

## Appendix F: Impact Assessment

# Impact Assessment

The assessment of impacts must adhere to the minimum requirements in the EIA Regulations, 2014 and should take applicable official guidelines into account. The issues raised by interested and affected parties should also be addressed in the assessment of impacts.

## **IMPACTS THAT MAY RESULT FROM THE PLANNING AND DESIGN, CONSTRUCTION, OPERATIONAL, DECOMMISSIONING AND CLOSURE PHASES AS WELL AS PROPOSED MANAGEMENT OF IDENTIFIED IMPACTS AND PROPOSED MITIGATION MEASURES**

The purpose of the assessment is to synthesise and analyse information relevant to the environmental impacts of a proposal. In order to achieve this, two elements, namely the outline of methodology used and the systematic assessment of the impacts are required.

The environmental significance scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can be ecological, economic, social, or all of the aforementioned. The evaluation of the significance of an impact relies heavily on the values of the person making the judgement. For this reason, impacts of especially a social nature need to reflect the values of the affected society.

This section identifies the issues associated with the proposed development, providing the significance scale and mitigation measures to reduce negative impacts and enhance positive impacts. This section provides an explanatory note on the methodology adopted for assessing the significance of the identified impacts.

To facilitate informed decision-making, EIA's must endeavour to come to terms with the significance of the potential environmental impacts associated with particular development activities. Despite their attempts at providing a completely objective and impartial assessment of the environmental implications of development activities, EIA processes can never completely escape the subjectivity inherent in attempting to define significance. Recognising this, we have attempted to address potential subjectivity in the current process as follows:

- Being explicit about the difficulty of being completely objective in the determination of significance, as outlined above.
- Developing an explicit methodology for assigning significance to impacts and outlining this methodology in detail in this BAR. Having an explicit methodology not only forces the assessor to come to terms with the various facets contributing toward determination of significance, thereby avoiding arbitrary assignment, but also provides the reader of the BAR with a clear summary of how the assessor derived the assigned significance.
- Wherever possible, differentiating between the likely significance of potential environmental impacts as experienced by the various affected parties.

Although these measures may not totally eliminate subjectivity, they provide an explicit context within which to review the assessment of impacts.

## 1 ASSESSMENT METHODOLOGY

This section outlines the methodology used to assess the significance of the potential environmental impacts. For each impact, the EXTENT (spatial scale), MAGNITUDE and DURATION (time scale) are described. These criteria are used to ascertain the significance of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The mitigation described represents the full range of plausible and pragmatic measures and does not imply that they would or should be implemented. The tables below show the scale used to assess these variables, and define each of the rating categories.

**Table 1: Assessment criteria for the evaluation of impacts**

CRITERIA	CATEGORY	DESCRIPTION
Extent or spatial influence of impact	<b>Regional</b>	Beyond 5 km of the proposed activity.
	<b>Local</b>	Within 5 km of the proposed activity.
	<b>Site specific</b>	On site or within 100 m of the site boundary.
Magnitude of impact (at the indicated spatial scale)	<b>High</b>	Natural and/ or social functions and/ or processes are <i>severely</i> altered.
	<b>Medium</b>	Natural and/ or social functions and/ or processes are <i>notably</i> altered.
	<b>Low</b>	Natural and/ or social functions and/ or processes are <i>slightly</i> altered.
	<b>Very Low</b>	Natural and/ or social functions and/ or processes are <i>negligibly</i> altered.
	<b>Zero</b>	Natural and/ or social functions and/ or processes remain <i>unaltered</i> .
Duration of impact	<b>Construction</b>	Up to 2 years.
	<b>Short Term</b>	0-5 years (after construction).
	<b>Medium Term</b>	5-15 years (after construction).
	<b>Long Term</b>	More than 15 years (after construction).

The SIGNIFICANCE of an impact is derived by taking into account the temporal and spatial scales and magnitude. The means of arriving at the different significance ratings is explained in Table 2.

**Table 2: Definition of significance ratings**

<b>SIGNIFICANCE RATINGS</b>	<b>LEVEL OF CRITERIA REQUIRED</b>
<b>High</b>	High magnitude with a regional extent and long term duration. High magnitude with either a regional extent and medium term duration or a local extent and long term duration. Medium magnitude with a regional extent and long term duration.
<b>Medium</b>	High magnitude with a local extent and medium term duration. High magnitude with a regional extent and short term duration or a site specific extent and long term duration. High magnitude with either a local extent and short term duration or a site specific extent and medium term duration. Medium magnitude with any combination of extent and duration except site specific and short term or regional and long term. Low magnitude with a regional extent and long term duration.
<b>Low</b>	High magnitude with a site specific extent and short term duration. Medium magnitude with a site specific extent and short term duration. Low magnitude with any combination of extent and duration except site specific and short term. Very low magnitude with a regional extent and long term duration.
<b>Very low</b>	Low magnitude with a site specific extent and short term duration. Very low magnitude with any combination of extent and duration except regional and long term.
<b>Neutral</b>	Zero magnitude with any combination of extent and duration.

Once the significance of an impact has been determined, the PROBABILITY of this impact occurring as well as the CONFIDENCE in the assessment of the impact, are estimated using the rating systems outlined in Table 3 and Table 4 respectively. It is important to note that the significance of an impact should always be considered in concert with the probability of that impact occurring. Lastly the REVERSIBILITY is estimated using the rating system outlined in Table 5.

**Table 3: Definition of probability ratings**

<b>PROBABILITY RATINGS</b>	<b>CRITERIA</b>
<b>Definite</b>	Estimated greater than 95 % chance of the impact occurring.
<b>Highly probable</b>	Estimated 80 to 95 % chance of the impact occurring.
<b>Probable</b>	Estimated 20 to 80 % chance of the impact occurring.
<b>Possible</b>	Estimated 5 to 20 % chance of the impact occurring.
<b>Unlikely</b>	Estimated less than 5 % chance of the impact occurring.

**Table 4: Definition of confidence ratings**

<b>CONFIDENCE RATINGS</b>	<b>CRITERIA</b>
<b>Certain</b>	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.
<b>Sure</b>	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
<b>Unsure</b>	Limited useful information on and understanding of the environmental factors potentially influencing this impact.

**Table 5: Definition of reversibility ratings**

<b>REVERSIBILITY RATINGS</b>	<b>CRITERIA</b>
<b>Irreversible</b>	The activity will lead to an impact that is permanent.
<b>Long Term</b>	The impact is reversible within 2 to 10 years after construction.
<b>Short Term</b>	The impact is reversible within the 2 years of construction.

## **2 SUBJECTIVITY IN ASSIGNING SIGNIFICANCE**

To facilitate informed decision-making, EIA's must endeavor to come to terms with the significance of the potential environmental impacts associated with particular development activities. Despite their attempts at providing a completely objective and impartial assessment of the environmental implications of development activities, EIA processes can never completely escape the subjectivity inherent in attempting to define significance. Recognising this, we have attempted to address potential subjectivity in the current process as follows:

- Being explicit about the difficulty of being completely objective in the determination of significance, as outlined above.
- Developing an explicit methodology for assigning significance to impacts and outlining this methodology in detail in this BAR. Having an explicit methodology not only forces the assessor to come to terms with the various facets contributing toward determination of significance, thereby avoiding arbitrary assignment, but also provides the reader of the BAR with a clear summary of how the assessor derived the assigned significance.
- Wherever possible, differentiating between the likely significance of potential environmental impacts as experienced by the various affected parties.

Although these measures may not totally eliminate subjectivity, they provide an explicit context within which to review the assessment of impacts.

### 3 CONSIDERATION OF CUMULATIVE IMPACTS

The National Environmental Management Act requires the consideration of cumulative impacts as part of any environmental assessment process. EIA's have traditionally, however, failed to come to terms with such impacts, largely as a result of the following considerations:

- Cumulative effects may be local, regional or global in scale and dealing with such impacts requires co-ordinated institutional arrangements; and
- EIA's are typically carried out on specific developments, whereas cumulative impacts may result from broader biophysical, social and economic considerations, which typically cannot be addressed at the project level.

In terms of the proposed satellite hub the following cumulative impacts have specifically been identified:

- Impact of additional construction related traffic.
- Impact that the additional infrastructure may have on the visual and aesthetic of the area.

### 4 CONSTRUCTION PHASE IMPACTS ON THE BIOPHYSICAL AND SOCIAL ENVIRONMENT

The construction phase is likely to result in a number of negative impacts on the biophysical and social environments. The significance of construction phase impacts is likely to be curtailed by their relatively short duration. Moreover, many of the construction phase impacts can be mitigated by the implementation of an approved Environmental Management Programme (EMPr), (see draft report attached as **Appendix G of the DBAR**).

The potential impacts and an assessment of their significance are discussed below.

#### **The bio-physical issues identified include:**

- Change to Physical Topography
- Ecological Sensitivity
- Erosion and Sedimentation
- Ground and surface water impact
- Stormwater management
- Geotechnical conditions

#### **The socio-economic impacts identified include:**

- Heritage
- Solid waste removal – to a registered site
- “Sense of place” – visual impact
- Dust
- Noise pollution
- Safety
- Traffic
- Employment opportunities (short and long-term) - positive

#### 4.1 Assessment of construction phase impacts

A summary of the construction phase impacts (assessed within the BAR) is provided below.

**Table 6: Summary of construction impacts**

IMPACT	Without mitigations (positive & negative)			With mitigation (positive & negative)		
	HIGH	MODERATE	LOW	HIGH	MODERATE	LOW
Change to Physical Topography		x				x
Ecological Sensitivity <ul style="list-style-type: none"> <li>• Habitat loss (Fauna and Flora)</li> <li>• Barriers to dispersal and migration of fauna and flora</li> </ul>	x					x
Erosion and Sedimentation		x				x
Ground and Surface Water Impact		x				x
Heritage			x			x
Solid Waste Removal		x				x
Noise disturbance		x				x
“Sense of Place” - Visual		x				x
Windblown Dust		x				x
Litter and Waste		x				x
Safety		x				x
Traffic		x				x
Socio-Economic <ul style="list-style-type: none"> <li>▪ Employment Opportunities (short-term)</li> <li>▪ Influx of aliens</li> </ul>			x		✓	
		x				x

A summary of the integrated construction phase impacts:

**Table 7: Summary of integrated construction impacts for the Tswalu Tented Camp and Staff Accommodation**

	Preferred Layout	
	Without mitigation	With mitigation
Extent	Site specific/ Local	Site specific/ Local
Magnitude	High (-)	Medium Low (-)
Duration	Construction	Construction
Significance	Medium (-)	Low (-)
Probability	Highly Probable	Highly Probable
Confidence	Certain	
Reversibility	Short Term	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

#### 4.1.1 Change to physical topography

Physiographically, the proposed sites fall within an area that constitutes gently sloping, undulating terrain (despite the tented camp site being at the foothills of a prominent rocky outcrop). Both individual sites are relatively flat.

The development and construction activities associated with the construction (excavation etc...), of the proposed Tented Camp and Staff Accommodation, suggests the possibility of changes to topography of each site respectively, and thus the landscape. However, the need for extensive “cut and fill” has been reduced by cognitive design.

This potential impact is considered to be of **low significance** with mitigation measures implemented

Mitigatory measures proposed are the following:

The Tented Camp and Staff Accommodation should be built and designed in such a way as to minimise its effect on the natural surroundings. The following should be taken note of:

- Excavation and reshaping of the area should be kept to a minimum.
- Structures to be built should where possible, be built to accommodate the natural features on site. These include but are not limited to:
  - Termite mounds, large trees and bush clumps as well as any other outstanding physical features. These should be left untouched and infrastructure aligned to accommodate these.
- Adequate storm water and erosion control measures should be put into place where topography is altered.

**Table 8: Change to physical topography**

	Preferred Layout	
	Without mitigation	With mitigation
Extent	Local	Local
Magnitude	Medium (-)	Low (-)
Duration	Short term	Short term
Significance	Medium (-)	Low (-)
Probability	Probable	Unlikely
Confidence	Sure	
Reversibility	Irreversible	



**Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)**

#### 4.1.2 Ecological Sensitivity

Both the new tented camp and the staff accommodation sites are represented by two distinct vegetation communities. While the tented camp site is undisturbed, there are areas within the proposed staff area that have been disturbed historically. As the sites are considered representative of their veld types, the sites have been allocated a High sensitivity status. The ecological specialist's assessment of the sites Specific Ecological importance also corroborates this.

The overall predicted significance on the impact of the construction within the study area is **Low**, except for two specific impacts whose significance is assessed as Medium:

- loss or damage of plant species of conservation importance and
- disturbance of conservation-important fauna.

These two impacts are the greatest threats presented by the proposed development on the ecological integrity of the area, particularly if the recommendations below are not implemented. To counter the few predicted Low and Medium impacts of the proposed development on the ecology of the study area, and to comply with the land use guidelines set out by SANBI for areas with High SEI, the preliminary recommendations and mitigation measures have been included below.

As a result of specialist ecological input, the following potential ecological impacts have been identified:

- **Losses of portions of Protected Areas, High Site Ecological Importance and Very High Destruction of a portion of a Protected Area** – the study area is situated within a formally proclaimed PA, which can be regarded as a CBA. However, the proposed development footprint is very small (less than 3 ha) and within a PA of over 110 000 ha. The significance of this is therefore **Low**.
- **Destruction / Degradation of a vegetation community with High Site Ecological Importance** – although both vegetation communities within the study area attain a High SEI, only the Plains Woodland community will be affected by the proposed development. However, the area to be destroyed is very small. The significance of this impact is therefore assessed as **Low**.
- **Loss or damage of plant species of conservation importance** – three protected plants species, one of which occurs in low density (*Lessertia frutescens*) and two in high density (*Boscia albitrunca* and *Vachellia erioloba*), are confirmed from within the study area and may be destroyed during clearing for construction. Due to the very high numbers present within the proposed development footprint, the significance of this is rated as **Medium**.
- **Invasion of natural habitat by alien plants** – although no alien plant species were located during fieldwork, invasion is possible as construction activities could introduce seeds which may thrive in bare soil resulting from building activities. Due to the low levels of infestation in the general area, the significance of this impact is **Low**.
- **Loss of habitat for conservation-important fauna** – several threatened mammal species were confirmed from within or adjacent to the study area. However, due to the small size of the proposed footprint and large size of the PA, the significance of this is **Low**.
- **Disturbance of conservation-important fauna** – evidence of several threatened mammal species was found around the artificial waterhole to the east of the study area during fieldwork. It is likely that both construction activities and the occupied villas themselves may cause unnecessary disturbance to sensitive species attempting to drink or hunt. The significance of this impact is assessed as **Medium**.
- **Potential of soil erosion** – rain and sediment runoff from loose and bare soil and solid structures such as roofs and decks is likely to result in some erosion. However, due to the sandy substrate and low rainfall of the area the significance of this impact is **Low**.

- **Increase in poaching activities** – unsupervised construction workers may participate in small scale poaching through setting snares or traps for bushmeat. Medicinal plants may also be harvested for muthi. Due to the strict access controls and anticipated high supervisory presence, the impact is likely to be **Low**

**The ecological study for the area concluded that; “Provided the recommendations suggested, are followed, there is no objection to the proposed development in terms of the terrestrial ecosystems of the study area.”**

#### **Important mitigation measures would include:**

- No development should take place within a 500m buffer of the existing waterhole situated on the eastern edge of the proposed development to alleviate the potential disturbance on potentially sensitive fauna species and ecological processes.
- Lights around the solar array to be kept to a minimum to reduce the potential collision of nocturnal migrating birds.
- The solar array site must be fenced off to prevent access and potential injury of fauna from the panels. The fence must be electrified to repel larger mammals such as Giraffe and Eland and must contain visible markers to deter fauna. The design of the electric fence must consider the potential threat to Pangolin.
- The electrical cables associated with the solar array should preferably be buried and aligned along existing tracks.
- The design of each of the villas and back of house infrastructure should preferably avoid all nationally and provincially protected plant species. If this is not possible, a destruction permit should be obtained from the relevant authority.
- It is preferable that the design and construction of the villas and back-of-house area disturb as little topsoil as possible. Therefore, a strut or pillar-supported approach should be considered as far as possible. This would entail aligning electrical, sewage and water systems to underneath walkways and decks to limit trenching.
- It is suggested that erosion control actions be implemented around all infrastructure and roads to prevent stormwater damage. Rainwater could be trapped off the roofs of the proposed infrastructure and sediment traps could be constructed at key points to prevent sedimentation of downstream habitats.
- It is suggested that a regular (annual) monitoring programme be implemented to identify and control any alien invasive plant species.
- All waste and litter generated at the proposed infrastructure sites should be stored in hyaena and baboon-proof areas and should be removed and recycled on a regular basis.
- It is important that weed control, if involving herbicides, be managed correctly to reduce the impact on the adjacent natural vegetation. Regular inspections should be made to determine if any additional alien plants have established.
- Labour teams should be supervised during construction activities and no access to the natural habitat adjacent to the study area should be allowed.
- Poaching could be a significant threat. If any external labour teams are used during construction, then these teams should preferably be accommodated off site; if this is not possible then teams should be carefully monitored to ensure that no unsupervised access to plant and animal resources takes place.
- The appointment of an ECO prior to construction, is important.
- The borders of the areas to be developed should be demarcated with rope in order to prohibit access by the construction team into ecologically sensitive vegetation communities (this rope must be removed once construction is completed).
- New infrastructure should not impact any large indigenous trees, wherever possible, especially the trees *Vachellia erioloba* and *Boscia albitrunca*, which are protected.
- New infrastructure to be designed to minimize any negative impacts. This could include building around taller trees or incorporating them into the design, ensuring the design and implementation of an environmentally aware waste treatment system, minimizing waste and encouraging waste recycling.

- Natural areas where new infrastructure is planned should be checked by a suitably experienced botanist prior to construction to locate all conservation-important species.
- All existing and proposed roads to contain adequate stormwater drainage and erosion control measures.

If all proposed activities are kept within the site footprint as indicated and mitigation measures are implemented, then this potentially medium significance could be reduced to **low**.

In addition to the mitigatory measures listed above the following mitigations are also of relevance.

### 1. Habitat loss (Fauna and Flora)

The proposed site for the Tented Camp and Staff Accommodation although somewhat disturbed contains indigenous vegetation, resulting in a vegetation sensitivity of moderate to high. The total loss of land for habitats is highly unlikely and any loss that does occur will be much localised. The significance of this habitat loss is **low** as much of the area surrounding the sites as well as the sites themselves will be able to sustain the vegetation in its natural state. Impacts will be site specific and temporary.

The development of the above-mentioned sites is in principal not a significant change in land-use and will thus not contribute to large scale fragmentation and loss of faunal habitats. The limited habitat loss and fragmentation that could occur on site would be permanent, site bound and of **low** significance.

The adoption of recommendations will be beneficial.

#### Mitigation:

- Existing indigenous vegetation should be retained and enhanced where possible.
- All instructions, as set out in the Tswalu Management rules and regulations must be adhered to.
- Indigenous vegetation should be utilized in landscaping to retain linkages and to retain a sense of place.

### 2. Barriers to dispersal and migration of fauna and flora

The construction of any structures, artificial landscapes, roads and fencing may create barriers to dispersal and migration of indigenous fauna and flora. The relatively small footprint of the proposed development and its proximity to existing infrastructure reduce the significance of this impact.

However, despite this, barriers to faunal dispersal and migration will probably occur and without mitigation the significance of the impacts will be **moderate**. These impacts will be permanent and localised. With mitigation, the impacts may be reduced to **low**.

#### Mitigation:

- Where infrastructure is to be built, the layout should take cognizance of the natural features and thus allow for relative free movement of fauna. Ecological corridors are to be incorporated into the design.

**Table 9: Ecological sensitivity**

	Preferred Layout	
	Without mitigation	With mitigation
Extent	Local	Local
Magnitude	High (-)	Low (-)
Duration	Short term	Short term
Significance	High (-)	Low (-)
Probability	Probable	Unlikely
Confidence	Sure	
Reversibility	Irreversible	

**Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)**

#### 4.1.3 Erosion and sedimentation

One of the potential impacts of construction is the erosion of surface soils and the subsequent sedimentation of downstream environments. This is due to the clearing of land, which leads to the runoff from the site having a high sediment load. Potential sedimentation of the streams, despite them being located quite a distance from the development, is therefore of particular concern.

Where possible, construction activities should be scheduled to occur outside of the rainy period, thereby reducing the volume of runoff during construction. If this is not possible then extra precaution needs to be taken to reduce this impact.

In addition to the above the following mitigatory measures should be implemented:

- Topsoil must be stockpiled separately on the high ground side of, and within the designated construction site of the camp for later rehabilitation use, and should not be compacted. No other soil may be placed or stockpiled upon it. Topsoil stockpiles are not to exceed 1.5 m in height and should be protected by a mulch cover. This mulch cover must not contain alien vegetation.
- Topsoil is to be replaced by direct return where feasible (i.e. replaced immediately on the area where construction is complete), rather than stockpiling it for extended periods, and may not be used for any other purpose.
- Where backfill material is deficient, it must be made up by importation from an approved borrow pit, and may not be made up by excavation within the construction site. Should the applicant have registered borrow pits located on their land, these may be used to source material.
- During construction, all areas susceptible to erosion must be protected by the installation of the necessary, temporary and permanent drainage works as soon as possible, and measures necessary for the prevention of surface water being concentrated in water sources and from scouring the slopes, banks and other areas must be taken into account.

Erosion protection measures should include, but not be limited to:

- The use of indigenous, endemic groundcover or grass
- Hard landscaping e.g. gabions.
- Storm water drainage measures should be implemented on site to control runoff and prevent erosion.
- Storm water berms should be constructed that will channel storm water appropriately.

This potential impact is considered to be of **low significance** with mitigation measures implemented.

**Table 10: Erosion and sedimentation**

	Preferred Layout	
	Without mitigation	With mitigation
Extent	Local	Local
Magnitude	Medium (-)	Low (-)
Duration	Short term	Short term
Significance	Medium (-)	Low (-)
Probability	Probable	Unlikely
Confidence	Sure	
Reversibility	Irreversible	

**Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)**

#### 4.1.4 Ground and surface water impact (Deterioration of water quality)

During construction, pollutants may find their way into drainage channels and watercourses. Typical sources of pollution include oils and fuels from construction vehicles and construction materials such as cement, detergents, paints and other chemicals. Careful management and education of all construction staff, together with the implementation of an appropriate EMP at this site, would curtail the risk of pollution spills. This potential impact is considered to be of **low significance** with mitigation measures implemented.

##### Mitigation:

- All personal washing operations will take place at a location where wastewater can be disposed of in an acceptable manner. Facilities not feeding into a formal drain should ensure that biodegradable soaps are used.
- Dry chemical toilets must be made available at the construction camp and must be cleaned and serviced regularly. All chemical toilets must be placed above the 1:100-year flood line or at least 100 m away from any water course.
- At least one toilet must be provided for every 15 employees or part thereof and must be serviced at least twice a month.
- All maintenance and repair work of construction vehicles will be carried out within an area designated for this purpose, equipped with the necessary pollution containment measures.
- The ground under the servicing and refuelling areas must be protected against pollution caused by spills and/or tank overfills.
- In the event of a breakdown or emergency repair, any accidental spillage must be cleaned up or removed immediately.
- All construction equipment and machinery must be maintained in good order. Regular checks must be undertaken for leaks and any found must be immediately repaired.
- Construction vehicles must be parked in the construction camp area after working hours.
- The Site Environmental Officer/Reserve Manager must ensure that reasonable precautions are taken to prevent the pollution of the ground and water resources on and adjacent to the sites during the construction phase.
- No natural watercourse is to be used for the cleaning of tools or any other apparatus. This includes for purposes of bathing, or the washing of clothes etc. All washing operations will take place at a location where wastewater can be disposed of in an acceptable manner.
- The contractor must maintain good housekeeping practices that ensure that all work sites are kept tidy and litter free, ensuring no runoff of refuse into surrounding watercourses.
- No spills may be hosed down into a storm water drain or sewer, or into the surrounding natural environment. All contaminated soil is to be excavated to the depth of contaminant penetration, placed in 200 litre drums and removed to an appropriate landfill site.

- Areas where cement and concrete are handled should be bunded and suitable methods developed to contain any access water containing waste. Water and slurry from concrete mixing operations must be contained to prevent pollution of the ground surrounding the mixing points.
- Tar and oil based products should be applied to the manufacturer's specifications. Care should be taken to identify pollution timely and suitable methods of decontamination should be used.
- Excavation of sand to solid ground must be done carefully and appropriate drainage incorporated. Excavating soil or imported backfill is to be stockpiled within the area designated for such, and may not take place within the 1:100-year flood line.
- A drainage diversion system is to be installed to divert run-off from areas of potential pollution. Internal storm water reticulation is to be constructed early in the project in order to significantly reduce the storm water effluent during construction.

**Table 11: Ground and surface water impact (Deterioration of water quality)**

	Preferred Layout	
	Without mitigation	With mitigation
<b>Extent</b>	Local	Local
<b>Magnitude</b>	Medium (-)	Low (-)
<b>Duration</b>	Short term	Short term
<b>Significance</b>	Medium (-)	Low (-)
<b>Probability</b>	Probable	Unlikely
<b>Confidence</b>	Sure	
<b>Reversibility</b>	Irreversible	

**Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)**

#### 4.1.5 Heritage impacts

The impact of the proposed development on both potential historical and palaeontological components within the study area was evaluated.

- **Historical**

At two of the survey locations, SO 1 and SO 5, a single isolated stone tool was found which is probably associated with the Late Stone Age (LSA). The artefacts are out of context and is scattered too sparsely to be of significance apart from mentioning them in this report.

In terms of the archaeological component of the Act (25 of 1999, section 35) two isolated stone tools were documented. One is outside of the proposed development area (Site SO1) and the other close to one of the tent unit footprints inside of the proposed development area. Due to the isolated nature and low frequency of the find, this is not regarded as being a significant archaeological site.

In terms of the built environment in the project area (section 34 of the Act) two sites were identified in the study area. They are of no heritage significance.

In terms of burial grounds and graves (section 36 of the Act) no graves or gravesites were identified in the study area.

This impact is thus considered to be of **low** heritage significance.

- **Palaeontological**

The area for the proposed Bruwer Camp lies on the ancient and non-fossiliferous strata of the Olifantshoek Supergroup, and the Quaternary aeolian sands that are potentially fossiliferous. Fossils could be found in palaeo-spring and palaeo-pan sites but none is visible from the satellite imagery.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are either much too old to contain fossils or have been wind transported. Only such geomorphological features such as palaeo-pans or paleo-springs might entrap fossils. No such feature is visible in the satellite imagery. Since there is an extremely small chance that fossils may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely **low** significance.

**Mitigation:**

- The bulk of archaeological remains are normally located beneath the soil surface. It is therefore possible that some significant cultural material or remains were not located during this survey and will only be revealed when the soil is disturbed. Should excavation or large scale earth moving activities reveal any human skeletal remains, broken pieces of ceramic pottery, large stone tool concentrations or large quantities of sub-surface charcoal or any material that can be associated with previous occupation, a local museum or qualified archaeologist should be notified immediately. This will also temporarily halt such activities until a heritage specialist has assessed the finds. It should be noted that if such a find occurs it may have further financial implications.

**Chance Find Protocol**

**Monitoring Programme for Palaeontology – to commence once the excavations / drilling activities begin.**

1. The following procedure is only required if fossils are seen on the surface and when drilling/excavations commence.
2. When excavations begin the rocks and must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
3. Photographs of similar fossil plants or bones must be provided to the developer to assist in recognizing the fossil plants in the shales and mudstones (for example see Figure 4, 5). This information will be built into the EMP's training and awareness plan and procedures.
4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer/environmental officer then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
7. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
8. If no fossils are found and the excavations have finished then no further monitoring is required.

**Table 12: Heritage**

	Preferred Layout	
	Without mitigation	With mitigation
<b>Extent</b>	<b>Local</b>	<b>Local</b>
<b>Magnitude</b>	<b>Low (-)</b>	<b>Low (-)</b>
<b>Duration</b>	<b>Short term</b>	<b>Short term</b>
<b>Significance</b>	<b>Low (-)</b>	<b>Low (-)</b>
<b>Probability</b>	<b>Highly Unlikely</b>	<b>Unlikely</b>
<b>Confidence</b>	<b>Sure</b>	
<b>Reversibility</b>	<b>Irreversible</b>	

**Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)**

#### **4.1.6 Solid waste removal**

Construction waste is an on-going issue on a construction site. Accumulation of waste can lead to health and safety hazards. Considering this any construction waste must be dealt with according municipal and governmental regulations. Household waste would be temporarily stored and sorted on site. Recycling of the waste would be promoted. An outside contractor would be appointed to remove all household waste from the developments to a registered waste disposal site. Any temporary waste storage site would be fenced off and made animal proof.

The developer envisages that the following waste management protocol be practiced:

- A place for food preparation and eating must be designated within the construction site. Dry chemical toilets must be made available at a ratio of 1:15 at the construction site and must be cleaned and serviced regularly.
- The contractor may not dispose of any waste and/or construction debris by burning or by burying. An adequate number of appropriate refuse bins must be provided at the construction site for refuse and solid waste.
- These bins must be emptied on a daily basis into an appropriate containment vessel that should be located in a designated waste storage area. This waste should be removed regularly to a registered dumping site for disposal.
- All waste must be transported in an appropriate manner (e.g. plastic rubbish bags). A specific site should also be allocated for construction waste e.g. empty cement bags etc. A low temporary fence may be erected around such a site in order to contain the waste and assist the effective removal thereof from the site.
- Waste should be separated and stored separately on site until removal. Construction waste should be removed on a weekly basis.
  - A place for food preparation and eating must be designated within the construction site. Dry chemical toilets must be made available at a ratio of 1:15 at the construction site and must be cleaned and serviced regularly.
  - The contractor may not dispose of any waste and/or construction debris by burning or by burying. An adequate number of appropriate refuse bins must be provided at the construction site for refuse and solid waste.
  - These bins must be emptied daily into an appropriate containment vessel that should be located in a designated waste storage area. This waste should be removed regularly to a registered dumping site for disposal.
  - All waste must be transported in an appropriate manner (e.g. plastic rubbish bags).A specific site should also be allocated for construction waste e.g. empty cement bags etc. A low temporary fence may be erected around such a site in order to contain the waste and assist the effective removal thereof from the site.



- Waste should be separated and stored separately on site until removal. Construction waste should be removed on a weekly basis. Limited amounts of non-hazardous rubble may be utilised as backfill in foundations that are to be capped to prevent any leaching occurring.
- Hazardous waste will be removed and taken to a registered hazardous waste disposal facility.
- Waste collected from units – internal collection
- Recycling policy – sort at source (will be investigated)
- Temporary onsite storage at for collection by Service provider (Professional Contractor)
- Disposal at registered landfill site – (Service agreement to be obtained)
- All storage facilities to be enclosed and animal proof.

**Table 13: Solid waste removal**

	<b>Preferred Layout</b>	
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	<b>Local</b>	<b>Local</b>
<b>Magnitude</b>	<b>Medium (-)</b>	<b>Low (-)</b>
<b>Duration</b>	<b>Short term</b>	<b>Short term</b>
<b>Significance</b>	<b>Medium (-)</b>	<b>Low (-)</b>
<b>Probability</b>	<b>Highly Unlikely</b>	<b>Unlikely</b>
<b>Confidence</b>	<b>Sure</b>	
<b>Reversibility</b>	<b>Irreversible</b>	

**Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)**

#### **4.1.7 Noise disturbance to surrounding land users**

Construction activities, construction vehicles and construction personnel on site would cause an increase in noise in the area, which may impact negatively on adjoining landowners and users. Since the proposed Tented Camp and Staff Accommodation is situated within the Tswalu Kalahari Private Nature Reserve, and given that existing lodges and surrounding neighbours require a quiet and calm ambiance and setting, this impact is considered of medium to high significance prior to mitigation.

Impacts of noise generation during construction in general could be mitigated by ensuring that all regulations relating to noise generation are observed and by restricting work to normal working hours. Further to this the following mitigation measures are of relevance:

- Landowners and neighbouring lodges should be informed prior to any activities that are bothersome taking place.
- Notify adjacent landowners of after-hours construction work and of any other activity that could cause a nuisance.
- No loud music is permitted on site.
- Noise from labourers to be controlled
- Noise suppression should be applied to all construction equipment
- If noise levels at the boundaries of the site exceed 7dB above ambient levels, then the local health authorities are to be informed.
- Respond to community complaints with regard to noise generation, taking reasonable action to eliminate and/or minimise the impact.
- Where complaints cannot be addressed to the satisfaction of all parties, then the Contractor will, upon instruction by the Project Manager, provide an independent and registered Noise Monitor to undertake a survey of the noise output levels. Recommendations to reduce noise to legislated levels must be implemented.

This potential impact could be readily managed by effective implementation of an EMP.

The significance of this impact would be reduced from **medium to low** by the implementation of these mitigation measures.

**Table 14: Noise disturbance to surrounding land users**

	Preferred Layout	
	Without mitigation	With mitigation
Extent	Local	Local
Magnitude	Medium (-)	Low (-)
Duration	Short term	Short term
Significance	Medium (-)	Low (-)
Probability	Probable	Unlikely
Confidence	Sure	
Reversibility	Irreversible	

**Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)**

#### 4.1.8 Visual – “Sense of Place”

The construction and operation of the proposed Tented Camp and Staff Accommodation will have a visual impact on the scenic resources of the study area especially on visitors to Tswalu, guests at the existing tourist lodges within this area and users of local roads. Visual impact associated with the new tented camp may be of a **moderate** significance. However, the staff accommodation site is adjacent to existing infrastructure and visual impact may be rated as **low**.

Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria and specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, current landuse, etc....) play a significant role.

A visual impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

The most noteworthy aspect contributing to the sense of place of the Tswalu Kalahari Reserve is the presence of undeveloped, natural bush.

However, mitigation of some of the visual impact is possible and will go far in reducing the magnitude of visual impacts discussed by softening the appearance of the development within its context. The recommendations made should be followed and the mitigation implemented on an ongoing basis. Considering all factors, it is concluded that the development is appropriate within its context from a visual perspective, and that the anticipated visual impacts are neither unacceptable in nature nor excessive in magnitude. Potential visual impacts are therefore not considered to be a fatal flaw for this development.

The anticipated visual impact of the Tented Camp and Staff Accommodation is expected to be of **moderate** significance and may be mitigated to **low**.

- Respond to the natural environment during the planning of buildings and infrastructure.
- Consolidate development and make use of already disturbed sites rather than pristine areas.
- Do not exceed 2 storey heights for all structures.
- Retain all large trees and protected species as identified, and adapting the development footprint to accommodate these.
- Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.
- Retain vegetation in all areas outside of actual built footprints wherever possible.
- Soften hard spaces and parking areas through the retention of existing vegetation or the introduction of appropriate indigenous planting.

- Make use of earth tones and natural materials rather than primary colours and hightech finishes.
- Visually break up large bulky buildings into smaller, subtler, less prominent shapes and planes.
- Avoid large areas of un-shaded reflective surface.
- Avoid the placement of unsightly services and infrastructure in visually prominent areas.
- Appropriate placement and screening of service areas
- Alignment should be compatible with the natural contours
- Mitigation of lighting impacts includes the pro-active design, planning and specification lighting for Tswalu Tented Camp and Staff Accommodation by a lighting engineer. The correct specification and placement of lighting and light fixtures for the house will go far to contain rather than spread the light.
- Mitigation of visual impacts associated with the construction phase, albeit temporary, entails proper planning, management and rehabilitation of the construction site. In addition, it is vital that vegetation is not unnecessarily cleared or removed during the construction period.
- The facility must be maintained in a neat and visually acceptable state throughout the operational life of the facility.

**Table 15: Visual Sense of Place**

	Preferred Layout	
	Without mitigation	With mitigation
Extent	Local	Local
Magnitude	Medium (-)	Low (-)
Duration	Long term	Long term
Significance	Medium (-)	Low (-)
Probability	Highly Probable	Probable
Confidence	Sure	
Reversibility	Irreversible	

Significance: positive impacts indicated by no shading & (+),negative impacts indicated by shading & (-)

#### 4.1.9 Traffic

Construction vehicles would have to make use of the public roads as well as smaller roads within the Tswalu Kalahari Reserve. Access will be via existing the Tswalu entrance gate. This area is utilised by general public as well as by other lodges for ingress and egress. It is important that any potential impacts associated with traffic generated by the project's construction traffic are minimised.

Measures to mitigate impacts on traffic flow, and potential damage that heavy trucks may have on these roads during construction include ensuring that all regulations relating to traffic management are observed. In addition to this construction vehicles must be made fully aware that the development is situated within a game reserve as well as be aware of the TKPNR rules and regulations and the sensitive nature of this impact.

This impact can be reduced to a **low** significance with the application of mitigation measures.

The following strategies should be implemented to minimise potential impacts from construction related traffic:

- All heavy vehicles travelling to and from the site will follow dedicated heavy vehicle routes to avoid roads that are not suited to these vehicles.
- Heavy vehicles will not be permitted to travel along these roads after more than 20 mm of rain and until the roads have dried satisfactorily.
- Where practicable, truck deliveries will be restricted to daytime working hours and the gate times of the TKPNR.
- If possible, the transport of oversize loads will be restricted to non-peak periods to minimise traffic disruptions and will be provided with appropriate escorts and approvals from the Tswalu Management, Roads Department and the Police.
- Clear traffic signs and signals will be installed on-site to provide for safe traffic movement.

- An on-site speed limit will be enforced.

**Table 16: Traffic**

	Preferred Layout	
	Without mitigation	With mitigation
Extent	Local	Local
Magnitude	High (-)	Low (-)
Duration	Short term	Short term
Significance	Medium (-)	Low (-)
Probability	Probable	Unlikely
Confidence	Sure	
Reversibility	Irreversible	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

#### 4.1.10 Windblown dust

Construction activities are likely to result in the increased production of windblown dust. However, provided that normal dust control measures (e.g. watering, suspending dust generating activities during high wind conditions, re-vegetating/ stabilising disturbed surfaces as soon as possible) are implemented, the significance of this potential impact is considered to be **low** post mitigation.

The following are mitigations that should be implemented:

- Air pollution caused during construction can be limited by using dust suppression methods such as water spraying.
- The use of delivery trucks during construction should be limited to travelling during the times as stipulated by the Tswalu Kalahari Reserve. Moreover, delivery times should take place outside of game drive times.
- Trucks that comply with the relevant legislation should be used and these delivery vehicles should be restricted in terms of the speed that they travel.
- Building material and sand should be covered during transport to and from the site.

**Table 17: Windblown dust**

	Preferred Layout	
	Without mitigation	With mitigation
Extent	Local	Local
Magnitude	Medium (-)	Low (-)
Duration	Short term	Short term
Significance	Medium (-)	Low (-)
Probability	Probable	Unlikely
Confidence	Sure	
Reversibility	Irreversible	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

#### 4.1.11 Litter/waste pollution

The effects of litter/waste pollution on the biophysical environment would be small, but could be more significant for the aesthetics of the area and golf course if not properly controlled. This potential impact could be readily managed by the provision of suitable refuse disposal facilities and the effective implementation of an EMP. The significance of this potential impact is considered to be **low** if the proposed mitigation measures are implemented.

The following are mitigations that should be implemented:

- Waste management plan for specific waste streams will be developed by the construction contractor prior to construction commencing.

- General waste will be collected and transported generally to local council approved disposal sites.
- Food wastes will be collected, where practicable, considering health and hygiene issues, for disposal off-site.
- Refuse containers will be located at each worksite.
- Where practical, wastes will be segregated and reused / recycled (e.g. scrap metal).
- All personnel will be instructed in project waste management practices and procedures as a component of the environmental induction process.
- Suppliers will be requested to minimise packaging where practicable.
- A high emphasis will be placed on housekeeping and all work areas will be maintained in a neat and orderly manner.
- All equipment and facilities will be maintained in a clean and safe condition.

**Table 18: Litter/waste pollution**

	Preferred Layout	
	Without mitigation	With mitigation
<b>Extent</b>	<b>Local</b>	<b>Local</b>
<b>Magnitude</b>	<b>Medium (-)</b>	<b>Low (-)</b>
<b>Duration</b>	<b>Short term</b>	<b>Short term</b>
<b>Significance</b>	<b>Medium (-)</b>	<b>Low (-)</b>
<b>Probability</b>	<b>Probable</b>	<b>Unlikely</b>
<b>Confidence</b>	<b>Sure</b>	
<b>Reversibility</b>	<b>Irreversible</b>	

**Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)**

#### 4.1.12 Safety

Construction activities could lead to injuries to staff, the public or fauna in the reserve.

These activities include:

- The construction of the Tented Camp and Staff Accommodation –
  - Movement of construction vehicles to and from the site
  - Handling of equipment and material

The significance of this potential impact is considered to be **low** if the proposed mitigation measures are implemented.

#### **General Mitigation:**

- Measures should be taken during the construction phase, to ensure that personnel and the general public are safe at all times.
- Access should be sufficient to provide safe movement of construction vehicles.
- Construction sites and trenches should be demarcated and protected.

#### **Emergency Response.**

The contractor will prepare a detailed emergency response plan prior to work commencing. The plan will include consideration of the following:

- Information identifying the obligations under the relevant legislation.
- Development of a response, investigation, command, control and recovery for both natural disasters and other disasters/emergencies and incidents.
- Response procedures in the event of a fire, chemical release, spill, accident, explosion, equipment failure, bomb threat, natural disaster (including severe storm, bushfire and flood events) or any other likely emergency.

- Communication arrangements and contact details.
- Roles and responsibilities of responsible personnel.
- Emergency controls and alarms.
- Evacuation procedures.
- Emergency response equipment.
- Training requirements.
- Site access and security.

## Fire Management

Minimise fire risk through evaluation processes and management of those risks.

- Restrict high-risk activities in accordance with local fire bans or in times of high fire danger.
- Maintain a plan for rapid and co-ordinated response to the outbreak of fire through an established fire response plan in conjunction with the local reserve and rural fire brigades.
- Develop evacuation procedures and hazard reduction.
- Undertake fire safety awareness training as part of site inductions.
- Conduct fire safety awareness training as part of site inductions.
- Conduct regular fire drills and record exercises as actions generated.
- Conduct periodic fire equipment audits.
- Consult with all relevant fire management authorities.

## Incidents and Complaints

All incidents and complaints will be managed through the auditing process and reported to the appropriate authority as required.

All incidents and complaints will be documented in an incidents/complaint register. The complaints form will document at least the following information:

- Time, date, and nature of complaint.

Type of communication (telephone, letter, email, visit).

- Name, contact address and contact number (if provided).
- Response and investigation undertaken as a result of the complaint.
- Action taken and signature of person investigating complaint.

Each complaint will be investigated as soon as practicable and, where appropriate, corrective action taken to remedy the cause of the complaint.

**Table 19: Safety**

	Preferred Layout	
	Without mitigation	With mitigation
<b>Extent</b>	Local	Local
<b>Magnitude</b>	High (-)	Low (-)
<b>Duration</b>	Short term	Short term
<b>Significance</b>	Medium (-)	Low (-)
<b>Probability</b>	Probable	Unlikely
<b>Confidence</b>	Sure	
<b>Reversibility</b>	Irreversible	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

#### 4.1.13 Socio-Economic Impact

There will definitely be a positive economic impact during the construction phase as temporary employment will be provided through the sourcing of unskilled labour. The construction of the proposed Tented Camp and Staff Accommodation opens up potential for local suppliers to also benefit from the proposed development. This positive impact will, however, be negated if out-of-town contractors are employed who utilise non-local construction workers and make use of supplies brought in from other provinces (i.e. Gauteng). If local labour and suppliers are utilised during the construction phase this potential positive socio-economic impact will go from a **low (negative)** to **medium (positive)** significance.

There is also the potential for negative social impacts if there is an influx of construction workers from outside the area. This issue needs to be carefully managed which will then reduce the significance from **medium** to **low**.

Mitigation should include:

- Continued promotion of Department of Trade and Industry's guidelines to redress past racial and gender inequalities.
- Promotion of local business ventures.
- Employment of local labour for permanent positions.
- Provision made for improvement of local skills

**Table 20: Socio-Economic impact – employment (short term)**

	Preferred Layout	
	Without mitigation	With mitigation
<b>Extent</b>	Local	Local
<b>Magnitude</b>	Low (-)	Medium (+)
<b>Duration</b>	Short term	Short term
<b>Significance</b>	Low (-)	Moderate (+)
<b>Probability</b>	Probable	Probable
<b>Confidence</b>	Sure	
<b>Reversibility</b>	Reversible	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

**Table 21: Socio-Economic impact – influx of aliens**

	Preferred Layout	
	Without mitigation	With mitigation
<b>Extent</b>	Local	Local
<b>Magnitude</b>	Moderate (-)	Low (-)
<b>Duration</b>	Short term	Short term
<b>Significance</b>	Moderate (-)	Low (-)
<b>Probability</b>	Probable	Probable
<b>Confidence</b>	Sure	
<b>Reversibility</b>	Reversible	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

## 5 Environmental Management Plan and Environmental Control Officer

As alluded to in the BAR, all of the aforementioned construction phase impacts could be addressed and minimised by the development and effective implementation of an Environmental Management Plan/Programme (EMPr). Accordingly, a draft EMPr for both construction and operational phases will be prepared (see draft report attached as **Appendix F; Annexure A**). Prior to construction, an appropriately qualified environmental consultant should ensure that the draft EMPr be amended to take cognisance of any further requirements included in the RoD. This EMPr should be incorporated into the Civil Tender Document, since this would ensure that:

- The Contractor is made aware of the EMPr “up front”;
- The EMPr is presented in a form and language familiar to the Contractor;
- The Contractor is able to cost for compliance with the EMPr; and
- The EMPr is binding within a well-developed legal framework.

To give appropriate effect to the environmental controls, it is essential that this EMPr be enforced by an appropriately qualified, independent Environmental Control Officer (ECO). The roles and responsibilities of the ECO should include:

- Ensuring that the necessary environmental authorisations and permits have been obtained;
- Monitoring and verifying that the EMPr is adhered to at all times and taking action if the specifications are not followed;
- Monitoring and verifying that environmental impacts are kept to a minimum;
- Reviewing and approving construction method statements with input from the Engineers;
- Assisting the Contractor in finding environmentally responsible solutions to problems;
- Giving a report back on the environmental issues at the monthly site meetings and other meetings that may be called regarding environmental matters;
- Keeping records of all activities/ incidents on Site in the Site Diary concerning the environment;
- Inspecting the site and surrounding areas regularly with regard to compliance with the EMPr;
- Keeping a register of complaints in the Site Office and recording and dealing with any community comments or issues;
- Monitoring the undertaking by the Contractor of environmental awareness training for all new personnel coming onto site;
- Ensuring that activities on site comply with other relevant environmental legislation;
- Ordering, via the Engineer’s Representative, the removal of person(s) and/or equipment not complying with the specifications;
- Issuing of fines for contraventions of the EMPr;
- Completing monitoring checklists; and
- Keeping a photographic record of progress on Site from an environmental perspective.



## 6 OPERATIONAL PHASE IMPACTS ON THE BIOPHYSICAL AND SOCIAL ENVIRONMENT

A limited number of potential long-term (operational) impacts were identified during the investigative phases.

### Potential bio-physical impacts:

- Erosion

### The socio-economic impacts identified include:

- Safety
- Visual impact

### 6.1 Assessment of operation phase impacts

A summary of the operation phase impacts (assessed within the draft BAR) is provided below.

**Table 22: Summary of operation impacts**

	Without mitigations			With mitigation		
	HIGH	MODERATE	LOW	HIGH	MODERATE	LOW
Erosion and Siltation			x			x
Visual – “sense of place		x				x
Land use			✓		✓	

#### 6.1.1 Erosion and Siltation

Erosion and siltation can be caused by various activities during the operational phase of the proposed new Tented Camp and Staff Accommodation if not properly managed. These activities include:

- The operation of the new Tented Camp and Staff Accommodation –
  - Increased run-off on the exposed areas of the rehabilitated bank prior to vegetation recolonizing the worked areas.

During the Operational phase the significance of this impact is viewed as **LOW** but may be mitigated to **VERY LOW** as vegetation cleared during construction will re-establish in a relatively short period providing natural stabilisation of the terrain against erosion.

#### Mitigation

- Vehicular activity in the immediate area surrounding the Tented Camp and Staff Accommodation must be kept to a minimum so as to avoid the formation of ruts and possible resultant erosion.
- Roads used for access and egress to the Hub should be properly planned and be placed in sympathy to the sites contours. These roads should have the necessary balusters and gabions in place so as to minimise stormwater runoff and the resultant erosion.
- Erosion protection measures should include, but not be limited to:
  - The use of groundcover or grass
  - Hard landscaping e.g. gabions.

**Table 23: Erosion and Siltation**

	Preferred Layout	
	Without mitigation	With mitigation
Extent	Local	Local
Magnitude	Medium (-)	Low (-)
Duration	Short term	Short term
Significance	Medium (-)	Low(-)
Probability	Probable	Unlikely
Confidence	Sure	
Reversibility	Short Term	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

### 6.1.2 Visual – “sense of place

Operation of the proposed development may impact negatively on the visual character of the area

However, mitigation of some of the visual impact is possible and will go far in reducing the magnitude of visual impacts discussed by softening the appearance of the development within its context. The recommendations made should be followed and the mitigation implemented on an ongoing basis. Considering all factors, it is concluded that the development is appropriate within its context from a visual perspective, and that the anticipated visual impacts are neither unacceptable in nature nor excessive in magnitude. Potential visual impacts are therefore not considered to be a fatal flaw for this development.

#### Mitigation

The appearance of the infrastructure (within reason) is possible to mitigate.

- The new Tented Camp and Staff Accommodation must be maintained in a neat and visually acceptable state throughout the operational life of the structures.
- Good practice requires that the mitigation of visual impacts as listed above be implemented and maintained on an ongoing basis. Mitigation of lighting impacts includes the pro-active design, planning and specification lighting for Tswalu Tented Camp and Staff Accommodation by a lighting engineer. The correct specification and placement of lighting and light fixtures for the house will go far to contain rather than spread the light.
- Mitigation of visual impacts associated with the construction phase, albeit temporary, entails proper planning, management and rehabilitation of the construction site. In addition, it is vital that vegetation is not unnecessarily cleared or removed during the construction period.
- The facility must be maintained in a neat and visually acceptable state throughout the operational life of the facility.

**Table 24: Visual – “sense of place**

	Preferred Layout	
	Without mitigation	With mitigation
Extent	Local	Local
Magnitude	Medium (-)	Low (-)
Duration	Short term	Short term
Significance	Medium (-)	Low(-)
Probability	Probable	Probable
Confidence	Sure	
Reversibility	Reversible	

Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)

### 6.1.3 Land Use

The proposed land use is compatible with the current land use, namely the use of the land for conservation, tourism and rendering the services related to this. The new Tented Camp and Staff Accommodation is directly linked to the successful operation of the properties as tourism and conservation based entities.

The proposed activity is in line with current activities as carried out within the Tswalu Kalahari Private Nature Reserve.

**NEMBA** identifies ecotourism as an integral component of the long term sustainability of conservation areas. The new Tented Camp and Staff Accommodation and the services required for the management of the TKPNR is integrally linked to conservation and tourism.

#### Mitigation to be implemented:

No mitigation is required as the development falls within the prescribed land use for the area.

**Table 25: Land Use**

	Preferred Layout	
	Without mitigation	With mitigation
<b>Extent</b>	Regional	Regional
<b>Magnitude</b>	Low (+)	High (+)
<b>Duration</b>	Long term	Long term
<b>Significance</b>	Low (+)	Moderate(+)
<b>Probability</b>	Highly Probable	Highly Probable
<b>Confidence</b>	Sure	
<b>Reversibility</b>	Long term	

**Significance: positive impacts indicated by no shading & (+), negative impacts indicated by shading & (-)**

## 7 FINAL CONCLUSIONS AND RECOMMENDATIONS

The essence of all EIA processes is aimed at ensuring informed decision-making and environmental accountability. Furthermore, it assists in achieving environmentally sound and sustainable development. In terms of NEMA (No 107 of 1998), the commitment to sustainable development is evident in the provision that “development must be socially, environmentally and economically sustainable and requires the consideration of all relevant factors. In addition, the preventative principle is required to be applied, i.e. that the disturbance of ecosystems and loss of biological diversity are to be “...avoided, or ... minimised and remedied” and “disturbance of the landscape and the nation’s cultural heritage is avoided and where it cannot be altogether avoided is minimised and remedied”. Therefore negative impacts on the environment and on people’s environmental rights in terms of the Constitution (Act 108 of 1996)) should be anticipated and prevented, and where they cannot be altogether prevented, they must be minimised and remedied in terms of “reasonable measures”. “Reasonable measures” implies that “every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law and cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment”.

## 8 CONCLUSIONS

The preceding chapters provide a detailed assessment of the anticipated environmental impacts on specific components of the biophysical and social environments associated with the proposed construction and operation of the two new Tented Camp and Staff Accommodation. This DBAR has provided a comprehensive assessment of the potential environmental impacts, identified by the EIA team and I&AP's, associated with the proposed project. **This investigation has not identified any potential impacts on the biophysical or social environments that are so severe as to suggest that the proposed activity should not proceed.** The design has taken cognisance of the various environmental considerations and accordingly, incorporates remedial measures aimed at curtailing the significance of the potential negative environmental impacts associated with the proposed development, as well as enhancing the potential positive environmental (including Socio-economic) impacts.

The significance of the potential environmental (biophysical and social) impacts associated with the proposed new Tented Camp and Staff Accommodation are summarised in Table 26.

It should be noted that the impacts have been assessed with a reasonable amount of confidence, i.e. in terms of the defined confidence ratings presented in Table 4.

From table 26 it is apparent that there is no long term or operational phase impacts of significant concern. The negative impacts associated with the operational phase are likely to be of **low to very low** significance, particularly if the proposed mitigation measures are implemented. Moreover, there are a number of potential positive impacts associated with the proposed development, viz., compliance with land use for the area, the creation of positive construction and operational phase impacts on employment opportunities and increased economic activity.

With regards to the short term or construction phase impacts, the significance of the construction phase impacts are likely to be curtailed by the relatively short duration of the construction phase. Moreover, many of the construction phase impacts could be mitigated by the effective implementation of the mitigation measures outlined above. If these measures were put into practice the significance of all construction phase impacts would be reduced to **low**. While the probability of the construction phase impacts occurring is relatively high without mitigation, the effective implementation of the mitigation measures will reduce the probability of the impacts occurring.

**Table 26: Summary of the significance and probability of the potential positive and negative impacts associated with the proposed new Tented Camp and Staff Accommodation.**

### Construction phase

IMPACT	Without mitigations (positive & negative)			With mitigation (positive & negative)		
	HIGH	MODERATE	LOW	HIGH	MODERATE	LOW
Surface & Ground-water contamination		x				x
Stormwater		x				x
Potential Impact on stream flow and riparian areas			x			x
Ecological Sensitivity		x				x
Loss of topsoil and soil erosion		x				x
Sanitation and waste management		x				x

IMPACT	Without mitigations (positive & negative)			With mitigation (positive & negative)		
	HIGH	MODERATE	LOW	HIGH	MODERATE	LOW
Visual Pollution / "Sense of Place"		*				*
Dust & Noise Pollution		*				*
Traffic		*				*
Safety		*				*
Socio-economic Impact			✓		✓	
Employment Opportunities (short-term)			✓		✓	

### Operation phase

	Without mitigations			With mitigation		
	HIGH	MODERATE	LOW	HIGH	MODERATE	LOW
Erosion and Siltation			*			*
Visual – "sense of place"		*				*
Land use			✓		✓	

*It is felt that the proposed Tented Camp and Staff Accommodation new Tented Camp and Staff Accommodation will have an overall positive impact on the natural and socio-economic environment, and should the necessary mitigation measures be implemented there are no impacts envisaged of high significance or any fatal flaws.*

*In this regard the EAP sees no reason as to why the proposed activity (development of the Farm Kingstown 380 KU new Tented Camp and Staff Accommodation) may not be authorised.*

## 9 RECOMMENDATIONS AND ENVIRONMENTAL IMPACT STATEMENT

### 9.1 Recommendations and Environmental Impact Statement

Should the proposed activity be authorised, the most important mitigation measures, which should be stipulated as requirements in any authorisation include the following:

- The Construction Phase EMP that addresses, inter alia, the issues discussed under Construction Phase impacts, viz. sedimentation, deterioration of water quality, traffic, windblown dust, noise disturbance and socio-economic impacts, should be effectively implemented for the duration of the project.

**All works will be conducted in accordance with the National Environmental Management: Protected Areas Act (No 10 of 2004); National Forest Act (No 84 of 1998) and National Water Act (No 36 of 1998); including obtaining the necessary permits to remove, destroy or damage any fauna or flora.**

**Strategies outlined below will be implemented to minimise potential impacts on flora and fauna:**

- No development should take place within a 500m buffer of the existing waterhole situated on the eastern edge of the proposed development to alleviate the potential disturbance on potentially sensitive fauna species and ecological processes.
- Lights around the solar array to be kept to a minimum to reduce the potential collision of nocturnal migrating birds.

- The solar array site must be fenced off to prevent access and potential injury of fauna from the panels. The fence must be electrified to repel larger mammals such as Giraffe and Eland and must contain visible markers to deter fauna. The design of the electric fence must consider the potential threat to Pangolin.
- The electrical cables associated with the solar array should preferably be buried and aligned along existing tracks.
- The design of each of the villas and back of house infrastructure should preferably avoid all nationally and provincially protected plant species. If this is not possible, a destruction permit should be obtained from the relevant authority.
- It is preferable that the design and construction of the villas and back-of-house area disturb as little topsoil as possible. Therefore, a strut or pillar-supported approach should be considered as far as possible. This would entail aligning electrical, sewage and water systems to underneath walkways and decks to limit trenching.
- It is suggested that erosion control actions be implemented around all infrastructure and roads to prevent stormwater damage. Rainwater could be trapped off the roofs of the proposed infrastructure and sediment traps could be constructed at key points to prevent sedimentation of downstream habitats.
- It is suggested that a regular (annual) monitoring programme be implemented to identify and control any alien invasive plant species.
- All waste and litter generated at the proposed infrastructure sites should be stored in hyaena and baboon-proof areas and should be removed and recycled on a regular basis.
- It is important that weed control, if involving herbicides, be managed correctly to reduce the impact on the adjacent natural vegetation. Regular inspections should be made to determine if any additional alien plants have established.
- Labour teams should be supervised during construction activities and no access to the natural habitat adjacent to the study area should be allowed.
- Poaching could be a significant threat. If any external labour teams are used during construction, then these teams should preferably be accommodated off site; if this is not possible then teams should be carefully monitored to ensure that no unsupervised access to plant and animal resources takes place.
- The appointment of an ECO prior to construction, is important.
- The borders of the areas to be developed should be demarcated with rope in order to prohibit access by the construction team into ecologically sensitive vegetation communities (this rope must be removed once construction is completed).
- New infrastructure should not impact any large indigenous trees, wherever possible, especially the trees *Vachellia erioloba* and *Boscia albitrunca*, which are protected.
- New infrastructure to be designed to minimize any negative impacts. This could include building around taller trees or incorporating them into the design, ensuring the design and implementation of an environmentally aware waste treatment system, minimizing waste and encouraging waste recycling.
- Natural areas where new infrastructure is planned should be checked by a suitably experienced botanist prior to construction to locate all conservation-important species.
- All existing and proposed roads to contain adequate stormwater drainage and erosion control measures.
- Respond to the natural environment during the planning of buildings and infrastructure.
- Consolidate development and make use of already disturbed sites rather than pristine areas.
- Do not exceed 2 storey heights for all structures.
- Retain all large trees and protected species as identified, and adapting the development footprint to accommodate these.
- Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.
- Retain vegetation in all areas outside of actual built footprints wherever possible.
- Soften hard spaces and parking areas through the retention of existing vegetation or the introduction of appropriate indigenous planting.
- Make use of earth tones and natural materials rather than primary colours and hightech finishes.
- Visually break up large bulky buildings into smaller, subtler, less prominent shapes and planes.
- Avoid large areas of un-shaded reflective surface.
- Avoid the placement of unsightly services and infrastructure in visually prominent areas.

- Appropriate placement and screening of service areas
- Alignment should be compatible with the natural contours
- Mitigation of lighting impacts includes the pro-active design, planning and specification lighting for Tswalu Tented Camp and Staff Accommodation by a lighting engineer. The correct specification and placement of lighting and light fixtures for the house will go far to contain rather than spread the light.
- Mitigation of visual impacts associated with the construction phase, albeit temporary, entails proper planning, management and rehabilitation of the construction site. In addition, it is vital that vegetation is not unnecessarily cleared or removed during the construction period.
- The facility must be maintained in a neat and visually acceptable state throughout the operational life of the facility.