity:** Damage and destruction of vertebrate fossils and heritage artefacts can occur due to the presence of visitors within the area.	
Significance rating:	Moderate-High	Moderate
Cumulative impact:	-	-
Proposed Mitigation:	• Strict rules should be formulated and applied in terms of visitor movements and actions in an effort to protect the surrounding deposits; • Vehicular access should be limited; • A monthly monitoring programme should be started to determine any increases in site deterioration by means of fixed-point photography and ground compaction tests; and, • A dedicated management plan that includes comprehensive monitoring should be put in place.	

4.3.3 SCHRODA ORIENTATION CENTRE

Operational Phase	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON GEOGRAPHICAL AND PHYSICAL ASPECTS		
Nature of impact: Handling of general waste materials on the development site.	**Activity:** The presence of visitors on site will increase the likelihood of littering and the dumping of solid waste.	
Significance rating:	Low	Low
Cumulative impact:	-	-
Proposed Mitigation:	• An adequate number of scavenger proof litter bins are to be placed within the visitor Orientation centres (if placed outside it might attract scavenger animals); • Waste sorting and separation bins should be placed at all public facilities, to encourage visitors to dispose wastepaper, glass and general waste separately; • Keep all work sites including storage areas, offices and workshops neat and tidy; • All domestic waste is to be removed from site and disposed of at a registered solid waste landfill site (Musina Landfill site) as mentioned in the BAR; • Care should be taken to ensure that no waste fall of disposal vehicles on-route to the landfill. If needed, a tarpaulin can be utilised; • The burning or burying of solid waste on site is prohibited. Do not burn PVC pipes or other plastic materials, as this is regarded as hazardous waste; • Minimise waste by sorting wastes into recyclable and non-recyclable waste; and, • A bi-weekly litter patrol of the entire site shall be conducted by the designated Park Ranger.	
Nature of impact: Traffic impacts associated with the movement of vehicles on site.	**Activity:** An increase in traffic flow can increase mortalities within the park if not mitigated properly.	

Operational Phase	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON GEOGRAPHICAL AND PHYSICAL ASPECTS		
Significance rating:	Moderate	Low
Cumulative impact:	-	-
Proposed Mitigation:	• Day visitor vehicles may not leave the designated roads and tracks, whilst U-Turns are prohibited on all roads; • Any damage to public roads is to be reported to the management authority and repaired to its original condition; and, • Speed restrictions must be enforced within the park boundaries (40 kph).	

Operational Phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON BIOLOGICAL ASPECTS:		
Nature of impact: Infestation of the area with Alien and Invasive Species.	**Activity:** Implementation of the MPNP Alien Species programme to control invasive alien plants.	
Significance rating:	Moderate	Low
Cumulative impact:	Low	-
Proposed Mitigation:	***Clearing and Guiding Principles*** • Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of the cleared area; • The lighter infested areas should be cleared first to prevent seed build-up; • Pre-existing dense areas should be left for last, as they probably will not increase in density or pose a greater threat than they are currently; and, • All clearing actions should be monitored and documented to keep track of which are due for follow-up clearing. ***Clearing Methods*** • Different species require different control methods such as manual, chemical or biological methods or a combination of the two; • Care should be taken to ensure that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, soil disturbance should be kept to a minimum. The vegetative stage of the plants should also be considered before clearing; • Fire is not a natural phenomenon in the area and should not be used in general for alien control or vegetation management at the site. Only *Cylindropuntia sp* should be destroyed by burning after removal, since these plants can spread vegetative as well as with seed; and, • The best-practice clearing method for each species identified should be used. The preferred clearing methods for most alien species can be obtained from the Department of Water and Agricultural Affairs (DWAF) Working for Water website: http://www.dwaf.gov.za/wfw/Control/. ***Use of Herbicides for Alien Control*** Although it is usually preferable to use manual clearing methods where possible, such methods may create additional mechanical disturbance which may stimulate alien invasion and may also be ineffective for many woody species which re-sprout. Where herbicides are to be used, the impact of the eradication program on the natural environment should be minimised be observing the following:	

Operational Phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON BIOLOGICAL ASPECTS:		
	• Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control; • Care must be taken to prevent contamination of water bodies. This includes special care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures; • Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable place; • To avoid damage to indigenous or other desirable vegetation, herbicides that would have the least effect on the indigenous vegetation should be used; • Droplet nozzles with a course spray pattern should be fitted to avoid drift of herbicides onto neighbouring vegetation; • The appropriate health and safety precautions should be followed regarding the storage, handling and disposal of herbicides; and, • The DFFE must be consulted prior to the clearance of Alien and Invasive Species to ensure that no listed activities are triggered in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998).	

Operational Phase	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON SOCIO-ECONOMIC ASPECTS:		
Nature of impact: Business/Tourism Opportunities	**Activity:** Job creation for Local Communities residing within the area.	
Significance rating:	Moderate (+)	Moderate (+)
Cumulative impact:	-	-
Proposed Mitigation:	• Where reasonable and practical the Applicant must appoint local contractors and implement a "local first" policy, especially for semi and low-skilled job categories. However; due to the low skill levels in the area, the majority of skilled posts are likely to be filled by personnel from outside the area; • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible, particularly for less labour-intensive work such as receptionist, tour guides and cleaners; and, • The ongoing presence of semi and high skilled personnel involved in the project construction phase will generate sustained clientele to a portion of the commercial industry within the vicinity of the development.	
Nature of impact: Business/Tourism Opportunities	**Activity:** Enhancement of visitor experience within the Mapungubwe National Park.	
Significance rating:	Moderate (+)	Moderate (+)
Cumulative impact:	-	-
Proposed Mitigation:	N/A	

Operational Phase	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON VISUAL:		
Nature of impact: Visual Impact on the surrounding areas.	**Activity:** The proposed development will have a Visual Impact on surrounding tourist as the development will include permanent structures.	
Significance rating:	Moderate	Low
Cumulative impact:	-	-

Operational Phase	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON VISUAL:		

Proposed Mitigation:	• Avoid shiny materials in structures. Where possible shiny metal structures should be darkened or screened to prevent glare;
	• Mitigation to minimise lighting impacts include the following:
	  • Shielding the sources of light by physical barriers (walls, vegetation or structures itself);
	  • Limit mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights);
	  • Make use of downward directional lighting fixtures;
	  • Make use of minimum lumen or wattage in lights;
	  • Ensure that no spotlights are on at night;
	  • Use motion sensors to activate lighting ensuring light is available when needed.
	• The aesthetic value should not be changed from those as illustrated within the building plans;
	• The height of buildings must be kept as stipulated within the building plans;
	• No open fires will be allowed on site;
	• Adequate waste bins must be placed through-out the site;
	• Should formal footpaths be developed it must be constructed from materials found within the study area;
	• Rehabilitation and Post-closure measures:
	  • All above-ground structures should be removed, safely disposed of or possibly recycled for use elsewhere; and,
	  • The affected area should be regarded to pre-development topographic conditions, unless the area is required for new specific uses.	

Operational Phase	Before Mitigation	After Mitigation
POTENTIAL IMPACT ON NOISE LEVELS:		
Nature of impact: Noise Impact on surrounding properties	**Activity:** Increased activities and visitors may contribute to noise levels within the area.	
Significance rating:	Low	Low
Cumulative impact:		
Proposed Mitigation:	• No loud music to be permitted on site; • Machinery such as aircon motors need to be placed behind acoustic screens in order to minimise noise; and, • All equipment must be well maintained in order to ensure that noise levels are kept to a minimum.	

Operational Phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON CULTURAL-HISTORICAL ASPECTS:		
Nature of impact: Damage and destruction of vertebrate fossils during tours.	**Activity:** Damage and destruction of vertebrate fossils and heritage artefacts can occur due to the presence of visitors within the area.	
Significance rating:	Moderate-High	Low
Cumulative impact:	-	-
Proposed Mitigation:	• Strict rules should be formulated and applied in terms of visitor movements and actions in an effort to protect the surrounding deposits; • Vehicular access should be limited;	

Operational Phase	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ON CULTURAL-HISTORICAL ASPECTS:		
	• A monthly monitoring programme should be started to determine any increases in site deterioration by means of fixed-point photography and ground compaction tests; and, • A dedicated management plan that includes comprehensive monitoring should be put in place.	

4.4 ENVIRONMENTAL IMPACT STATEMENT

4.4.1 MAPUNGUBWE DORMITORIES

During the construction phase most impacts have a moderate impact rating prior to mitigation; however, if all mitigation measures are adhered to these impacts will have a low impact rating. The highest pre-mitigation impact will be the occurrence of veld fires due to the sensitive nature of the environment. If all mitigation measures are implemented on site, the occurrence of veld fires will have a low impact rating. It must be noted that one (1) positive impact will occur in the form of job creation during the construction phase. The employment opportunities will be temporary; however, it will provide some relief in a remote area. Layout Alternative 1 will have a lower impact on the haphazard placement of infrastructure on the environment than that of Layout Alternative 2. Layout Alternative 1 will occupy a smaller footprint and as such will require less material during the construction phase.

During the operational phase all impacts pre-mitigation will be moderate; however, all these impacts can be mitigated to a low impact rating. Layout Alternative 1 will have a lower impact in the handling of general waste material and visual aspects. This difference in the impact rating between Layout Alternative 1 and Layout Alternative 2 is as a result of the difference in the development footprint size.

4.4.2 MAPUNGUBWE HILL COMPLEX

The Mapungubwe Hill Complex is one of the most sensitive heritage areas within Southern Africa and as such will have a moderate-high impact pre-mitigation; however, the impact on heritage sources can be mitigated to a moderate level. As the proposed complex is situated deep within the Mapungubwe National Park veld fires caused by construction activities will have a devastating effect on the natural environment and the world heritage site and as such have been given a moderate-high impact rating. All other impacts have a moderate impact rating pre-mitigation and can be mitigated to a low level. Layout Alternative 1 will have a lower rating on groundwater contamination than Layout Alternative 2 as it will not be situated within thirty-two metres (32 m) of a watercourse.

During the operational phase the highest pre-mitigated impact will be that of cultural-historical aspects given the sensitivity of the Mapungubwe Hill complex. However, if all mitigation measures are implemented the impact can be mitigated to a moderate level. The proposed development will enhance tourism experiences and create employment opportunities and as such will have a moderate positive impact on the socio-economic aspect. All other impacts during the operational phase will have a low post-mitigation impact rating.

4.4.3 SCHRODA ORIENTATION CENTRE

Given the small development footprint and remoteness of the Schroda site, the majority of the impacts can be mitigated to a low impact rating. The highest impact during the construction phase will be the possibility of veld

fires that may occur due to malpractices. It must be ensured that firefighting equipment is readily available at all working stations. The Schroda Orientation centre will have a moderate visual impact as it is situated at a higher elevation within the landscape. Except for the two (2) instances provided all other impacts can be mitigated to a low impact rating during the construction phase.

During the operational phase all post-mitigated impact will be low, except for the socio-economic aspect which will be moderately positive. The low impacts are assigned as the interpretative centre will have a small footprint and will be light to earth (constructed on stilts).

4.5 GAPS IN KNOWLEDGE

The EIA process is being undertaken prior to the availing of certain information which would be derived from the project design and feasibility studies. As such, technical aspects included herein derive from a range of sources including pre-feasibility engineering and through personal communication with the design team. Given that the EIA process is one of several investigations being done, milestones and key outputs for each of these may not always be available for interrogation into the EIA process. As such, the DFFE and other commenting and decision-making Authorities are required to generate their decision based on the information available to the study at the time, whilst measures can be adopted to manage any changes as conditions within decisions are made.

Enviroworks is an independent environmental consulting firm and as such, all processes and attributes of the EIA are addressed in a fair and unbiased fashion. It is believed that through the running of a transparent and participatory process, risk associated with assumptions, uncertainties and gaps in knowledge can be, and where, minimised.

4.6 ASSUMPTIONS

The following assumptions can be made:

- All information provided by the Applicant (SANParks) to the EAP was correct and valid at the time it was provided;
- The public will receive a fair and recurring opportunity to participate in the EIA process, through the provision of Public Participation timeframes stipulated in the Regulations;
- The need and desirability was based on strategic national, provincial and local plans and policies which reflect the interests of both statutory and public viewpoints;
- The EIA process is a project-level framework and is limited to assessing the environmental impacts associated with the project phases of the activity being applied for only; and,
- Strategic level decision making is achieved through co-operative governance with sustainable development principles underpinning all decision-making.

4.7 UNCERTAINTIES

Given that an EIA involves prediction, uncertainty forms an integral part of the process. Two types of uncertainty are associated with the EIA process, namely process-related and prediction related. The FAO (2010) cites types of uncertainty as discussed by De Jongh in Wathern. These are summarised as follow:

- **Uncertainty of prediction** is critical at the data collection phase as final certainty will only be resolved on implementation of the activity being applied for;
- **Uncertainty of values** depicts the approach assumed during the EIA process, while final certainty will be determined at the time decisions are made. Enhanced communications and widespread co-ordinations can lower uncertainty; and,
- **Uncertainty of related decisions**, relates to the decision-making aspect of the EIA process, which shall be appeased once monitoring of the project phase is undertaken (Dougherty and Hall, 1995).

The FAO (2010) further stresses the significance of widespread consultation towards minimising the risk of omitting significant impacts. The use of quantitative impact significance rating formulas can further limit the occurrence and scale of uncertainty.

5 SECTION E: CONCLUSIONS AND RECOMMENDATIONS OF PRACTITIONER

Derived from the EIA it is advised that the Mapungubwe Hill Orientation Centre Alternative 1 is the preferred and recommended site. Even though both sites have a similar ecological state, Alternative 2 is closer to the drainage line and would increase the risk of pollution and contamination during the construction- and operational- phases. Overall, the likely impacts associated with the development are likely to be low and there are no anticipated impacts of high significance. Consequently, it is recommended that the proposed development should be allowed to continue.

The Visual Specialist indicated that the proposed upgrades would result in a higher quality of visitors experience and will draw more visitors to the park. The upgrades will result in a positive impact if all mitigation measures are implemented and therefore, the proposed development should be allowed to continue.

The Heritage Practitioner concluded that the Youth Centre Dormitories could possibly have an impact on heritage related deposits although no virgin deposits could be observed directly or through trowel tests. There were some displaced potsherds and stone tools suggesting that there might be deposits close by or sub-surface. The Mapungubwe and Schroda Orientation Centres – will have the greatest impacts in terms of heritage resources as they are located on very important archaeological deposits. It is imperative that the recommendations in this report be followed strictly should these developments continue. Overall, the socio-economic benefits to be gained through these developments seems to outweigh the localised impacts they might have on the archaeological deposits.

The EIA appended to this BAR illustrates that the proposed developments post mitigation will likely have a low impact on the surrounding environment. If all mitigation measures are implemented as listed within the Impact Assessment Report and Environmental Management Programme the positive impacts will outweigh the negative impact and as such from an environmental point of view it is recommended that the proposed developments be authorised. The EAP; however, recommends that the following conditions be included within the Environmental Authorisation:

- The use of designated roads should be maintained under all circumstances, except under exceptional circumstances where existing roads can't be used;
- Disturbed areas should be rehabilitated as soon as possible after the construction period;
- The facility and compliance with the EMP'r should be monitored intermittently during the construction and operational phase of the project;
- No open fires are to be allowed on site;
- Designated smoking areas must be marked on site;
- All applicable mitigation measures recommended by the various Specialists should be strictly implemented; and,
- The EMP'r should be approved by the DFFE prior to construction and its implementation should form part of the conditions of the Environmental Authorisation.

6 SECTION F: APPENDICES

Appendix A - Maps of the Study Area;

Appendix B - Photographs of the Study Area;

Appendix C - Facility Illustration of the Proposed Development;

Appendix D - Specialist Reports;

Appendix E - Public Participation Process (Comments and Response Report);

Appendix F - Impact Assessment;

Appendix G - Environmental Management Programme;

Appendix H - Details of the Environmental Assessment Practitioner;

Appendix I - Specialist Declaration; and,

Appendix J - Additional Information.

7 REFERENCES

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