4.2.4 Cultural and Historical Environment

This section is based on the Heritage Assessment by ACO Associates cc, 2015 (Appendix J).

KNPS was built between 1976 and 1981 on what was at the time an undeveloped and alien infested farm. The site alternatives for the TISF were both extensively disturbed by extensive massive earthworks and lay down areas for the construction of KNPS. While the broader site is rich, particularly in Pleistocene fossil deposits and possibly even earlier Miocene and Pliocene deposits at deeper depths, the site alternatives are sterile and significantly transformed by previous activities.

4.2.4.1 Palaeontological Context

In 1973, Richard Klein discovered the palaeontological site known as Duinefontein 2, which comprised of fragments of fossil animal bone that were un-earthed during trial excavations for KNPS. The site was extensively excavated between 1998 and 2003. There are at least three buried horizons (ancient land surfaces) at Duinefontein 2 (Klein 1999), each of which represents different ages in the Pleistocene and Holocene history of the region. Klein and his team found the fossilized remains of ancient Pleistocene fauna (about 300 000 years old) along with traces of human activity. The animals included many species not seen in the Cape today, as well as several extinct species such as the giant buffalo, giant pigs, extinct species of elephant, hippopotamus and the cape horse. The main fossil horizon lay roughly 1 m below the surface of the present day windblown sands. Nodular calcretes had developed over the fossil horizon making excavation very difficult at times. Deep soundings by Klein and his team revealed the presence of an even older deeper horizon; however groundwater at a depth of 2 m prevented its detailed excavation. Klein (pers. comm.) is of the opinion that archaeological and palaeontological deposits such as those found at Duinefontein 2 have the potential to exist anywhere within the Eskom held property and beyond; however more detailed surveys conducted since, show that the main fossil beds lie in the portion of the nature reserve to the north of KNPS.

When the excavation for KNPS took place in the 1970's, a deep sequence of fossil bearing sediments was exposed. The most recent sands and calcretes contained Pleistocene mammalian fossils as well as evidence of Early Stone Age occupation in the form of stone artefacts (Klein pers. comm.). Deeper down in the sequence, the sediments contained marine fossils of the Miocene period deposited during periods of marine transgression. Palaeontologist John Pether (2007) has indicated that these early deposits are deeply buried at 10-14 m below surface level, underneath a vertical section of 24-28 m of sediment.

4.2.4.2 Archaeological Context

The coastal regions of the southwestern Cape were occupied in pre-colonial times by peoples who exploited marine resources for their livelihood. Human occupation of the coast is archaeologically reflected in the thousands of shell midden sites and rock shelter deposits. Herder sites, such as at Kasteelberg, show occupation between 1800 and 1600 years ago. European explorers had contact with many of the Khoekhoen groups along the coast. These peoples included the CochoqQua, whose territory stretched from Saldanha Bay to Vredenburg, and the ChariGuriQua or GuriQua who occupied the lower Berg River area, St Helena Bay and points around Piketberg. Shell middens have been observed locally at Blouberg Beach, Atlantic Beach but very few within the Koeberg Nature Reserve despite exhaustive surveys.

Archival documentation makes reference to Hermanus Dempers an 'inhabitant and owner of the 'Opstal' on the loan place named 'Duinefontein' (CA CO 3985 ref, 117, CO 3887 ref 79). When the property was surveyed in 1834, there was no indication of houses or any built structures. There is, however, a 'Kraal Ordannantie' which features on the diagram as well as the later 1890 SW Cape survey map. The kraal location appears to be outside of KNPS boundary. The site of Demper's

house is not known, but it is possible that ephemeral evidence of its presence may lie under the dune sands somewhere on the Eskom property.

The colonial period history of Duinefontein is interesting; however, it does not reveal any particular significance in terms of associations with events, or important historical personalities.

4.2.5 Visual and Aesthetic Environment

The inherent value of the visual landscape to viewers is informed by geology/topography, vegetation and land-use and is expressed as *Visual Character* (overall impression of the landscape), *Visual Quality* (how the landscape is experienced) and *Sense of Place* (uniqueness and identity).

4.2.5.1 Visual Character

Visual character is descriptive and non-evaluative, which implies that it is based on defined attributes that are neither positive nor negative. A change in visual character cannot be described as having positive or negative attributes until the viewer's response to that change has been taken into consideration. The probable change caused by the project is assessed against the existing degree of change caused by previous development.

Typical character attributes, used to describe the visual character of the affected area and to give an indication of potential value to the viewer, are provided in Table 4-8.

The basis for the visual character of the study area is provided by the geology/topography, vegetation and land use of the area, giving rise to a confined industrial enclave in an open area of stable and active dunes under predominantly natural cover with influence from the ocean. The study area can be described as a *transition landscape* associated with the interface between urban development to the south and natural areas to the north.

The TISF will be located in KNPS SPA, a substantially modified landscape (*highly transformed landscape*) with high levels of visual impact caused by the reactor units and associated infrastructure (buildings, roads, powerlines, etc.).

4.2.5.2 Visual Quality

Aesthetic value is an emotional response derived from our experience and perceptions. As such, it is subjective and difficult to quantify in absolute terms. Studies in perceptual psychology have shown that humans prefer landscapes with higher complexity (Crawford, 1994). Landscape quality can be said to increase when:

- Topographic ruggedness and relative relief increases;
- Water forms are present;
- Diverse patterns of grasslands, shrubs and trees occur;
- Natural landscape increases and man-made landscape decreases; and
- Where land-use compatibility increases.

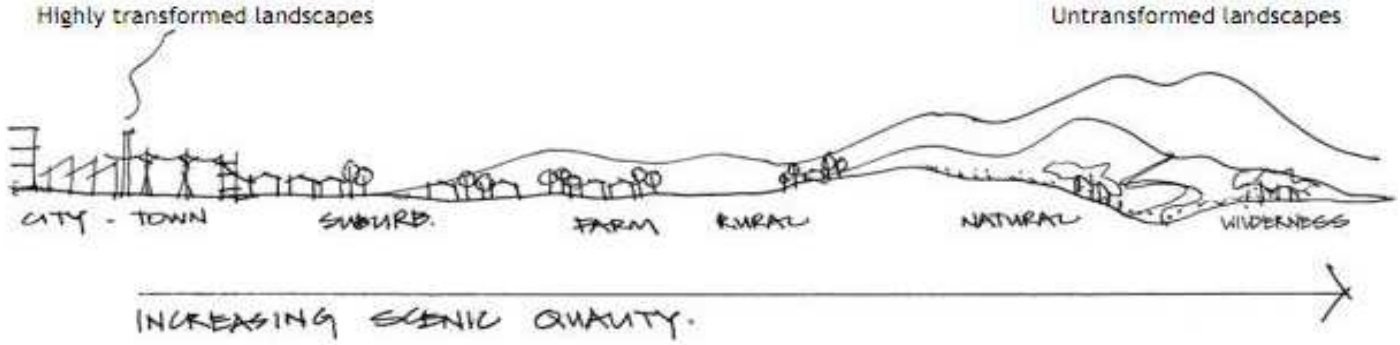
The visual quality of the overall area can be ascribed to the open, modified natural character of the landscape with KNPS as a prominent landmark on the coastline.

The visual quality is also enhanced by the view of Table Mountain in the background (looking south).

The low-growing vegetation does not add any visual interest although the predominantly natural state of the landscape inland of KNPS (within the Koeberg Nature Reserve) and the vegetated primary dune and active dunefield to the north adds to the visual quality of the study area.

Table 4-8: Typical visual character attributes

Highly transformed landscape – urban/industrial	Transition landscape	Modified rural landscape	Natural transition landscape	Untransformed landscape – natural
Substantially developed landscape. High levels of visual impact associated with buildings, factories, roads and other related infrastructure (e.g. powerlines).	Transitional landscape associated with the interface between, rural, agricultural area and more developed suburban or urban zones.	Typical character is rural landscape, defined by field patterns, forestry plantations and agricultural areas and associated small-scale roads and buildings.	A changing landscape character associated with the interface between natural areas and modified rural / pastoral or agricultural zones.	No / minimal impact associated with the actions of man. National parks, coastlines, pristine forest areas.



Source: CNDV, 2006

http://www.shandinglu.org

http://www.nightjartravel.com

http://www.boschkloof.com

The visual quality of the area can be experienced through a number of views. These views include:

- Open views along the coast towards KNPS (Figure 4-18);
- Rolling views across Koeberg Nature Reserve towards KNPS (Figure 4-18 and Figure 4-19); and
- Extended, open views from the ridgeline across the coastal plain (Figure 4-19).

There are elements that detract from visual quality in the study area, notably the powerlines from KNPS across the study area, and telecommunications masts. Nevertheless the visual quality of the study area is considered to be moderate.

4.2.5.3 Sense of Place

Our sense of a place depends not only on spatial form and quality but also on culture, temperament, status, experience and the current purpose of the observer (Lynch, 1992). Central to the idea of 'sense of place' or Genius Loci is identity. An area will have a stronger sense of place if it can easily be identified, that is to say if it is unique and distinct from other places. Lynch defines 'sense of place' as "the extent to which a person can recognise or recall a place as being distinct from other places – as having a vivid or unique, or at least a particular, character of its own" (Lynch, 1992:131).

It is often the case that sense of place is linked directly to visual quality and that areas/spaces with high visual quality have a strong sense of place. However, this is not an inviolate relationship and it is plausible that areas of low visual quality may have a strong sense of place or – more commonly – that areas of high visual quality have a weak sense of place. The defining feature of sense of place is uniqueness, generally real or biophysical (e.g. trees in an otherwise treeless expanse), but sometimes perceived (e.g. visible but unspectacular sacred sites and places which evoke defined responses in receptors). Tourism can sometimes serve as an indicator of sense of place insofar as it is often the uniqueness (and accessibility) of a space/place which attracts tourists.

The sense of place of the study area is determined by KNPS facility and associated infrastructure located in a predominantly natural setting and influenced by the proximity to the coast and the Koeberg Nature Reserve. The study area has an immediately recognisable sense of place as KNPS reactor units have been distinguishable, though not overly intrusive landmarks on the landscape for many years.

4.2.5.4 Visual Receptors

Receptors are important insofar as they inform visual sensitivity. The sensitivity of viewers is determined by the number of viewers and by how likely they are to be impacted upon. Potential viewers include the following:

- **Motorists**: KNPS is visible to users travelling on the R27 along the eastern boundary of the study area. Viewers along the R27 are transient (and moving at speed) and so are exposed to visual impacts for a relatively short period. The dunefield in the north of the study area provides partial screening, and although KNPS is visible to motorists along the R27, the TISF will not be visible as the alternative sites are wholly screened by the primary dune.
- **Residents of Duynefontein**: Visibility from individual households is likely to be low, since the urban fabric obtrudes views of the site beyond the very immediate foreground. The primary dune provides visual screening to receptors in Duynefontein. The Alternative 2 site on the southern side of KNPS may be partially visible from the beach, although this is unlikely as receptors can only approach to within approximately 1.6 km of KNPS and the dunes provide partial screening. The Alternative 1 site will not be visible to residents of Duynefontein as this site is located on the northern side of KNPS and will therefore be screened by existing infrastructure.

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Figure 4-18: View of KNPS from Duynefontein beach (above) and view of KNPS from Koeberg Nature Reserve with Table Mountain in the background (below)

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Figure 4-19: View across Koeberg Nature Reserve from the R27 (above) and view across the coastal plain towards the R27 from the primary dune (below)

- **Visitors to the Koeberg Nature Reserve**: The primary dune provides visual screening to many of the trails and viewpoints within the nature reserve. Regular visitors to the area will have become accustomed to KNPS infrastructure, while new visitors to the study area could be expected to notice industrial elements.

The ridgeline ensures that most of KNPS *SPA*, and therefore the site alternatives, are screened from receptors. The TISF is unlikely to be easily distinguishable from the rest of KNPS infrastructure. The sensitivity of viewers or visual receptors potentially affected by the visual impact of the Project is considered to be very low.

4.2.5.5 Viewing Distance and Visibility

The distance of a viewer from an object (in this case the TISF) is an important determinant of the magnitude of the visual impact. This is because the visual impact of an object diminishes/attenuates as the distance between the viewer and the object increases. Thus the visual impact at 1 000 m would, nominally, be 25% of the impact as viewed from 500 m. At 2 000 m it would be 10% of the impact at 500 m (Hull and Bishop, 1988 in Young, 2000).

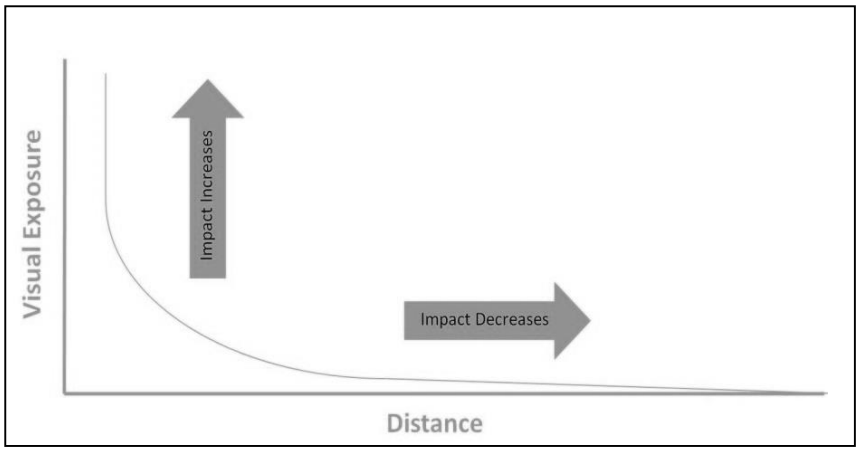


Figure 4-20: Visual exposure vs distance

Source: Adapted from Hull and Bishop (1998)

Three basic distance categories can be defined for a Project of this scale (as discussed and represented in Table 4-9):

- Foreground;
- Middleground; and
- Background.

Table 4-9: Distance categories

FOREGROUND (0 – 1 km)	The zone where the proposed Project will dominate the frame of view. The TISF will be *highly visible* unless obscured.
MIDDLEGROUND (1 – 3 km)	The zone where colour and line are still readily discernible. The TISF will be *moderately visible* but will still be easily recognisable.
BACKGROUND (> 3 km)	This zone stretches from 3 km to the point from where the TISF can no longer be seen. Objects in this zone can be classified as *marginally visible* to *not visible*.

A range of (reasonably) accessible viewpoints were selected from the surrounding areas, in order to provide an indication of the likely visibility of the TISF. The viewpoints were not randomly selected but were chosen because they are likely to afford optimal views of the project, i.e. the TISF is likely to be less visible from other accessible viewpoints.

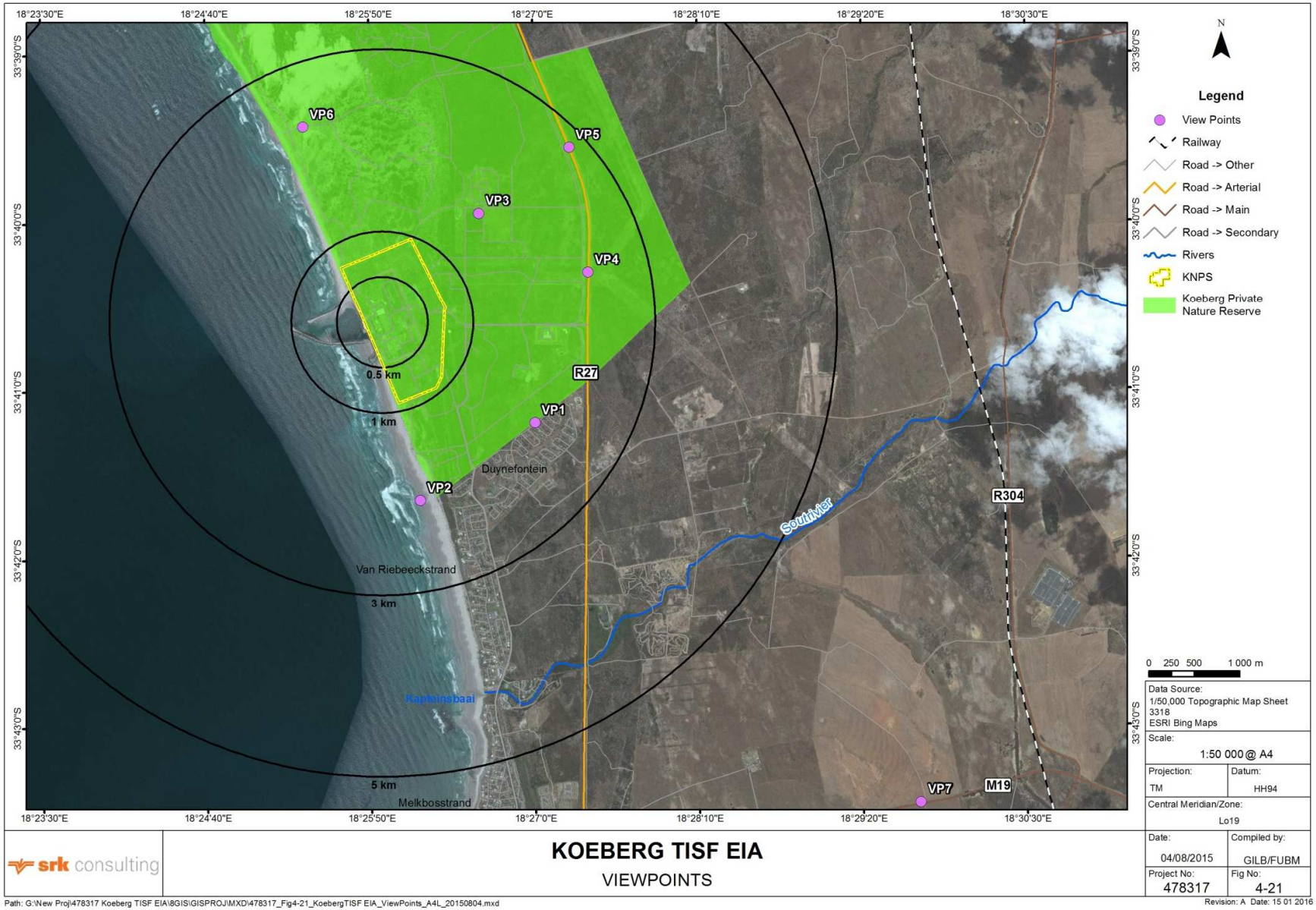
The selected viewpoints are shown in Figure 4-21, and views from these viewpoints are shown in the accompanying photographs (Figure 4-22 to Figure 4-25). The criteria used to determine the visibility of the TISF are set out in Table 4-10 and the visibility from each viewpoint is summarised in Table 4-11.

Although the site alternatives may be marginally visible to receptors at Melkbosstrand beach[15] and visitors to Robben Island, at 5 km and 14 km respectively, the TISF will not be discernible from the existing infrastructure at KNPS.

Table 4-10: Visibility criteria

NOT VISIBLE	Project cannot be seen	
MARGINALLY VISIBLE	Project is only just visible / partially visible (usually in background zone)	
VISIBLE	Project is visible although parts may be partially obscured (usually in middleground zone)	
HIGHLY VISIBLE	Project is clearly visible (usually in foreground or middleground zone)	

[15] The TISF will not be visible to receptors at Blouberg beach.


18°23'30"E
18°24'40"E
18°25'50"E
18°27'0"E
18°28'10"E
18°29'20"E
18°30'30"E
33°39'0"S
33°40'0"S
33°41'0"S
33°42'0"S
33°43'0"S
N
Legend
View Points
Railway
Road -> Other
Road -> Arterial
Road -> Main
Road -> Secondary
Rivers
KNPS
Koeberg Private Nature Reserve
VP6
VP5
VP3
VP4
VP1
VP2
VP7
0.5 km
1 km
3 km
5 km
R27
R304
M19
Duynefontein
Van Riebeeckstrand
Melkbosstrand
Raptainsbaai
Sout River
0 250 500 1 000 m
Data Source:
1/50,000 Topographic Map Sheet 3318
ESRI Bing Maps
Scale:
1:50 000 @ A4
Projection:
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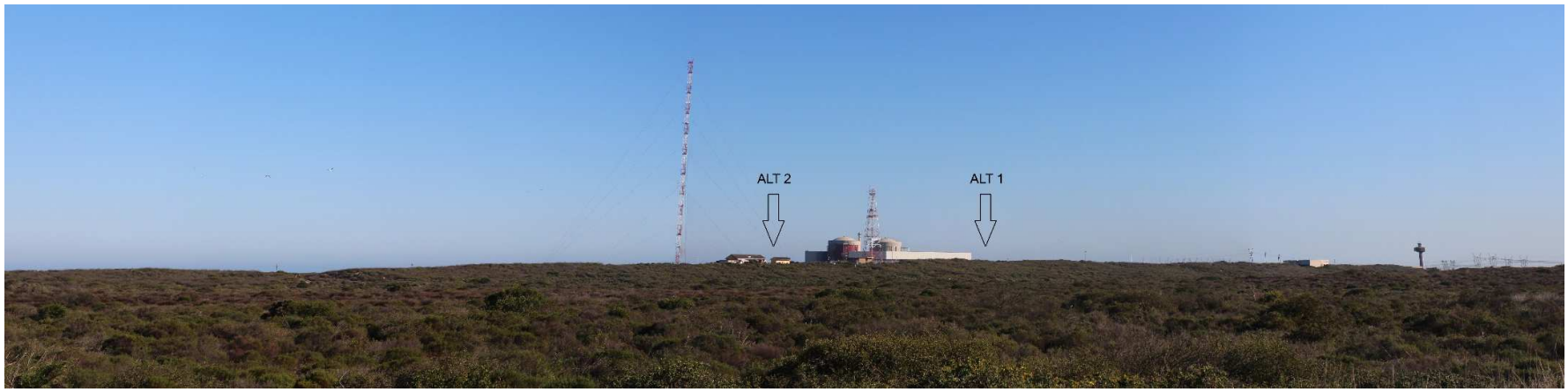
Revision: A Date: 15 01 2016

Table 4-11: Visibility from viewpoints

View Point #	Location	Co-ordinates	Direction of view towards/from the site	Time of Photograph	Potential Receptors	Visibility
VP1	Duynefontein (Napoleon Avenue)	33°41'11.63"S; 18°27'0.35"E	North-west	10:37am	Residents of Duynefontein	Alternative 1 - Not visible **Alternative 2 - Not visible**
VP2	Duynefontein beach	33°41'39.15"S; 18°26'11.29"E	North	10:53am	Visitors to Duynefontein beach	Alternative 1 - Not visible **Alternative 2 - Marginally visible**
VP3	Koeberg Nature Reserve administration buildings	33°39'56.73"S; 18°26'36.79"E	South-west	11:23am	Visitors to the Koeberg Nature Reserve	Alternative 1 - Not visible **Alternative 2 - Not visible**
VP4	R27	33°40'17.89"S; 18°27'23.29"E	West	11:30am	Users of the R27	Alternative 1 - Not visible **Alternative 2 - Not visible**
VP5	R27	33°39'33.36"S; 18°27'15.42"E	South-west	11:33am	Users of the R27	Alternative 1 - Not visible **Alternative 2 - Not visible**
VP6	Dune Road in Koeberg Nature Reserve north of site	33°39'24.25"S; 18°25'32.97"E	South	12:25pm	Visitors to Koeberg Nature Reserve	Alternative 1 - Marginally visible **Alternative 2 - Not visible**
VP7	Melkbosstrand Road	33°43'27.51"S; 18°29'44.40"E	North-west	10:25am	Users of Melkbosstrand Road	Alternative 1 - Not visible **Alternative 2 - Marginally visible but 7.5km from site**

Note: Shading indicates visibility according to Table 4-9.

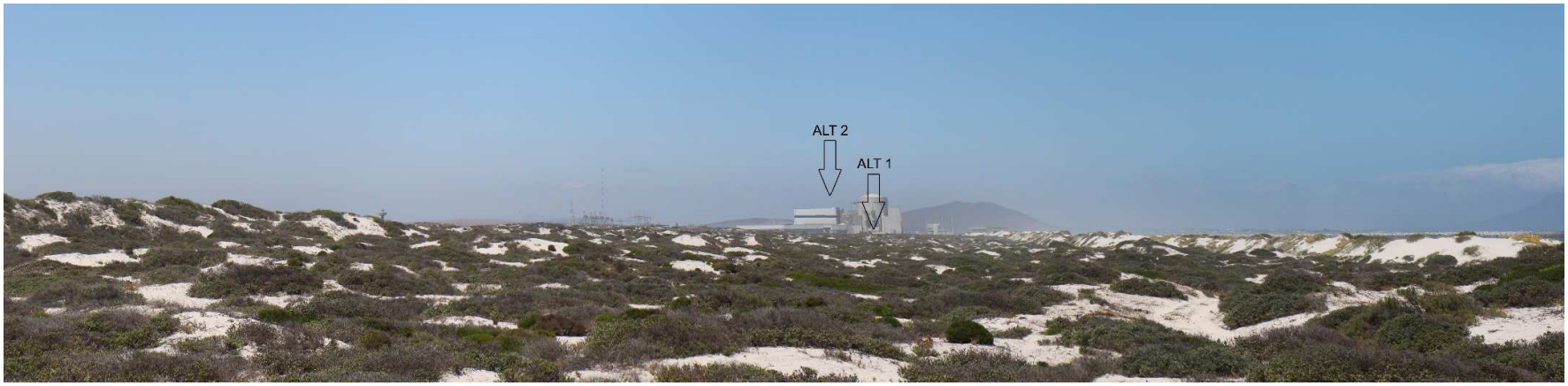


srk consulting	**KOEBERG TISF VIA** VIEWS FROM VIEWPOINTS 1 & 2	Project No. 478317

Figure 4-22: Views from Viewpoint 1 (above) and Viewpoint 2 (below)

srk consulting	**KOEBERG TISF VIA** VIEWS FROM VIEWPOINTS 3 & 4	Project No. 478317

Figure 4-23: Views from Viewpoint 3 (above) and 4 Viewpoint (below)



srk consulting	**KOEBERG TISF VIA** VIEWS FROM VIEWPOINTS 5 & 6	Project No. 478317

Figure 4-24: Views from Viewpoint 5 (above) and Viewpoint 6 (below)

srk consulting	**KOEBERG TISF VIA** VIEWS FROM VIEWPOINT 7	Project No. 478317

Figure 4-25: Views from Viewpoint 7

5 Stakeholder Engagement

Stakeholder engagement forms a key component of the S&EIR process. The objectives of stakeholder engagement are outlined in this section, followed by a summary of the approach followed in compliance with Chapter 6 of the EIA Regulations, 2014 and issues raised by the public with regard to the proposed development during Pre-Application and Scoping Phases.

5.1 Objectives and Approach to Stakeholder Engagement

The overall aim of public consultation is to ensure that all stakeholders have adequate opportunity to provide input into the process and raise their comments and concerns. More specifically, the objectives of public consultation are to:

- Identify I&APs and inform them about the proposed development and S&EIR process;
- Provide the public with the opportunity to participate effectively in the process and identify relevant issues and concerns;
- Coordinate cooperation between organs of state in the consideration of the assessment; and
- Provide the public with the opportunity to review documentation and assist in identifying mitigation and management options to address potential environmental issues.

5.2 Stakeholder Engagement during the Pre-Application and Scoping Phases

The activities undertaken during the Pre-Application and Scoping Phases of the assessment are outlined in Table 5-1 and Table 5-2 below.

Table 5-1: Stakeholder engagement activities undertaken during the Pre-Application Phase

Task	Objectives	Dates
Advertise release of Background Information Document (BID) for I&AP registration	To provide stakeholders with the opportunity to review the BID and register on the I&AP database.	08 October 2015
Initial public comment and registration period	To provide stakeholders with the opportunity to review the BID and provide initial comment and register as stakeholders for the EIA process.	09 October to 09 November 2015
Public Open Day	To present the proposed project to stakeholders and provide an opportunity for questions and discussion.	27 October 2015
Focus Group Meetings	To present the proposed project to relevant authorities and focus groups identified through stakeholder interest, and provide an opportunity for questions and discussion.	November 2015 to January 2016
Release Draft Scoping Report for public comment	To provide stakeholders with the opportunity to review the Scoping Report and provide initial comment.	March to April 2016
Compile Comments and Responses Summary	To record all issues and concerns raised and collate these comments in the Scoping Report.	May 2016

Table 5-2: Stakeholder engagement activities undertaken during the Scoping Phase

Task	Objectives	Dates
Advertise commencement of EIA process and release of Scoping Report for public comment period	To notify I&APs of the commencement of the EIA process and to provide a description of the proposed project and the affected environment, as well as a description of potential environmental issues, and the proposed approach to the Impact Assessment Phase.	July 2016
Public comment period	To provide stakeholders with the opportunity to review and comment on the results of the Scoping Phase.	8 July to 8 August 2016
Public Open Day	To present the findings of the Scoping Report to stakeholders and provide an opportunity for questions and discussion.	21 July 2016
Focus Group Meetings	To present the findings of the Scoping Report to relevant authorities and focus groups identified through stakeholder interest, and provide an opportunity for questions and discussion.	July to August 2016
Compile Comments and Responses Summary and finalise Scoping Report	To record all issues and concerns raised and collate these comments in the final report which provides DEA with information to decide whether to accept the Scoping Report.	August 2016

The key activities are described in further detail below.

5.2.1 Identification of Key Stakeholders and I&APs

Relevant I&APs from local, provincial and national authorities, conservation bodies, Non-Governmental Organisations (NGO) groups, local businesses and forums and surrounding land owners and occupants were considered for inclusion as I&APs for the project.

Relevant authorities (Organs of State) have been automatically registered as I&APs. In accordance with the EIA Regulations, 2014, all other persons must request in writing to be placed on the register, submit written comments or attend meetings in order to be registered as stakeholders and included in future communication regarding the project. As specified in GN R 982, all persons who submit written comments, attend meetings or request in writing to be placed on the register were (and will be) registered as I&APs.

The stakeholder database is attached as Appendix K and was updated throughout the process.

5.2.2 Pre-Application Phase

5.2.2.1 Release of BID for Public Comment

Key stakeholders were identified and notified of the availability of the BID for public review. Newspaper advertisements announcing the availability of the BID and inviting I&APs to register on the project database were placed in:

- One regional newspaper:
  - The Cape Times (in English).
- Five local newspapers:
  - WeskusNuus (in Afrikaans);
  - Table Talk (in English);
  - Tygerburger Table View (in English and Afrikaans);
  - Isolabantu (in isiXhosa); and

- Impact 24/7 (in Afrikaans).

A notice was also placed in the Shutdown Times (in English), an Eskom internal newsletter.

Copies of the BID and I&AP registration forms were made available for collection at the following venues:

- Koeberg Public Library, Duynefontein;
- Wesfleur Public Library, Atlantis;
- Cape Town Public Library;
- KNPS Visitors Centre; and
- SRK's office in Rondebosch.

A4 or A3 size notices, in English and/or Afrikaans, were placed on the noticeboards at each of the relevant locations. A2 site notices were placed at the entrances to KNPS.

5.2.2.2 Public Open Day and Focus Group Meetings

A Public Open Day was held on Tuesday 27 October 2015 at KNPS Visitors Centre from 15h00 to 18h30. The Public Open Day included a poster presentation. The purpose of the Public Open Day was to provide stakeholders with information regarding the proposed project and allow for the identification of key issues and concerns to inform the Scoping process.

Focus Group Meetings were held with key stakeholders listed in Table 5-3 to facilitate focused discussion and the dissemination of information regarding the project.

Table 5-3: Focus Group Meetings during the Pre-Application Phase

Meeting 1: Pre-Application Meeting	**Date:** 20 November 2015	**Venue:** DEA Offices, Pretoria
Stakeholder	***Organisation***	
Henriette van Graan	NNR	
Peter Mkhabela	NNR	
Lerato Mokoena	DEA	
Wayne Hector	DEA	
Millicent Solomons	DEA	
Meeting 2: Authorities Meeting	**Date:** 26 January 2016	**Venue:** DEA&DP Offices, Cape Town
Stakeholder	***Organisation***	
Alvan Gabriel	DEA&DP: Development Management	
Adri la Meyer	DEA&DP: Development Management	
Lance McBain-Charles	DEA&DP: Waste Management Licencing	
Russell Mehl	DEA&DP: Pollution Management	
Melanese Schippers	DEA&DP: Development Management	
Anthony van Wyk	DEA&DP: Environmental Officer	
Zayed Brown	DEA&DP: Pollution and Chemicals Management	
Peter Harmse	DEA&DP: Air Quality Management	
Bhawoodien Parker	DEA&DP: Air Quality Management Monitoring	
Eugene Pienaar	DEA&DP: Waste Management	
Pat Titmuss	CoCT: Environmental Resources Management	
Morne Theron	CoCT: Environmental Resources Management	
Ian Gildenhuys	CoCT: City Health	

Comments received at stakeholder meetings were incorporated into the Comments and Responses Summary (Appendix L).

5.2.2.3 Notification of Draft Scoping Report for Public Comment

The release of the Draft Scoping Report for public review was communicated to all automatically registered I&APs by post, email or fax on or by 18 March 2016. Hard copies of the full report were placed at the following venues for review:

- Koeberg Public Library, Duynefontein;
- Wesfleur Public Library, Atlantis;
- Cape Town Public Library;
- KNPS Visitors Centre; and
- SRK's office in Rondebosch.

An electronic version of the report was available on SRK's website www.srk.co.za.

Hard copies of the Draft Scoping Report were sent to the following Organs of State on 18 March 2016 for comment:

- DEA;
- NNR;
- DEA&DP;
- HWC;
- DWS;
- DoE;
- CoCT;
- CapeNature; and
- DEA:O&C.

Stakeholders were afforded a 30 day comment period, ending on 25 April 2016.

5.2.3 Scoping Phase

5.2.3.1 Notification of the EIA Process and Scoping Report for Public Comment

Newspaper advertisements announcing the formal commencement of the S&EIR process, the availability of the Scoping Report for stakeholder review and once again inviting additional I&APs to register on the project database were placed in:

- One regional newspaper:
  - The Cape Times (in English).
- Five local newspapers:
  - WeskusNuus (in Afrikaans);
  - Table Talk (in English);
  - Tygerburger Table View (in English and Afrikaans);
  - Isolabantu (in isiXhosa); and
  - Impact 24/7 (in Afrikaans).

The release of the Scoping Report for public review was communicated to all automatically registered I&APs by post, email or fax on or by 8 July 2016. Hard copies of the full report were made available at the venues listed in Section 5.2.2.3, and an electronic version of the report was available on SRK's website www.srk.co.za.

A2 site notices were placed at the entrances to KNPS.

DEA was notified that the reports were sent to the organs of state listed in Section 5.2.2.3 to request their comment.

Stakeholders were afforded a 30 day comment period, ending on 8 August 2016. Comments submitted during the public review period during the Scoping Phase are provided in this report (see Appendix M).

5.2.3.2 Public Open Day and Focus Group Meetings

A Public Open Day was held on Thursday 21 July 2016 at KNPS Visitors Centre from 15h00 to 18h30. The Public Open Day included a poster presentation. The purpose of the Public Open Day was to present the findings of the Scoping report and the Plan of Study for EIA to stakeholders and allow for the identification of additional issues and concerns to inform the Impact Assessment process.

A Focus Group Meeting was held with authorities (Table 5-4) on 27 July 2016 to facilitate focused discussion and the dissemination of information regarding the project. Notes from this meeting were included in the Final Scoping Report.

Table 5-4: Focus Group Meeting during the Scoping Phase

Meeting 1: Authorities Meeting	**Date:** 27 July 2016	**Venue:** DEA&DP Offices, Cape Town
Stakeholder	***Organisation***	
Sifiso Nhleko	NNR	
Adri la Meyer	DEA&DP: Development Management	
Melanese Schippers	DEA&DP: Development Management (Region 1)	
Thorston Aab	DEA&DP: Waste Management	
David Chapman	CoCT: City Health	
Ian Gildenhuys	CoCT: City Health	

Comments received at stakeholder meetings were incorporated into the Comments and Responses Summary (Appendix L).

5.2.4 Issues and Concerns Raised by I&APs during Pre-Application and Scoping

All written and verbal comments received prior to and during the EIA process to date have been incorporated into the Comments and Responses Summary (Appendix L**)**. Key issues and concerns raised by stakeholders can be summarised as follows:

- **Project Motivation**: Used nuclear fuel should be stored at a CISF and not at KNPS, concern that used nuclear fuel from other sources may be stored at the TISF and reasons explaining why a CISF has not yet been established;
- **Project Description:** The length of time fuel will be stored on site, how casks will be transported to and from the TISF and maintenance requirements of the casks;
- **Alternatives:** The possibility of reprocessing of used nuclear fuel instead of storage;
- **Current operations: T**he procedure for treatment/disposal of contaminated water used for cooling in SFPs;
- **Health and safety risks:** The risk of KNPS being subject to terrorist attacks and the potential for casks to leak and cause radiation exposure;

- **Impacts of the TISF:** Potential negative impacts on coastal processes, sense of place, groundwater and terrestrial ecology;
- **Cumulative impacts:** Cumulative impacts of other proposed projects at KNPS, the layout and location of the TISF in relation to the Nuclear 1 site and cumulative exposure of radiation from the KNPS site;
- **EIA process:** Which specialist studies were undertaken and the scope of each, the need for external peer review of in-house specialist studies and the applicability of NEMA listed activities; and
- **Regulatory requirements:** The TISF must meet the requirements of the NNR and the IAEA; and permitting requirements related to transportation of abnormal loads.

Many of the comments received from stakeholders during the Pre-Application and Scoping Phases could only be addressed in the Impact Assessment Phase of the project, as indicated in the responses provided in the Scoping Report Comments and Responses Summary. These comments and recommendations have been considered in the assessment of impacts in Section 6 of this report.

5.2.5 Submission and Acceptance of Final Scoping Report

The Final Scoping Report, which was prepared in compliance with Section 21 of the EIA Regulations, 2014, and submitted to DEA on 22 August 2016, within 44 days of the submission of the application for EA. Acknowledgement of Receipt of the Final Scoping Report was received from DEA on 1 September 2016 and the Final Scoping Report was accepted by DEA on 28 September 2016.

5.3 Stakeholder Engagement during the Impact Assessment Phase

Stakeholder engagement activities during the Impact Assessment Phase are aimed at ensuring that the specialist studies and assessment by the EIA project team adequately address the issues and concerns raised during the Pre-Application and Scoping Phases. Opportunity to raise further issues is also provided.

The key public participation activities during the Impact Assessment Phase are summarised in Table 5-5 below.

Table 5-5: Stakeholder engagement activities undertaken and planned during the Impact Assessment Phase

Task	Objectives	Projected Dates
Public comment period including distribution of an Executive Summary to all registered stakeholders	To provide stakeholders with the opportunity to review and comment on the results of the Impact Assessment Phase, and to obtaining written comments from stakeholders and key stakeholders on the EIA Report.	15 November 2016 – 14 December 2016
Public Open Day	To present the findings of the EIA Report to stakeholders and provide an opportunity for questions and discussion.	30 November 2016
Compile Comments and Responses Summary	To record and respond to all issues and concerns raised, and collate these comments. To provide an opportunity for stakeholders to review changes to the EIA Report, and make comments on these changes if necessary.	13 January 2017
Finalise EIA Report and submit to DEA	To present the findings of the EIA process, incorporating stakeholder comment and submit the EIA Report to the authorities to facilitate their decisions.	4 February 2017

The key activities are described in further detail below.

5.3.1 Notification of EIA Report for Public Comment

Registered stakeholders will be notified of the release of the draft EIA Report for public review. Notifications, including copies of the Executive Summary, will be posted, faxed or e-mailed to all registered I&APs on the same date (a list of registered I&APs notified of the draft EIA Report is included as Appendix K).

Hardcopies of this report are available for public review at the following venues:

- Koeberg Public Library, Duynefontein;
- Wesfleur Public Library, Atlantis;
- Cape Town Public Library;
- KNPS Visitors Centre; and
- SRK's office in Rondebosch.

The report is also accessible as an electronic copy on SRK's website www.srk.co.za (via the "Library" and then "Public Documents" links), and available on CD, on request. A hard copy of the draft EIA Report as well as a CD containing an electronic copy has been made available to each of the following authorities, to facilitate comment:

- DEA;
- NNR;
- DEA&DP;
- HWC;
- DWS;
- DoE;
- CoCT; and
- CapeNature.

A 30-day comment period commenced on 15 November 2016 and registered I&APs are requested to submit comments to SRK Consulting by 14 December 2016. Comments received in response to the draft EIA Report will be included in an EIA Report Comments and Responses Summary and attached to the final EIA Report.

5.4 Next steps

Following the close of the comment period, a Comments and Responses Summary will be compiled for inclusion with the final EIA Report. The EIA Report will be submitted to the DEA on 4 February 2017, which is within 106 days of the acceptance of the Scoping Report, as prescribed by the EIA Regulations, 2014.

6 Environmental Impact Assessment

6.1 Introduction

6.1.1 Environmental Impacts Identified

Based on the professional experience of the EIA team, legal requirements (Section 2), the nature of the proposed activity (Section 3), the nature of the receiving environment (Section 4) and issues raised in the stakeholder engagement process (Section 4.1.7), the following key environmental issues – potential negative impacts and potential benefits – were identified:

- **Geohydrology** – The construction of the TISF may potentially impact on groundwater levels and quality, although this is unlikely as groundwater at the project site is deeper than the proposed TISF excavation depth. Dewatering of excavations will probably not be required during construction.
- **Terrestrial ecology** – Due to the ecological sensitivity of both TISF site alternatives and the presence of sensitive vegetation types, the project may negatively impact threatened and/or protected floral species. The project does not pose a threat to threatened or protected faunal species.
- **Socio-economic** – Potential negative impacts on the surrounding communities would be associated with an increase in nuisance factors (e.g. poor noise and air quality conditions during construction). Potential economic benefits are expected due to increased employment opportunities during the construction phase. The TISF will also ensure the continued operation of KNPS, a significant electricity producer in the Western Cape.
- **Radiation and Human Health –** The potential exposure of Eskom employees as well as individuals in surrounding communities to radiation due to the handling and storage of used fuel at the TISF and the potential negative impacts on human health of surrounding communities.
- **Heritage** – Although the West Coast is known for its wealth of fossil and shell middens, both TISF site alternatives are considered significantly disturbed by previous construction activities and, in terms of the heritage landscape, the possibility of finding sites of archaeological or palaeontological importance is highly unlikely.
- **Visual –** The sense of place of the study area is determined by KNPS infrastructure located in a predominantly natural setting and influenced by the proximity to the coast. The TISF will be located in KNPS SPA, a substantially modified landscape and is therefore unlikely to have significant negative visual impacts for receptors.

6.1.2 Specialist Studies Undertaken

A number of specialist studies were undertaken during the Impact Assessment Phase to investigate the key potential direct, indirect and cumulative impacts (negative and positive) identified during Scoping. These specialist impact studies are listed in Table 4-1.

Impact Assessments and technical reports undertaken by in-house Eskom and SRK specialists were reviewed by independent specialists. Independent reviews undertaken for the EIA process are listed in Table 6-2.

Table 6-1: Independent reviews undertaken for the EIA

Independent Review	Review Specialist	Organisation
Review of Geohydrology Impact Assessment	Ms. Karen Burgers	Advisian (trading as Worley Parsons RSA)
Review of Socio-Economic Impact Assessment	Ms. Alex Kempthorne	Urban-Econ Development Economists
Review of Visual Impact Assessment	Ms. Larissa Heyns	Square One Landscape Architects
Review of Stormwater Management Plan	Mr. Sampie Laubscher	BVi Consulting Engineers
Review of Radiological Assessment	Dr. Dawid de Villiers	SciRAD Consulting

Independent reviews of the Stormwater Management Plan and Geohydrology Impact Assessment are included in the relevant Appendices (F and G) along with the studies reviewed. The independent reviews of the Radiological Assessment and sections of this EIA assessing Socio-economic and Visual Assessment are attached as Appendices N - P.

Certain impacts which SRK believes to be less significant and do not warrant specialist investigation are assessed in Section 6.2. These impacts include:

- Increased dust and associated impacts on air quality;
- Increased noise and vibration;
- Potential contamination of surface water resources; and
- Increased traffic volumes and deterioration of roads.

6.1.3 Alternatives Assessed in the EIA

During the prefeasibility phase of most projects various development alternatives are investigated. Furthermore, the EIA Regulations, 2014, require that all S&EIR processes must identify and describe “alternatives to the proposed activity that are feasible and reasonable”.

In the case of the TISF project, various location alternatives have been considered during the early feasibility phase of the project, many of which were eliminated for environmental or technical reasons (refer to Section 0).

Two site locations for the TISF i.e. the CSB site - the preferred alternative (Alternative 1) - and the Ekhaya site (Alternative 2) were identified for further assessment in the EIA (Figure 3-3). Alternative 1 is located adjacent to the CSB on the northern boundary of KNPS and Alternative 2 is located along the southern boundary of KNPS next to the Ekhaya Building.

Only the project components discussed in Section 0 and Section 3.6 will be assessed in the EIA.

The No Go alternative will be considered in the EIA in accordance with the requirements of the EIA Regulations, 2014. The No Go alternative entails no change to the *status quo*, in other words the TISF and associated infrastructure will not be built.

6.1.4 Impact Rating Methodology

The assessment of impacts was based on specialists’ expertise, SRK’s professional judgement, field observations and desk-top analysis.

The significance of potential impacts that may result from the proposed project was determined in order to assist decision-makers (typically by a designated competent authority or state agency, but in some instances, the applicant).

The **significance** of an impact is defined as a combination of the **consequence** of the impact occurring and the **probability** that the impact will occur.

The criteria used to determine impact consequence are presented in the table below.

Table 6-2: Criteria used to determine the consequence of the impact

Rating	Definition of Rating	Score
A. *Extent* *– the area over which the impact will be experienced*		
Local	Confined to project or study area or part thereof (e.g. the development site and immediate surrounds)	1
Regional	The region (District Municipality or Quaternary catchment)	2
(Inter) national	Nationally or beyond	3
B. ***Intensity*** *– the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources*		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
C. ***Duration*** *– the timeframe over which the impact will be experienced and its reversibility*		
Short-term	Up to 2 years and reversible	1
Medium-term	2 to 15 years and reversible	2
Long-term	More than 15 years and irreversible	3

The combined score of these three criteria corresponds to a **Consequence Rating**, as follows:

Table 6-3: Method used to determine the consequence score

***Combined Score* (A+B+C)**	3 – 4	5	6	7	8 – 9
Consequence Rating	Very low	Low	Medium	High	Very high

Once the consequence was derived, the probability of the impact occurring was considered, using the probability classifications presented in the table below.

Table 6-4: Probability classification

Probability *– the likelihood of the impact occurring*	
Improbable	< 40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

The overall **significance** of impacts was determined by considering consequence and probability using the rating system prescribed in the table below.

Table 6-5: Impact significance ratings

		Probability			
		Improbable	Possible	Probable	Definite
Consequence	Very Low	**INSIGNIFICANT**	**INSIGNIFICANT**	**VERY LOW**	**VERY LOW**
	Low	**VERY LOW**	**VERY LOW**	**LOW**	**LOW**
	Medium	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**
	High	**MEDIUM**	**MEDIUM**	**HIGH**	**HIGH**
	Very High	**HIGH**	**HIGH**	**VERY HIGH**	**VERY HIGH**

Finally the impacts were also considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The prescribed system for considering impacts status and confidence (in assessment) is laid out in the table below.

Table 6-6: Impact status and confidence classification

Status of impact	
Indication whether the impact is adverse (negative) or beneficial (positive).	+ ve (positive – a 'benefit')
	– ve (negative – a 'cost')
Confidence of assessment	
The degree of confidence in predictions based on available information, SRK's judgment and/or specialist knowledge.	Low
	Medium
	High

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **INSIGNIFICANT**: the potential impact is negligible and **will not** have an influence on the decision regarding the proposed activity/development.
- **VERY LOW**: the potential impact is very small and **should not** have any meaningful influence on the decision regarding the proposed activity/development.
- **LOW**: the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.
- **MEDIUM**: the potential impact **should** influence the decision regarding the proposed activity/development.
- **HIGH**: the potential impact **will** affect the decision regarding the proposed activity/development.
- **VERY HIGH**: The proposed activity should only be approved under special circumstances.

Practicable mitigation and optimisation measures are recommended and impacts are rated in the prescribed way both without and with the assumed effective implementation of mitigation and optimisation measures. Mitigation and optimisation measures are either:

- **Essential**: measures that must be implemented and are non-negotiable; and
- **Best Practice:** recommended to comply with best practice, with adoption dependent on the proponent's risk profile and commitment to adhere to best practice, and which must be shown to have been considered and sound reasons provided by the applicant if not implemented.

6.1.5 Integration of Studies into the EIA Report and Review

The completed specialist studies and their findings have been integrated into the EIA Report. The key findings of each specialist were evaluated in relation to each other to provide an overall and integrated assessment of the project impacts.

SRK has considered the suite of potential impacts in a holistic manner and in certain instances, based on independent professional judgment and this integrated approach, may have altered impact significance ratings provided by the specialist. Where this has been done it is indicated in the relevant section of the report.

Specialists have made recommendations for the management of impacts, and the EIA team has assessed these recommendations. For the sake of brevity, only **key** (i.e. non-standard essential) mitigation measures are presented in impact rating tables (later in this section), with a collective summary of all recommended mitigation measures presented at the end of each discipline.

6.2 Less Significant (or Minor) Impacts

Certain impacts, while important, are considered likely to be less significant and do not warrant specialist investigation. These include:

- **Air Quality** – potential changes in air quality due to project related emissions;
- **Noise** – potential increased noise levels due to project activities;
- **Surface water** – potential contamination of surface water resources; and
- **Traffic** – potential increase in traffic and deterioration of roads.

These impacts are not expected to be significant and have therefore not been subjected to detailed impact analysis. However, they have been assessed by the EAPs through desktop investigation and ground-truthing, and are discussed below. Mitigation measures are also identified.

6.2.1 Potential Impact A1: Changes in Air Quality due to Project Related Emissions for Alternative 1 and Alternative 2

There are no significant sources of air pollution in the area and it is expected that air quality in the project area is fairly good.

Air emissions during the construction phase will include dust generated by construction activities (i.e. bulk earthworks) and emissions generated by vehicles and other equipment. In total an area of at least 1.3 ha will be stripped and levelled to facilitate construction of the TISF. Dust generating activities would temporarily affect air quality in the area immediately surrounding KNPS and, although unlikely, could cause a nuisance to receptors in Duynefontein (located ~2.5 km from Alternative 1 and ~1.5 km from Alternative 2). Emissions from vehicles are likely to be very low.

Emissions from the TISF during operations are associated only with vehicles transferring used fuel from the SFPs to the TISF and are likely to be limited. Air quality impacts during the operational phase will be localised and of low intensity. There is unlikely to be any meaningful increase in carbon emissions and no contribution to climate change.

Air quality impacts can be readily mitigated by implementing standard housekeeping measures.

The impact is therefore assessed to be ***insignificant*** during the construction and operational phases for both site alternatives, assuming mitigation measures are implemented.

6.2.1.1 Mitigation Measures: Potential Air Quality Impacts

Essential air quality mitigation measures during **construction and operations** are as follows:

- Maintain all generators, vehicles, vessels and other equipment in good working order to minimise exhaust fumes.
- Avoid clearing of vegetation until absolutely necessary (i.e. just before earthworks).
- Avoid excavation, handling and transport of materials which may generate dust under high wind conditions or when a visible dust plume is present.
- Reduce airborne dust through e.g.:
    - Dampening dust-generating areas/roads with freshwater.
    - Covering dumps or stockpiles of loose material with plastic sheeting or netting, especially during windy conditions.
- Respond rapidly to complaints and taking appropriate corrective action.

6.2.2 Potential Impact N1: Increased Noise due to Project Activities for Alternative 1 and Alternative 2

Noise pollution results from unwanted or excessive noise with effects that range from nuisance to more harmful effects such as sleep disturbance, high stress levels and impaired hearing.

Existing noise levels in the area are typical of a remote location and both daytime and night time average noise levels are expected to be low, with noise mostly generated by the movement of vehicles on the R27 and in Duynefontein, and operations at KNPS. Wave action also contributes to the ambient noise level of the area.

The closest sensitive noise receptors are located in Duynefontein, approximately ~2.5 km from Alternative 1 and ~1.5 km from Alternative 2.

Traffic and building activities including blasting and piling (if required) during the construction phase are anticipated sources of noise, although these are not considered to be excessive and resulting noise would be of a limited duration.

During the operational phase, vehicles and other equipment may generate (occupational) noise; however, the noise from the TISF is not likely to be higher than ambient noise levels in the area.

The impact is therefore assessed to be ***insignificant*** during the construction and operational phases for both site alternatives, assuming mitigation measures are implemented.

6.2.2.1 Mitigation Measures: Potential Noise Impacts

Essential noise mitigation measures during **construction and operations** are as follows:

- Limit noisy construction activities to daylight hours from Monday to Saturday or in accordance with relevant municipal bylaws, if applicable.
- Comply with the applicable municipal and / or industry noise regulations.
- Notify adjacent residents before particularly noisy construction activities will take place (e.g. piling).
- Maintain all generators, vehicles, vessels and other equipment in good working order to minimise excess noise.
- Enclose diesel generators (if required for temporary power supply) to reduce unnecessary noise.
- Respond rapidly to complaints and take appropriate corrective action.

6.2.3 Potential Impact S1: Contamination of Surface Water for Alternative 1 and Alternative 2

Although no surface water features occur on or in close proximity to either of the TISF site alternatives, some wetlands occur in surrounding areas and may be impacted if run-off from the site is not adequately controlled.

Bulk earthworks and general construction activities, including accidental hydrocarbon leaks or spills from vehicles and machinery may contaminate stormwater run-off during the construction phase if not adequately managed.

During operations, contamination of stormwater run-off from the TISF is not expected, although Eskom's radiation monitoring plan will include monitoring of the potential radiological contamination of run-off. The concrete slab of the TISF will prevent the infiltration of rainfall, increasing runoff from the area. Stormwater will flow into Eskom's existing stormwater management system.

Stormwater management measures for the construction and operational phases of the development respectively are included in the conceptual stormwater management plan forming part of the EMPr.

The impact is therefore assessed to be ***insignificant*** during the construction and operational phases for both site alternatives, assuming mitigation measures are implemented.

6.2.3.1 Mitigation Measures: Potential Surface Water Impacts

Essential surface water mitigation measures during **construction and operations** are as follows:

- Refuel and service vehicles on an impermeable surface.
- Make use of a drip tray / sand tray under the fuel nozzle when refuelling vehicles or equipment on site.
- Place drip trays / sand trays under engines of vehicles or mechanical equipment when parked or stored overnight or longer.
- Immediately clean oil and fuel spills and dispose of contaminated material (soil, etc.) at licensed waste disposal sites.
- Do not release any pollutants, including sediment, sewage, cement, fuel, oil, chemicals, hazardous substances, waste water, etc., into the environment.
- Compile a procedure for the storage, handling and transport of different hazardous materials and ensure that it is strictly adhered to.
- Ensure vehicles and equipment are in good working order and drivers and operators are trained with respect to actions to be taken in the case of a spill or leak.
- Implement the stormwater management plan developed for the construction and operational phases of the development.

6.2.4 Potential Impact T1: Impacts of Project Related Traffic on Existing Road Users and Surrounding Residents for Alternative 1 and Alternative 2

The number of vehicles on the roads around KNPS will increase marginally during the construction phase. However, traffic in the area is modest and it is considered highly unlikely that increased traffic volumes will result in noticeably increased congestion on the roads.

Increased traffic is expected during the construction phase, mainly comprising construction equipment, large vehicles and trucks, as well as smaller passenger vehicles. Construction vehicles will access the site alternatives via the R27 and KNPS internal access roads.

Casks will be transported to the site by road, and would be classified as abnormal loads, requiring an abnormal load permit. This may result in some disruption to traffic, although it would be for a very limited period of time only. It is not expected that the volume of construction traffic will be so substantial as to lead to deterioration of existing roads.

During the operational phase, increased traffic will only be associated with the transfer of the casks from the fuel to the TISF on existing haul roads, inside the KNPS boundaries.

The impact is therefore assessed to be ***insignificant*** during the construction phase for both site alternatives, assuming mitigation measures are implemented. There will be no impact during the operational phase.

6.2.4.1 Mitigation Measures: Potential Traffic Impacts

Essential traffic mitigation measures during **construction** are as follows:

- Manage construction sites and activities so as to minimise impacts on road traffic as far as possible, e.g.:
  - Attempt to arrange delivery of materials when it will least disrupt traffic.
  - Stagger deliveries if possible rather than concentrating them during “rush” hours.
  - Keep construction materials and machinery at the construction site throughout the construction period, where possible.
- Ensure that large construction vehicles are suitably marked to be visible to other road users and pedestrians.
- Ensure that all safety measures are observed and that drivers comply with the rules of the road.
- Ensure that vehicle axle loads do not exceed the technical design capacity of roads utilised by the project.
- Investigate and respond to complaints about traffic.
- Obtain the required abnormal load permits prior to the transport of casks to the site.

6.3 Potential Geohydrology Impacts

6.3.1 Introduction, Terms of Reference and Methodology

This assessment is based on the Geohydrology Assessment undertaken by SRK (see Appendix G). The purpose of the study was to assess the potential impacts of the development alternatives on groundwater resources, indicate their environmental acceptability and recommend practicable mitigation measures to minimise potential impacts and maximise potential benefits.

The ToR for the study were to:

- Review available studies undertaken at KNPS to determine baseline information available and to determine gaps in information;
- Describe and map the existing groundwater resources potentially affected by the proposed Project, including groundwater levels, groundwater quality, hydrological linkages with other surface and groundwater resources and existing users of groundwater resources in the area;
- Simulate a dewatering scenario for the construction phase and determine dewatering flow rates, volumes and impact on the aquifer by using the existing numerical model developed for the Duynefontein Site Safety Report (SSR);
- Identify potential impacts of the proposed project on groundwater resources as well as potential impacts of groundwater on the proposed development;
- Assess the impacts of the proposed project on groundwater resources using the prescribed impact assessment methodology;
- Identify and assess potential cumulative impacts resulting from the proposed development in relation to proposed and existing developments in the surrounding area;
- Recommend practicable mitigation measures to avoid and/or minimise/reduce impacts and enhance benefits. Assess the effectiveness of proposed mitigation measures using the prescribed impact assessment methodology; and

- Recommend and draft a monitoring campaign to ensure the correct implementation and adequacy of recommenced mitigation and management measures, if applicable.

The Geohydrology Assessment included a review of previous groundwater studies undertaken in the area since 2007 to identify gaps in baseline information. These studies included:

- The geohydrology section for the Duynefontein SSR completed in 2014;
- Various groundwater and wetlands monitoring reports for Eskom's proposed nuclear site at Duynefontein from 2008 to September 2013;
- Various groundwater monitoring and specialist geohydrological reports for the proposed Pebble Bed Modular Reactor (PBMR) Demonstration Power Plant site EIA compiled from 2007 to 2008; and
- A specialist geohydrological report for Eskom's proposed Duynefontein Nuclear power station EIA completed in September 2015.

Previous studies contained valuable information including site surveys, hydrocensuses and geophysical data, as well as siting, drilling and testing of approximately 30 test and monitoring boreholes at the PMBR site (south of KNPS), Duynefontein Nuclear 1 Site (north of KNPS) and at KNPS, numerical flow modelling and monitoring of groundwater levels and chemistry over a six year period. Based largely on this information, the existing groundwater resources potentially affected by the proposed project were described and mapped, including groundwater levels, groundwater quality, hydrological linkages with other surface and groundwater resources and existing users of groundwater resources in the area.

6.3.2 Assessment of Impacts: Construction Phase

One potential direct construction phase impact on the groundwater of the area was identified, and assessed once for both site alternatives:

- G1: Groundwater Contamination due to Construction Activities.

6.3.2.1 Potential Impact G1: Groundwater Contamination due to Construction Activities

During the construction phase of the proposed facility, the groundwater resources underlying the site may potentially be impacted as follows:

1. Hydrocarbon contamination: Downward migration of leaked and/or spilled fuel, oil and grease into the underlying aquifer system;
2. Hazardous waste/chemicals contamination: Downward migration of contaminants from on-site waste storage areas and /or chemical storage areas into the underlying aquifer system; and
3. Organic and bacterial (microbiological) contamination: Downward migration of contaminants from leaks and/or spills from temporary on-site sewage facilities into the underlying aquifer system.

With respect to the potential hydrocarbon, hazardous waste, chemicals and organic and bacterial (microbiological) contamination of the aquifer, the intensity of the impacts is considered to be low, as the natural quality of groundwater should not be notably degraded. It is presently not known what types of hazardous substances may be stored, transported or disposed of, or otherwise handled, at the site during construction. However, typical examples of such potential contaminants are paints and solvents, vehicle wastes (e.g. used motor oil, etc.), mercury-containing wastes (e.g. thermometers, switches, fluorescent lighting, etc.), caustics and cleaning agents and batteries.

It is expected that potential contaminants used and/or stored, and spilled and/or leaked at the site, would be at very limited volumes and thus be insufficient to extensively contaminate the primary aquifer. The water quality analyses from boreholes drilled at the Duynefontein site show no indications of degradation of quality due to construction of KNPS and the impacts are thus expected to be of a short-term nature.

The impact is assessed to be of ***very low*** significance for both site alternatives and with the implementation of mitigation is reduced to ***insignificant*** (Table 6-7Table 6-24).

Table 6-7: Potential groundwater contamination caused by construction activities

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Low 1	Short-term 1	**Very Low** **3**	Probable	**VERY LOW**	– ve	High
Essential mitigation measures: • Undertake any on-site refuelling and maintenance of vehicles/machinery in designated areas. Line these areas with an impermeable surface and install oil traps. • Use appropriately sized drip trays for all refuelling and/or repairs done on machinery – ensure these are strategically placed to capture any spillage of fuel, oil, etc. • Clean up any spills immediately, through containment and removal of free product and dispose of contaminated material at a licensed waste disposal facility. • Prevent discharge of any pollutants, such as cements, concrete, lime, chemicals, and other contaminated waste water and fuels into the environment. • Compile a procedure for the storage, handling and transport of hazardous materials and ensure that it is strictly adhered to. • Ensure vehicles and equipment are in good working order and drivers and operators are trained with respect to actions to be taken in the case of a fuel spill or leak.								
With mitigation	Local 1	Low 1	Short-term 1	**Very Low** **3**	Possible	**INSIGNIFICANT**	– ve	High

6.3.3 Assessment of Impacts: Operational Phase

One potential direct impact on the groundwater of the area was identified during the operational phase, and assessed once for both site alternatives:

- G2: Groundwater Contamination due to Project Operations.

6.3.3.1 Potential Impact G2: Groundwater Contamination due to Project Operations

The potential impacts on groundwater during the operational phase are associated with:

1. Fuel and oil leaks from the vehicles transporting the storage casks; and
2. Breached storage casks resulting in the dispersion of radioactive spent fuel particles and release of radioactive aerosols (e.g. Cesium-137) at the site, which could percolate into the groundwater resources in the vicinity of the site through rainfall recharge.

Under normal operational conditions, releases or radioactive material from storage casks are highly unlikely. This has been demonstrated by cask storage operations at KNPS over the past 30 years. The results of the 2010 environmental surveillance programme at KNPS do not indicate any significant adverse effects on the environment. There are also no significant increases in the levels of radioactivity in environmental samples over pre-operational levels, with the exception of marine and sewage sludge samples. The casks will also be designed to contain any accidental releases. Impacts of such accident scenarios are therefore not assessed here.

Leakage of radioactivity into the underlying aquifer is highly unlikely and will not directly affect any existing groundwater users, but if such an incident were to occur, the receiving environment will be affected. Taking cognisance that an impermeable containment structure (concrete slab) will be constructed for the TISF, any contaminants emanating from this source will be contained on the

concrete slab. In the highly unlikely event of such a cask breach, the monitoring system will detect this and remediation actions will be taken.

It is expected that the quantity of potential non-radioactive contaminants used and/or stored, and spilled and/or leaked at the sites, will be insufficient to extensively contaminate the primary aquifers. If such contamination were to occur, it is likely to be at a small scale and the impact will be of a short-term nature. For example, the water quality analyses from boreholes drilled at the Duynefontyn site show no indications of degradation due to operation of KNPS.

The impact is assessed to be of ***very low*** significance for both site alternatives and with the implementation of mitigation is reduced to ***insignificant*** (**Table 6-8**).

Table 6-8: Potential groundwater contamination caused by operational activities

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Low 1	Short-term 1	**Very Low** **3**	Probable	**VERY LOW**	– ve	High
Essential mitigation measures: • Implement a monitoring system to monitor for radioactive emissions. • In the case of suspected emissions, return cask to fuel building for evaluation and repair and decontaminate cask storage pad. • Clean up any hydrocarbon spills immediately, through containment and removal of free product and dispose of contaminated material at a licensed waste disposal facility. • Use existing ablution and waste water treatment facilities at KNPS. • Prevent discharge of any pollutants, such as cements, concrete, lime, chemicals, and other contaminated waste water and fuels into the environment. • Ensure vehicles and equipment are in good working order and drivers and operators are trained.								
With mitigation	Local 1	Low 1	Short-term 1	**Very Low** **3**	Possible	**INSIGNIFICANT**	– ve	High

6.3.4 The No-Go Alternative

The No-Go alternative entails no change to the *status quo*. If the proposed TISF is not developed, the existing used fuel storage status quo will continue with no change in groundwater contamination risk.

6.3.5 Mitigation Measures: Potential Geohydrology Impacts

Essential geohydrology mitigation measures during **construction** are as follows:

- Undertake any on-site refuelling and maintenance of vehicles/machinery in designated areas. Line these areas with an impermeable surface and install oil traps.
- Use appropriately sized drip trays for all refuelling and/or repairs done on machinery – ensure these are strategically placed to capture any spillage of fuel, oil, etc.
- Clean up any spills immediately, through containment and removal of free product and dispose of contaminated material at a licensed waste disposal facility.
- Prevent discharge of any pollutants, such as cements, concrete, lime, chemicals, and other contaminated waste water and fuels into the environment.
- Compile a procedure for the storage, handling and transport of different hazardous materials and ensure that it is strictly adhered to.
- Ensure vehicles and equipment are in good working order and drivers and operators are trained with respect to actions to be taken in the case of a fuel spill or leak.
- Ensure that good housekeeping rules are applied.

Essential geohydrology mitigation measures during **operations** are as follows:

- Implement a monitoring system to monitor for radioactive emissions.
- In the case of suspected emissions, return cask to fuel building for evaluation and repair and decontaminate cask storage pad.
- Clean up any hydrocarbon spills immediately, through containment and removal of free product and dispose of contaminated material at a licensed waste disposal facility.
- Use existing ablution and waste water treatment facilities at KNPS.
- Prevent discharge of any pollutants, such as cements, concrete, lime, chemicals, and other contaminated waste water and fuels into the environment.
- Ensure vehicles and equipment are in good working order and drivers and operators are trained.
- Ensure that good housekeeping rules are applied.

6.4 Potential Terrestrial Ecology Impacts

6.4.1 Introduction, Terms of Reference and Methodology

This assessment is based on the Terrestrial Ecology Assessment undertaken by SAS (see Appendix H). The purpose of the study was to assess the potential impacts of the development alternatives on terrestrial ecology, indicate their environmental acceptability and recommend practicable mitigation measures to minimise potential impacts and maximise potential benefits.

The ToR for the study were to:

- Review available studies undertaken at KNPS to determine baseline information available and to determine gaps in information;
- Undertake a field assessment of the entire area to be affected by construction activities as well as the immediate surrounding zone of influence to identify habitat types, conservation importance and ecological state;
- List any potentially threatened, endangered and endemic floral and faunal species in the area and indicate the importance of the identified species in a local, regional and national context;
- Map areas of higher and lower sensitivity on the site;
- Define applicable legislative requirements regarding any permit applications required;
- Identify potential impacts of the proposed project on terrestrial ecology;
- Assess the impacts of the proposed project on terrestrial ecology in the area using the prescribed impact assessment methodology;
- Identify and assess potential cumulative ecological impacts resulting from the proposed development in relation to proposed and existing developments in the surrounding area; and
- Recommend practicable mitigation measures to avoid and/or minimise/reduce impacts and enhance benefits. Assess the effectiveness of proposed mitigation measures using the prescribed impact assessment methodology.

The Terrestrial Ecology Assessment included a literature review, followed by a site assessment undertaken in June 2015, to determine the Ecological Importance and Sensitivity of the terrestrial habitat associated with each of the site alternatives. A thorough ‘walk through’ of the sites was undertaken to determine the occurrence of the dominant floral communities, species and habitat

diversities. Special emphasis was placed on areas that may potentially support floral SCC as listed by previous ecological assessments undertaken within and in the vicinity of KNPS.

The faunal assessment was based on a literature review, drawing on information gained from online resources as well as previous studies conducted within the Koeberg Nature Reserve (Harrison 2008, Todd, 2013 and the Koeberg Nature Reserve Management Plan, 2015). This information was cross referenced with data and visual observation made during the vegetation assessment of the site alternatives, in order to determine habitat intactness and probability of species occurring in the site alternatives.

6.4.2 Assessment of Impacts: Construction Phase

Two potential direct construction phase impacts on the terrestrial ecology of the area were identified, and assessed together for each site alternative:

- TE1: Loss of Vegetation, Floral Biodiversity and Protected Species; and
- TE2: Loss of Faunal Habitat, Faunal Biodiversity and Protected Species.

6.4.2.1 Potential Impact TE1: Loss of vegetation, Floral Biodiversity and Protected Species

Construction related activities will require the physical disturbance and removal of vegetation and soils, leading to the removal of floral habitat and floral communities. Disturbance associated with construction activities may include the disturbance and compaction of soils in surrounding areas and may also result in the proliferation of alien and invasive species in the area.

The development of the TISF on either Alternative 1 or Alternative 2 will result in the removal of Endangered vegetation (National List of Threatened Terrestrial Ecosystems) and SCC as well as protected floral species. However, neither of the site alternatives are located within a CBA or ESA. Although the site alternatives are located within the Koeberg Nature Reserve, they are situated within the Industrial Development Zone, defined as a development area within the nature reserve.

Terrestrial habitat associated with Alternative 1 is considered to be of low to moderate sensitivity. The vegetation is dominated by the pioneer shrub *Chrysanthemoides incana* which is indicative of past disturbance on the site. However additional indigenous floral species which are considered to be representative of the vegetation type were also encountered scattered within the area. One possible floral SCC [16], *Lampranthus* cf *explanatus, and* two protected floral species, *Lampranthus* cf *explanatus* and *Carpobrotus acinaciformis,* were encountered within Alternative 1.

Terrestrial habitat associated with Alternative 2 is considered to be of a moderate sensitivity. Floral species diversity within Alternative 2 is considered to be higher than that associated with Alternative 1 with a higher floral species richness and evenness encountered, and indigenous floral species encountered within the area are considered to be representative of the natural vegetation type. No floral SCC were encountered at the time of the assessment, however, the presence of individuals of the SCC *Lessertia canescens* was confirmed during a previous assessment of the site in 2013, and two protected floral species, *Carpobrotus acinaciformis and Drosanthemum* sp. were encountered within Alterative 2.

The loss of floral habitat, biodiversity and SCC/protected species for the selected site alternative will definitely occur with the development of the TISF, which would be a long term impact, although local in extent. The development of either site alternative will result in the loss of a relatively small area of indigenous vegetation in the context of the larger Koeberg Nature Reserve and in the context of the

[16] Not in flower at the time of the assessment which created a limitation to the identification of the species. The is thus assumed to be present on site for the purposes of the assessment.

remaining natural vegetation which forms part of the West Coast form of the Cape Flats Dune Strandveld. Although the impact is considered to be of medium intensity for both site alternatives, the intensity is considered to be slightly lower for Alternative 1 than Alternative 2, since Alternative 2 is considered to be more sensitive.

The impact is assessed to be of ***medium*** significance for both site alternatives and with the implementation of mitigation is reduced to ***low*** (Table 6-9). The impact at Alternative 1 is however slightly lower than at Alternative 2.

Table 6-9: Significance of loss of vegetation, floral biodiversity and protected species

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Definite	**MEDIUM**	– ve	Medium[17]
Essential mitigation measures: • Limit the footprint area of the construction activity to what is absolutely essential. • Demarcate and fence off construction site boundaries upon establishment and limit all activities to inside these boundaries. • Designate areas outside the construction footprint as No Go areas. • Confine construction vehicles to designated roadways and strictly prohibit the indiscriminate movement of construction vehicles through vegetation falling outside of the construction footprint. • Prohibit temporary storage of building material or soil within areas of natural vegetation falling outside of the construction footprint. • Implement the following mitigation measures with respect to SCC and protected species to comply with best practice[18]: o Once the final construction footprint has been pegged, appoint a suitably qualified person to indicate and/or mark SCC and protected species within the area and appoint a suitably experienced person to oversee the removal, rescue and relocation of the SCC. o Undertake rescue and relocation of SCC prior to the commencement of construction related activities in consultation with a suitably qualified person and/or CapeNature. o Submit an application for a floral permit to CapeNature should SCC and protected species be removed from the construction footprint. • Remove all alien and weed species encountered within areas disturbed by construction activities in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998). Removal of species should take place throughout the construction and operational phases of the development. • Rehabilitate the development footprint with species indigenous to the vegetation type during the decommissioning phase of the development. Rehabilitation must be undertaken or supervised by a suitably qualified professional.								
With mitigation	Local 1	Low 1	Long-term 3	**Low** **5**	Definite	**LOW**	**– ve**	Medium

6.4.2.2 Potential Impact TE2: Loss of Faunal Habitat, Faunal Biodiversity and Protected Species

Construction related activities that may lead to this impact include the clearing of vegetation and destruction of habitat, collision of construction vehicles with fauna and potential hunting or trapping of fauna.

Both site alternatives are located within the fenced SPA of KNPS, and as such are subject to an increased level of anthropogenic activity. Furthermore, the fence line surrounding the site alternatives will act as a barrier to terrestrial faunal species.

[17] The confidence levels of the assessment were reduced slightly as a result of the seasonal constraints of the assessment. However, the level of detail undertaken in the study is considered sufficient to ensure that the results of the assessment accurately define the impact of the proposed development in order to provide the relevant planners and decision makers with sufficient information to formulate an opinion on the viability of the proposed development from a conservation view point.

[18] It should be noted that rescue and relocation is not supported by CapeNature as an acceptable mitigation measure for many species for various reasons. Therefore, although it is listed as an essential mitigation measure and must be implemented, rescue and relocation will not contribute to the lowering of the impact score.

Vegetation clearing on either site alternative will lead to a loss of nesting/ perching sites for avifaunal species, whilst ground dwelling species currently inhabiting the site alternatives will be displaced by construction activities. Furthermore, edge effects from construction activities, increased anthropogenic activity as well as the increased movement of vehicles within the areas could lead to further loss of habitat and faunal biodiversity in the natural areas surrounding the site alternatives if edge effects are not managed.

However, due to the location of both site alternatives it is unlikely that either supports a high level of faunal biodiversity and as such the development of the TISF is unlikely to have a significant impact on faunal habitat or biodiversity of the greater area surrounding the TISF or within the region. No SCC are considered to occur within either of the site alternatives, and as such development within these areas is unlikely to impact upon SCC conservation within the region.

The construction of the TISF will involve the clearing of all the vegetation and thus complete loss of faunal habitat within the selected site, with a long term impact on the site specific faunal habitat and species. However, the availability of suitable primary habitat surrounding the site alternatives into which any displaced species can disperse will have a net effect of decreasing this level of impact to a medium (negative) impact. The availability of suitable habitat outside of the site alternatives combined with systematic site clearing towards the fence line, allowing for species to disperse into the Koeberg Nature Reserve, will have the net effect of reducing the overall significance of the impacts to a very low (negative) level provided mitigation measures are adhered to.

The impact is assessed to be of ***medium*** significance for both site alternatives and with the implementation of mitigation is reduced to ***very low*** (Table 6-10).

Table 6-10: Significance of loss of faunal habitat, faunal biodiversity and protected species during construction

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Medium 2	Long-term 3	**Medium** **6**	Definite	**MEDIUM**	– ve	Medium
Essential mitigation measures: • Limit the footprint area of the construction activity to what is absolutely essential. • Demarcate and fence off construction site boundaries upon establishment and limit all activities to inside these boundaries • Designate areas outside the construction footprint as No Go areas. • Confine vehicles to designated roadways and strictly prohibit the indiscriminate movement of vehicles through terrestrial habitat falling outside of the disturbance footprint. • Attempt, as far as possible to flush any fauna within the construction footprint towards more suitable habitat within the surrounding areas. Clear vegetation towards the security fence line, thereby enabling any fauna to naturally relocate through the fence into the surrounding natural areas. • Do not allow contractors or staff to harm, catch or kill birds or animals by any means, including poisoning, trapping, shooting or setting of snares.								
With mitigation	Local 1	Low 1	Medium-term 2	**Very Low** **4**	Definite	**VERY LOW**	**– ve**	Medium

6.4.3 Assessment of Impacts: Operational Phase

One potential direct impact on the terrestrial ecology of the area was identified during the operational phase, and assessed together for both site alternatives:

- TE3: Loss of Faunal Biodiversity and Protected Species.

6.4.3.1 Potential Impact TE2: Loss of Faunal Biodiversity and Protected Species

During the operational phase there is a potential risk of vehicle collisions with fauna, especially small faunal species that are capable of traversing through the fence line. These faunal impacts are likely to be restricted to small reptile, amphibian and invertebrate species. However, ongoing operational

activities and species natural disturbance/ threat avoidance habits will greatly minimise the threat of these collisions. In order to further minimise collision related impacts, vehicles must be restricted to the designated roadways and no off-road driving is to be permitted through areas of natural faunal habitat. Furthermore, edge effects from the operational activities may also result in additional loss of faunal habitat if disturbance is not managed, notably from the spreading of alien invasive plants which may transform the current faunal habitat and lower species carrying capacity.

The impact is assessed to be of ***low*** significance for both site alternative and with the implementation of mitigation is reduced to ***insignificant*** (Table 6-11).

Table 6-11: Significance of loss of faunal biodiversity and protected species during operations

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Low 1	Long-term 3	**Low** **5**	Probable	**LOW**	– ve	Medium
Essential mitigation measures: • Continue alien vegetation control throughout the operational phase of the development. • Restrict vehicles to designated roadways.								
With mitigation	Local 1	Low 1	Short-term 1	**Very Low** 3	Possible	**INSIGNIFICANT**	– ve	Medium

6.4.4 The No-Go Alternative

The No-Go alternative entails no change to the *status quo*. No Endangered vegetation or SCC/protected species will be removed and the status quo of the area, in terms of vegetation is likely to remain unchanged. The overall impact of the No-Go alternative is therefore considered to be neutral. In terms of faunal species and the protection of SCC, there will be no loss of habitat at either site; however due to the fence structure acting as a barrier it is unlikely that even over time the full potential of faunal biodiversity will be realised within the site alternatives.

6.4.5 Mitigation Measures: Potential Terrestrial Ecology Impacts

Essential terrestrial ecology mitigation measures during **construction** are as follows:

- Limit the footprint area of the construction activity to what is absolutely essential.
- Demarcate construction site boundaries upon establishment. Control security and access to the site. Fence off site boundaries and ensure that plant, labour and materials remain within site boundaries.
- Designate areas outside the construction footprint as No Go areas.
- Confine construction vehicles to designated roadways and strictly prohibit the indiscriminate movement of construction vehicles through vegetation falling outside of the construction / disturbance footprint.
- Prohibit temporary storage of building material or soil within areas of natural vegetation falling outside of the construction footprint.
- Implement the following mitigation measures with respect to SCC and protected species to comply with best practice[19]:

[19] It should be noted that rescue and relocation is not supported by CapeNature as an acceptable mitigation measure for many species for various reasons. Therefore, although it is listed as an essential mitigation measure and must be implemented, rescue and relocation will not contribute to the lowering of the impact score.

  - Once the final construction footprint has been pegged, appoint a suitably qualified person to indicate and/or mark SCC and protected species within the area and appoint a suitably experienced person to oversee the removal, rescue and relocation of the SCC.
  - Undertake rescue and relocation of SCC prior to the commencement of construction related activities in consultation with a suitably qualified person and/or CapeNature.
  - Submit an application for a floral permit to CapeNature should SCC and protected species be removed from the construction footprint.
- Remove all alien and weed species encountered within areas disturbed by construction activities in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 and Section 28 of the National Environmental Management Act, 1998). Removal of species should take place throughout the construction and operational phases of the development.
  - Where possible, remove alien species by hand.
  - Keep footprint areas as small as possible when removing alien plant species.
  - Dispose of removed alien plant material at a licensed waste disposal facility.
- Rehabilitate the development footprint with species indigenous to the vegetation type during the decommissioning phase of the development. Rehabilitation must be undertaken or supervised by a suitably qualified professional.
- Attempt, as far as possible to flush fauna within the construction footprint towards more suitable habitat within the surrounding areas. Clear vegetation towards the security fence line, thereby enabling any fauna to naturally relocate through the fence into the surrounding natural areas.
- Do not allow contractors or staff to harm, catch or kill birds or animals by any means, including poisoning, trapping, shooting or setting of snares.

Essential terrestrial ecology mitigation measures during **operations** are as follows:

- Continue alien vegetation control throughout the operational phase of the development.
- Restrict vehicles to designated roadways.

6.5 Potential Socio-economic Impacts

6.5.1 Introduction, Terms of Reference and Methodology

This assessment is based on Socio-economic specialist input provided by Matthew Law of SRK: a stand-alone specialist report was not produced. The purpose of the study was to assess the potential socio-economic impacts of the proposed project, indicate the environmental acceptability of the project from a socio-economic perspective and recommend practicable mitigation measures to avoid or minimise potential impacts and maximise potential benefits.

The ToR for the study were to:

- Describe the socio-economic characteristics of the study area:
- Describe current and historical social trends;
- Identify the potential social and economic impacts of the project;
- Assess the socio-economic impacts of the project area using the prescribed impact assessment methodology. Findings of other specialist studies, such as the visual, heritage and human health studies compiled for the project, were considered where relevant;

- Identify and assess potential cumulative socio-economic impacts resulting from the proposed development in relation to proposed and existing developments in the surrounding area; and
- Recommend practicable mitigation measures to avoid and/or minimise/reduce impacts and enhance benefits. Assess the effectiveness of proposed mitigation measures using the prescribed impact assessment methodology.

Information regarding the existing socio-economic situation (baseline) was based on:

- Literature review (including relevant planning and policy frameworks for the area, spatial data analysis produced by the CoCT, and other economic publications); and
- Statistical data from Census 2011 and 2001 and the 2007 community survey.

Socio-economic impacts of the project were identified taking the following into account:

- There are a number of typical socio-economic impacts related to an influx of job seekers attracted by large-scale projects. However, the proposed project is for new infrastructure at an existing power generation facility within an urban area and is therefore not considered a large scale project. Competition for new jobs is high (see Table 4-7) and the likelihood of an influx of job-seekers, and associated pressure on infrastructure and services, and communities, is therefore low. No impacts or benefits of the project on infrastructure and services, or on the community fabric are therefore anticipated.
- Radiation, health and hydrogeological specialists found that it is highly improbable that the project will affect human (or biophysical) receptors in any way; and heritage impacts have been found to be insignificant. These aspects have, therefore, been excluded from the socio-economic analysis.

6.5.2 Assessment of Impacts: Construction Phase

The main potential direct socio-economic impacts in the construction phase are the:

- SE1: Decline in quality of life caused by construction activities (visual, noise and traffic);
- SE2: Generation of employment, income and skills during construction;
- SE3: Increased revenue to government and economic investment during construction; and
- SE4: Decrease in resource value from a loss of floral habitat and species.

6.5.2.1 Potential Impact SE1: Decline in Quality of Life caused by Construction Activities

Construction phase activities at the site could lead to nuisance caused by:

- Delays to road users due to construction related traffic;
- Increased noise; and
- Altered sense of place and visual intrusion.

Sensitive receptors (in this case immediately surrounding communities and road users) could experience a decline in their quality of life and wellbeing (or negative utility) occasioned by these nuisance factors. These impacts have been assessed separately in Sections 6.2.4, 6.2.2 and 6.7 respectively and found to be insignificant after mitigation has been applied, mainly because:

- There is low population density surrounding the site and considerable distance to the nearest receptors;
- Both site alternatives have low visibility and construction activities will be congruent with other activities taking place on site; and

- Few construction vehicles are anticipated, and congestion will not increase appreciably.

The impact is assessed to be of ***very low*** significance for both site alternatives and with the implementation of mitigation is reduced to ***insignificant*** (Table 6-12).

Table 6-12: Significance of a decline in quality of life caused by construction activities

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Low 1	Short-term 1	**Very low 3**	Probable	**VERY LOW**	– ve	High
Essential mitigation measures: • Comply with mitigation measures intended to reduce noise, visual and traffic impacts.								
With mitigation	Local 1	Low 1	Short-term 1	**Very low 3**	Improbable	**INSIGNIFICANT**	**– ve**	High

6.5.2.2 Potential Impact SE2: Generation of Employment, Income and Skills during Construction

Employment provides many socio-economic benefits to employees and their dependants, including:

- Improved material wealth and standard of living;
- Enhanced potential to invest and improved access to social services such as education and health services;
- Enhanced skills of previously unskilled workers, facilitating employment prospects of such workers; and
- Contribution to a sense of independence, freedom and pride, which may promote a good work ethic.

It is estimated that approximately 40 temporary jobs will be generated directly by the project during the one-year construction phase. The construction phase is also expected to generate indirect employment at local companies, since materials and services required in the construction phase of the project are not specialised, and can in all likelihood be procured locally. It is not possible to quantify indirect employment and income that will be created by the project at this stage, but it is likely to be modest.

The number of direct employment opportunities created during the construction phase is relatively small when considering the number of people unemployed in the socio-economic study area (see Table 4-5 and Table 4-7). Construction employment will be limited to approximately one year, and opportunities for skills development will be limited during the construction phase of the project. The opportunity for workers to improve their economic prospects in the longer term from increased income, experience and skills transferred to them through the project is therefore considered to be extremely limited.

The benefit is assessed to be ***insignificant*** for both site alternatives and with the implementation of optimisation is increased to ***very low*** (Table 6-13).

Table 6-13: Significance of generation of employment, income and skills training during construction

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Low 1	Short-term 1	**Very low 3**	Improbable	**INSIGNIFICANT**	+ ve	High
Essential optimisation measures: • Prioritise the employment of local people (people living in the socio-economic study area). • Procure locally produced goods (plant and materials) and services, where possible. • Promote on-the-job training wherever possible. • Specify the above-mentioned optimisation measures in construction contract documents.								
With mitigation	Local 1	Low 1	Short-term 1	**Very low 3**	Possible	**VERY LOW**	+ ve	High

6.5.2.3 Potential Impact SE3: Increased Revenue to Government and Economic Investment during Construction

During construction, income to the government is expected to be marginally increased by taxes (VAT) paid by Eskom on locally procured goods and services. Investment in locally procured goods and services will also have a very limited indirect and induced effect on economic performance.

Local investment (for example, the purchase of goods and services locally) leads to (direct) new business sales. The suppliers of these goods and services spend their additional income, further adding to the circulation of money. This secondary expenditure, or demand, results in indirect and induced new business sales (i.e. the multiplier effect). Total new business sales are determined by the addition of direct, indirect and induced sales in the economy.

Although detailed project investment schedules are not currently available, it is reasonably assumed that the taxes generated by local procurement will represent an insignificant portion of provincial and national government income, and that new business sales from investment will only contribute a very small percentage to the municipal economy over the short term (construction phase).

The benefit is assessed to be ***insignificant*** for both site alternatives. No optimisation is possible (Table 6-14).

Table 6-14: Significance of increased revenue to government and economic investment during construction

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Low 1	Short-term 1	**Very low 3**	Improbable	**INSIGNIFICANT**	+ ve	High
Essential optimisation measures: • No optimisation possible.								
With mitigation	Local 1	Low 1	Short-term 1	**Very low 3**	Improbable	**INSIGNIFICANT**	+ ve	High

6.5.2.4 Potential Impact SE4: Decrease in Resource Value from a Loss of Floral Habitat and Species

Although no faunal SCC were encountered or are expected, a number of floral SCC and protected floral species have a probability of occurring at both site alternatives (see Section 4.1.8). Furthermore, the vegetation type at both sites is Endangered. The reduction in Endangered habitat and the potential loss of rare and / or endangered plants may cause a marginal loss of use value (e.g. as a scientific resource) and non-use value (e.g. the intrinsic value placed on the knowledge of the continued presence and viability of a species) of the ecological resource at the site.

None of the protected floral species or floral SCC are restricted to either of the proposed site alternatives, and the project does not threaten the viability of these species or the host vegetation type (SAS, 2015). While the loss of a fairly small portion of an endangered vegetation type cannot be effectively mitigated, mitigation measures recommended by the terrestrial ecologist seek to reduce the probability of a loss of SCC plant individuals.

The impact is assessed to be of ***very low*** significance for both site alternatives. No mitigation is necessary (Table 6-15).

Table 6-15: Significance of decrease in resource value from a loss of floral habitat and species

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Low 1	Long-term 3	**Low 5**	Improbable	**VERY LOW**	- ve	High
Essential mitigation measures: • No mitigation is necessary								
With mitigation	Local 1	Low 1	Long-term 3	**Low 5**	Improbable	**VERY LOW**	– ve	High

6.5.3 Assessment of Impacts: Operational Phase

The main potential direct socio-economic impacts during the operational phase are:

- SE5: Decline in quality of life from altered sense of place and visual intrusion;
- SE6: Generation of employment, income and skills during operations; and
- SE7: Increased revenue to Government and economic investment during operations.

6.5.3.1 Potential Impact S5: Decline in Quality of Life from Altered Sense of Place and Visual Intrusion

Sensitive receptors can experience a decline in quality of life (or negative utility) from altered sense of place and visual intrusion (i.e. a decline in satisfaction or wellbeing). However, the massing and materials used for the TISF will be similar to existing infrastructure at KNPS, the existing structures at KNPS (reactor units, buildings) will reduce the visibility of the TISF by providing visual enclosure, and receptors are accustomed to large scale infrastructure at the site. A decline in welfare to immediately surrounding communities and road users is therefore considered extremely unlikely.

The impact is assessed to be ***insignificant*** for both site alternatives. No mitigation is necessary (Table 6-16).

Table 6-16: Significance of a decline in quality of life from altered sense of place and visual intrusion

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Low 1	Long-term 3	**Very low 3**[20]	Improbable	**INSIGNIFICANT**	– ve	High
Essential mitigation measures: • No mitigation necessary.								
With mitigation	Local 1	Low 1	Long-term 3	**Very low 3**	Improbable	**INSIGNIFICANT**	**– ve**	High

[20] Although the consequence of this impact is calculated as "low" using SRK's standard impact rating methodology, it is the opinion of the specialist that the consequence should be reduced in this case due to the extremely low intensity of the impact.

6.5.3.2 Potential Impact S6: Generation of Employment, Income and Skills during Operations

In 2015 Eskom entered into a contract for the supply of seven dry storage metal casks from a company based in the United States (Mining Weekly, 2016). These casks are used for the storage of nuclear waste prior to the completion of the TISF (see Section 3.2). This contract stipulated that the supplier would train local skills to conduct the fuel loading, or casking activities (Mining Weekly, 2016). It is assumed that Eskom has retained these skills, and that while the TISF (and associated fuel loading and casking activities) will sustain a small number of permanent employment positions in the medium-term, the opportunities for the transfer of new skills is limited. This is further enforced by the specialised nature of the skills required for nuclear waste management.

Local indirect and induced employment is not anticipated during the operational phase as casks are currently imported. In the future casks for the TISF will be procured through a tender process, and it is possible that a new, local supplier will emerge as a preferred bidder, creating opportunities for new indirect employment and associated social benefits. However, as no local supplier currently exists this possibility has not been factored into this analysis.

The benefit is assessed to be of ***very low*** significance for both site alternatives, with or without the implementation of optimisation measures (Table 6-17).

Table 6-17: Significance of generation of employment, income and skills training during operations

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Low 1	Med-term 2	**Very low** **4**	Possible	**VERY LOW**	+ ve	High
Essential optimisation measures: • Favour local procurement.								
With mitigation	Local 1	Low 1	Med-term 2	**Very low** **4**	Possible	**VERY LOW**	+ ve	High

6.5.3.3 Potential Impact S7: Increased Revenue to Government and Economic Investment during Operations

During operations, while investment in the form of locally procured goods and services will be very limited, income to the government is expected to be marginally increased by import duties and taxes from the import of casks (estimated cost per cask is R30 million – Biz News, 2016). While import duties paid by Eskom are not known, average import duty in South Africa is ~20%, and Eskom anticipates that between 30 and 40 casks will be procured over the operational lifespan of the TISF (i.e. until 2025 – see Section 3.2). Annual import duties that are likely to be incurred by Eskom are therefore crudely estimated at R35 million. Although significant (to Eskom), this figure only represents a very small fraction of total import duties and taxes collected nationally on an annual basis.

As the local procurement of casks is not currently envisaged, local investment will be extremely limited and an indirect and induced effect on local economic performance during operations is not anticipated.

The benefit is assessed to be of ***very low*** significance for both site alternatives. No optimisation is possible (Table 6-18).

Table 6-18: Significance of increased revenue to government and economic investment during operations

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Low 1	Med-term 2	**Very low 4**	Probable	**VERY LOW**	+ ve	High
Essential optimisation measures: • No optimisation possible.								
With mitigation	Local 1	Low 1	Med-term 2	**Very low 4**	Probable	**VERY LOW**	+ ve	High

6.5.4 The No Go Alternative

The project is acceptable from a socio-economic perspective, and no fatal flaws have been identified. If the No Go alternative is selected, moderate socio-economic benefits will be forgone, and a small decline in welfare and resource value will be avoided.

Under the No Go alternative, Eskom will not be able to optimise the SFPs to open up new storage cells forgoing additional on-site storage capacity, and off-site dry storage of spent nuclear fuel would need to be considered in the short term. This will be at significant additional cost to Eskom.

Furthermore, the project is considered to be both needed and desirable at either site alternative as:

- It will enhance the medium to long term viability of KNPS thereby facilitating trade and investment and promoting economic growth;
- It is advantageous to locate a TISF at an existing controlled facility from a biophysical and social perspective;
- It is in line with local, metropolitan and provincial spatial planning documents; and
- It will improve job opportunities to a very limited extent.

The No Go alternative is therefore not considered to be the preferred alternative from a socio-economic perspective.

6.5.5 Mitigation Measures: Potential Socio-economic Impacts

Essential socio-economic mitigation and optimisation measures during **construction** are as follows:

- Comply with mitigation measures intended to reduce noise, visual and traffic impacts.
- Prioritise the employment of local people (people living in the socio-economic study area).
- Procure locally produced goods (plant and materials) and services, where possible.
- Promote on-the-job training wherever possible.
- Specify the above-mentioned optimisation measures in construction contract documents.

Essential socio-economic optimisation measures during **operations** are as follows:

- Favour local procurement.

6.6 Potential Human Health Impacts

6.6.1 Introduction, Terms of Reference and Methodology

This assessment is based on the Human Health Impact Assessment undertaken by Infotox (see Appendix I). The purpose of the study was to assess the potential impacts of the development of the TISF on the health of surrounding communities, with a specific focus on the potential impacts of

radiation from the facility, indicate the acceptability of impacts and recommend practicable mitigation measures to minimise potential impacts and maximise potential benefits.

The ToR for the study were to:

- Compile a baseline assessment based on exposure scenarios prior to development of the TISF;
- Contextualise radiation dose (using data from the Eskom TISF Radiological Assessment Report) in terms of risk for morbidity and mortality using generic numerical factors to convert total radiation dose to cancer risk;
- Identify potential impacts of the project on human health of the communities surrounding KNPS;
- Assess the impacts of the project on human health in the area using the prescribed impact assessment methodology;
- Identify and assess potential cumulative human health impacts resulting from the proposed development in relation to existing developments at KNPS;
- Recommend practicable mitigation measures to avoid and/or minimise/reduce impacts and enhance benefits;
- Assess the effectiveness of proposed mitigation measures using the prescribed impact assessment methodology; and
- Recommend and draft a monitoring campaign to ensure the correct implementation and adequacy of recommended mitigation and management measures, if applicable.

The methodology and approach to the health impact assessment was largely derived from three internationally recognised benchmarks, namely:

- International Association for Impact Assessment (IAIA) Health Impact Assessment: International Best Practice Principles (Quigley et al. 2006);
- International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (IFC, 2012); and
- The Equator Principles: a financial industry benchmark for determining, assessing and managing environmental and social risk in projects (EPFI, 2013).

The assessment made use of the rapid appraisal approach, considered by IFC to be appropriate for in-country Health Assessments with limited impacts. The baseline radiation exposure prior to development of the TISF was informed by the Environmental Survey Laboratory (ESL) 2015 Annual Report to the NNR (Eskom, 2016a) and the determination of the potential sensitivity of the community surrounding KNPS was based on a literature review. The projected radiation dose emanating from the (future) TISF, obtained from the Eskom TISF Radiological Assessment Report (Eskom, 2016b) was used to calculate the potential cancer risk associated with the development of the TISF, which is contextualised in terms of current baseline cancer risks.

The Radiological Assessment undertaken by Eskom evaluates radiation exposures and the risks of workers and the public radiation exposure from direct external radiation and radioactive releases to the environment from the proposed TISF. A graded approach[21] has been applied to the Radiological Assessment since the final site alternative has not yet been selected. The scope of the assessment

[21] A graded approach recognises the different levels of complexity in performing assessment for different stages of the licencing of a nuclear facility. During the (current) siting and site evaluation stage, an initial assessment using regional or generic data is typically undertaken, with more detailed assessments and models undertaken during subsequent stages of the licencing process.

was limited to the loading, transfer and storage of used nuclear fuel at the TISF under normal conditions and does not deal with accidents.

Collective radiation exposure *is the total radiation exposure for all the individuals involved in the activity. It is a sum of all individual exposures.*

In accordance with a graded approach for an initial assessment, the radiological consequences were determined using operational experience from the nuclear industry that best represents the most probable technology choices that Eskom will make (e.g. with respect to the type of cask and ancillary equipment to be used). The most applicable, yet conservative data has been utilized to determine the radiological consequences for each step of used fuel cask loading, transfer and storage at the TISF as well as the radiological consequences and dose rates from the casks, to the public at the site boundary of the controlled area, and the environment. (Eskom, 2016b)

The Radiological Assessment was subject to an independent review by SciRad (Appendix N).

6.6.2 Potential Radiation Exposure

Radiation, if released from any source could lead to dispersion into the environment and exposure of members of the public. Potential exposure pathways are illustrated in Figure 6-1.

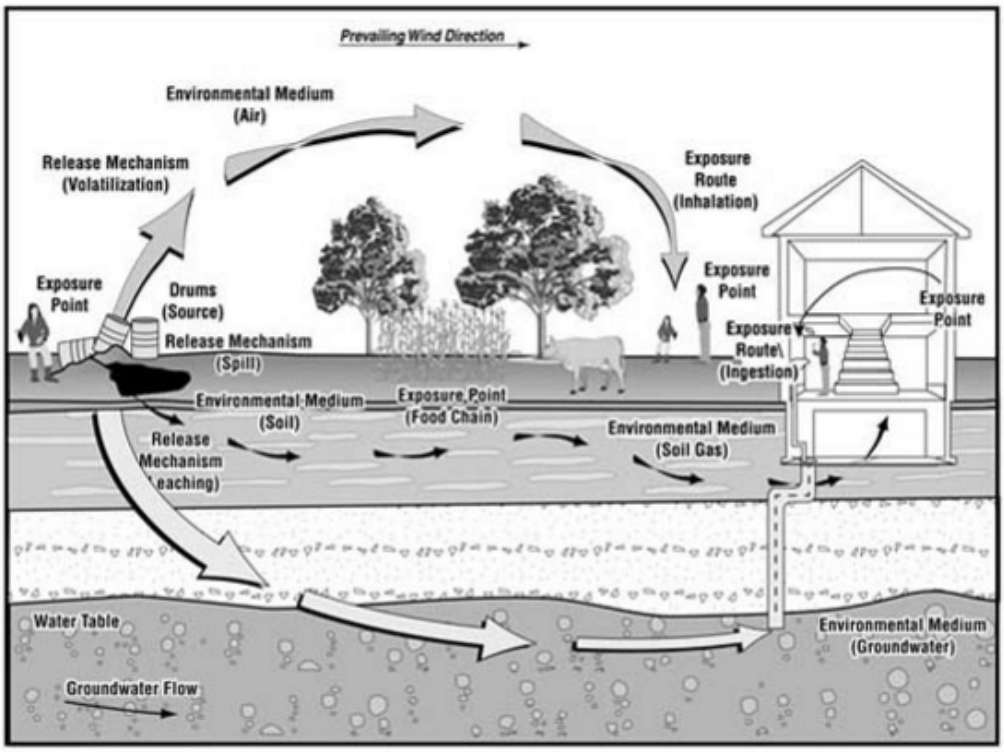


Figure 6-1: Potential radiation pathways
Source: https://www.atsdr.cdr.gov/hac/phamanual/ch6.html

6.6.2.1 Baseline radiation dose

The regulatory limit of **collective radiation exposure** to any member of the public is 1 mSv[22] per calendar year.

[22] 1 mSv: 0.001 Sv

Eskom currently follows a program of environmental monitoring of radionuclide[23] concentrations occurring in various environmental media in the vicinity of KNPS. Annual reports on the environmental measurements are submitted to the NNR by the KNPS ESL. The ESL report includes a calculation of the **committed effective radiation** dose experienced by members of the public in the vicinity of KNPS, based on the results of environmental monitoring.

The committed effective radiation dose reported for 2015 is 1.788E-06 Sievert (Sv)[24], or 1.79 µSv (Eskom 2016a).

6.6.2.2 TISF-associated radiation dose

The storage of used fuel in metal or concrete casks is practiced extensively throughout the nuclear industry and is deemed a safe medium-to-long term storage solution. Many facilities have recorded dose rates, collective dose rates and levels of radioactive contamination from the loading, transfer and storage of used fuel in dry storage casks, as well as dose rates at exclusion boundaries.

> ***Committed effective radiation dose*** *is the lifetime dose expected to result from the radiation exposure, taking into account specific weighting factors. It is the measure of the radiation effect on the body over the individual's lifetime.*

The storage and transport of all radioactive material is governed by strict and prescriptive international regulatory requirements, with which the TISF will need to comply in order to obtain the required licences from the NNR. (Eskom, 2016b)

According to the Radiological Assessment Report (Eskom 2016b), the TISF must meet the requirements of 10 CFR 72 and the dose constraints prescribed by the NNR in Requirements Document (RD) -0022, which is based on "*the annual dose equivalent to any real individual located beyond the owner-controlled area boundary*". The boundary of the owner controlled area coincides with the boundary for KNPS as indicated on Figure 1-1.

The NNR's RD-0022 (NNR 2004) prescribes an individual dose limit of 0.25 mSv per annum for the average representative of the critical group applicable to KNPS. This limit applies to "*any real public individual at or beyond the controlled area boundary*" (Eskom, 2016b).

Rather than estimating the TISF-associated radiation dose at the boundary of the owner controlled area, the approach taken by Eskom to ensure compliance with this requirement was to determine the distance from the TISF at which an exclusion security fence should be placed to ensure that the public do not have access to areas in which the prescribed dose could be exceeded. This distance was determined by Eskom to be 400 m from the TISF, which is situated inside the owner controlled area. Since the owner controlled area extends approximately 1 500 m from the TISF at the closest point (depending on which of the two site alternatives is ultimately selected) there is a large margin of safety. (Eskom 2016b)

When considering the cumulative radiation contributions from both KNPS and the TISF, the dose to an individual at the boundary of the owner controlled area (at 1 500 m from the TISF) for 2 000 hours (83.3 days) per year would be below the regulatory limit of 0.25 mSv per year (Eskom 2016b). This

[23] A radionuclide is an atom with excess nuclear energy, making it unstable and able to emit radiation.

[24] Sievert is the unit of radiation absorption. 1 Sv is the amount of radiation roughly equivalent in biological effectiveness to one gray (Infotox, 2016). The gray (Gy) is a derived unit of ionising radiation dose and is defined as the absorption of one joule of radiation energy per kilogram of matter.

corresponds with a dose rate of less than 0.0005 mSv/h[25] at the exclusion security fence, easily compliant with RD-0022 for public exposure. Therefore, in effect, the TISF does not contribute sufficient radiation for the regulatory limit to be exceeded. The specific dose rate is required for the licensing of the TISF, and will be calculated during the NNR licensing phase (Eskom 2016b). However, the confirmation of compliance with the regulatory dose rates is sufficient to inform the assessment of impacts on human health. Eskom confirms that their initial assessment of dose rates was based on very conservative assumptions and it is likely that the confirmatory study will indicate even lower health risks.

6.6.3 Health effects of low levels of ionizing radiation

This section is based on information presented in the Human Health Impact Study.

In 2001 the Committee on Medical Aspects of Radiation in the Environment (COMARE) published a review of pregnancy outcomes following pre-conception exposure to radiation. The review confirmed that available epidemiological data does not indicate a link between congenital abnormalities as a whole and parental exposure to radiation pre-conception. Miscarriage or spontaneous abortion, neonatal death, congenital abnormalities as a whole, and the ratio of baby boys to girls, did not appear to be significantly associated with parental radiation exposure before conception. This finding is confirmed in the most recent report of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR, 2013). However, although these epidemiological studies have failed to demonstrate a link, experimental studies on plants and animals have demonstrated that radiation can induce hereditary effects and humans are unlikely to be an exception (UNSCEAR, 2013). Therefore, the hazard of hereditary effects is recognised, although the potential risk cannot currently be quantified.

Prenatal (in utero) exposure to ionizing radiation is a known risk factor for childhood cancers. UNSCEAR (2013) cites a statistically significant increased risk among children of leukaemia and all solid cancers i.e. cancers of the organs and soft tissues of the body, of about 40 % relative to the baseline. Regarding exposure in childhood, the risk of cancer associated with a given radiation dose is higher in children compared with adults. The latency period is variable, with the result that radiation exposure at a young age may induce a cancer within a few years, or the cancer may present decades later (UNSCEAR, 2013).

Circulatory diseases present the only significant group of non-cancer somatic effects. Although a matter of much debate, it was concluded that a dose of 0.5 Gy represented a threshold for developing circulatory diseases more than 10 years after exposure (UNSCEAR, 2013).

Cancer is the major concern for the long term effects of radiation exposure. A review of the cancer risks associated with radiation exposure indicated that leukaemia and cancers of the lung and female breasts are associated with the highest risk per radiation dose (Harley 2001). Cancer of the bone, thyroid and skin were reported at lower risk levels. More recent reviews focussed on the effects of protracted exposure to low levels of ionising radiation and indicated the risk of leukaemia (Brenner et al. 2003). Most recently, an international study of occupational exposure to low levels of ionising radiation confirmed the risk of leukaemia, but also of solid cancers. (Richardson et al. 2015)

6.6.3.1 Baseline cancer risk

The most recent nominal cancer risk coefficients proposed by the International Commission on Radiological Protection (ICRP) are used to estimate the baseline cancer risk i.e. the risk based on exposure scenarios prior to development of the TISF. The radiation dose from the TISF is

[25] Based on the annual public exposure limit of 1mSv divided by 2000 hours.

contextualised in terms of risk for morbidity and mortality using generic numerical factors to convert total radiation dose to cancer risk. The nominal risk coefficient for fatal cancer (resulting in mortality) is 414 cases per 10 000 persons per Sv, or 0.041 Sv^{-1}. The risk coefficient for non-fatal cancer (not resulting in mortality) is 0.13 Sv^{-1}. The coefficient for total cases is 0.17 Sv^{-1}, which is the morbidity, or the total number of cases regardless of whether or not a fatality follows.

6.6.3.2 TISF-associated cancer risk

Although the approach followed by Eskom in determining the TISF-associated radiation dose (Section 6.6.2.2) demonstrates preliminary compliance with regulations, it does not allow quantification of the cancer risk associated with the operation of the TISF, since an applicable radiation dose is not available at this stage. However, considering the large margin of safety provided by the owner controlled boundary (at least 1 500 m), a significant additional risk due to the TISF is unlikely. Furthermore, based on the margin of safety, the TISF-associated cancer risk should be only a fraction of the current risk estimated for KNPS. The estimated current risk of cancer morbidity is approximately 3 cases in a population of ten million and the risk of mortality is less, namely, approximately 7 cases in a population of 100 million. Therefore, the potential risk associated with the TISF should be a fraction of each of these numbers. The resultant risk cannot be viewed as significant and cannot be seen as a reason for concern. It is unlikely that the planned operation of the TISF will result in a discernible increase in cancer incidence in the population surrounding KNPS.

6.6.4 Assessment of Impacts: Construction Phase

No direct construction phase impacts on human health are associated with the project.

6.6.5 Assessment of Impacts: Operational Phase

One potential direct operational phase impact on human health of surrounding communities was identified, and assessed together for both site alternatives:

- HH1: Increased Health Risk due to Radiation Exposure.

6.6.5.1 Potential Impact HH1: Increased Health Risk due to Radiation Exposure

The main health impact of concern regarding exposure to low levels of ionising radiation, as expected around a nuclear power station, is cancer (Section 6.6.3). KNPS is situated in the West Coast district of the Western Cape. The baseline health status of the population in this district, with regard to cancer, is aligned with the Western Cape population at large. Therefore, the population surrounding KNPS is apparently not more vulnerable to cancer than the other Western Cape districts and thus not more sensitive to the health effects of low levels of ionising radiation potentially emitted from the TISF.

The current estimated cancer risk associated with current levels of radiation from KNPS is so low as not to result in a discernible effect in the surrounding population. Therefore, the current risk associated with KNPS cannot be viewed as a factor predisposing the surrounding community to sensitivity to cancer.

The potential risk associated with the TISF should be a fraction of that currently associated with KNPS. Regarding potential cumulative human health impacts resulting from the proposed TISF in relation to existing developments and operations at KNPS, it is unlikely that the cancer risk would be significantly increased in relation to the existing risk, and a cumulative impact is also unlikely.

Based on the above information, it is concluded that the potential impact of the operation of the TISF on human health in the surrounding communities is negligible with regard to the risk of cancer.

Impacts on other aspects of health are unlikely, since the operation is not a major addition to KNPS, which is an existing operational nuclear power station. Potential impacts on the social interface with health, such as usually considered during the construction and commissioning of a nuclear power station, are thus not expected.

Mandatory radiation control and monitoring measures are already in place in and around KNPS; therefore, additional radiation control and monitoring measures are not proposed. However, it is essential that such current measures are maintained. Current ongoing environmental radiation monitoring, dose assessment and reporting conducted by the KNPS ESL are mandatory in order to satisfy the requirements of the NNR and will continue in future. The ESL programme will automatically encompass the monitoring and assessment of any potential radiation exposure to the public that might result from the TISF.

The impact is assessed to be of ***low*** significance for both site alternatives, with no mitigation possible (Table 6-19).

Table 6-19: Significance of increased health risk due to radiation exposure

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Regional 2	Low 1	Long-term 3	**Medium 6**	Improbable	**LOW**	– ve	Medium
Essential mitigation measures: • No mitigation require/possible								
With mitigation	Regional 2	Low 1	Long-term 3	**Medium 6**	Improbable	**LOW**	**– ve**	Medium

6.6.6 The No-Go Alternative

The No-Go alternative entails no change in the *status quo*, in other words there would be no additional sources of radiation at KNPS with the potential to affect health of surrounding communities.

6.6.7 Mitigation Measures: Potential Human Health Impacts

No mitigation of human health impacts is required/possible.

6.7 Potential Heritage Impacts

6.7.1 Introduction, Terms of Reference and Methodology

This assessment is based on the Heritage Impact Assessment undertaken by ACO Associates (see Appendix J). The purpose of the study was to assess the potential impacts of the development of the TISF on heritage resources, indicate the acceptability of impacts and recommend practicable mitigation measures to minimise potential impacts and maximise potential benefits.

The ToR for the study were to:

- Review available studies undertaken at KNPS to determine baseline information available and to determine gaps in information;
- Compile the NID for submission to HWC;
- Identify and describe any heritage resources in the area and their importance in a local, regional and national context;
- Identify potential impacts of the proposed project on heritage resources;

- Assess the impacts of the proposed project on heritage resources in the area using the prescribed impact assessment methodology;
- Identify and assess potential cumulative impacts resulting from the proposed development in relation to proposed and existing developments in the surrounding area;
- Recommend practicable mitigation measures to avoid and/or minimise/reduce impacts and enhance benefits. Assess the effectiveness of proposed mitigation measures using the prescribed impact assessment methodology; and
- Recommend and draft a monitoring campaign to ensure the correct implementation and adequacy of recommenced mitigation and management measures, if applicable.

The property on which KNPS is situated has been subject to a significant amount of palaeontological and archaeological research in the past. A physical site inspection of the affected area was undertaken by the specialist to evaluate the baseline situation, however the bulk of available knowledge of the site and immediate environs is based on available data and accumulated local experience. No trial excavations were undertaken as part of this study.

6.7.2 Assessment of Impacts: Construction Phase

One potential construction phase impact on heritage resources was identified, and is assessed together for both site alternatives:

- H1: Loss or destruction of archaeological sites.

6.7.2.1 Potential Impact H1: Loss or destruction of archaeological sites

Destruction of tangible heritage inevitably takes place during the construction process rather than during the operational phases of developments as the main source of impact is normally due to the disturbance of undisturbed ground or landscape and/or demolition of structures and places protected by the NHRA. Invariably these impacts are irreversible and of permanent duration. Cultural landscapes are highly sensitive to cumulative impacts and large scale development activities that change the character and public memory of a place, however KNPS does not lie within an easily definable cultural landscape context – there are no significant streetscapes or concentrations of historic structures in, or close, to the area.

Although the area is potentially rich in buried archaeological and palaeontological resources, both site alternatives are situated in areas which were significantly transformed during the construction of KNPS in the 1970s. The chances of finding intact shell middens or any other form of surface archaeology within a 500 m radius of the existing power station is considered very low. As such, the relatively shallow excavations required for the construction of the TISF are unlikely to impact on any *in situ* archaeological or palaeontological material.

The impact is assessed to be of ***very low*** significance for both site alternatives. Mitigation is required in the unlikely event of a chance find of archaeological or palaeontological material during construction (Table 6-20).

Table 6-20: Significance of loss or destruction of archaeological sites

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Low 1	Short-term 1	**Low** **3**	Improbable	**VERY LOW**	– ve	High
Essential mitigation measures: • Empower staff to stop works on (chance) discovery of archaeological or palaeontological artefacts on site. • Report the presence of graves or human remains, fragments of fossil bone, ostrich egg or stone fragments to HWC and/or a suitably qualified archaeologist. • Agree with HWC or the archaeologist regarding suitable mitigation depending on the nature of the find and the circumstances under which mitigation, if necessary, can be accomplished in the case of a chance find. • Obtain a permit for the removal of artefacts from the site (if any are discovered) during construction.								
With mitigation	Local 1	Low 1	Short-term 1	**Low** **3**	Improbable	**VERY LOW**	– ve	High

6.7.3 Assessment of Impacts: Operational Phase

No potential direct operational phase impacts on cultural and heritage resources are associated with the project.

6.7.4 The No-Go Alternative

The No-Go alternative entails no change in the *status quo*, in other words there would be no potential for disturbance of heritage resources.

6.7.5 Mitigation Measures: Potential Heritage Impacts

Essential heritage mitigation measures during **construction** are as follows:

- Empower staff to stop works on (chance) discovery of archaeological or palaeontological artefacts on site.
- Report the presence of graves or human remains, fragments of fossil bone, ostrich egg or stone fragments to HWC and/or a suitably qualified archaeologist.
- Agree with HWC or the archaeologist regarding suitable mitigation depending on the nature of the find and the circumstances under which mitigation, if necessary, can be accomplished in the case of a chance find.
- Obtain a permit for the removal of artefacts from the site (if any are discovered) during construction.

6.8 Potential Visual and Sense of Place Impacts

6.8.1 Introduction, Terms of Reference and Methodology

This impact has been assessed by SRK specialists using SRK's standard Impact Assessment rating methodology and a stand-alone specialist study has not been produced.

The purpose of the study was to assess the potential impacts of the development on visual resources and sense of place, indicate the acceptability of impacts and recommend practicable mitigation measures to minimise potential impacts and maximise potential benefits.

The ToR for the study were to:

- Determine the character and sensitivity of the visual environment;
- Identify visual resources and key viewing corridors / viewpoints;

- Determine the existing visual character and quality in order to understand the sensitivity of the landscape;
- Identify and determine the magnitude of visual impacts through analysis and synthesis of the following factors:
    - Visual absorption capacity;
    - Visual exposure;
    - Viewing Distance and Visibility;
    - Landscape Integrity; and
    - Sensitivity of Viewers (visual receptors);
- Assess the impacts of the project on the visual environment and sense of place using the prescribed impact assessment methodology;
- Identify and assess potential cumulative visual impacts resulting from the proposed development in relation to proposed and existing developments in the surrounding area; and
- Recommend practicable mitigation measures to avoid and/or minimise/reduce impacts and enhance benefits. Assess the effectiveness of proposed mitigation measures using the prescribed impact assessment methodology.

The assessment included an analysis of visual data (including data on topography, vegetation cover and land-use), an extensive reconnaissance of the study area and key viewpoints, and visual sampling and a mapping exercise to define the visual exposure and visibility of the project.

6.8.2 Analysis of the Magnitude of the Visual Impact

The following section outlines the analysis that was undertaken to determine the **magnitude or intensity** of the overall visual impact of the project. Various factors were considered in the assessment, including:

- Visual exposure or the viewshed;
- Visual absorption capacity;
- Potential visual receptors;
- Visibility and viewing distance; and
- Integrity with existing landscape / townscape.

The analysis of the magnitude or intensity of the visual impact, as described in this section, is summarized and integrated in Table 6-23 and forms the basis for the assessment and rating of the impact as documented in the next section (Sections 6.8.3 and 6.8.4).

6.8.2.1 Visual Exposure (Viewshed)

Visual exposure is determined by the zone of visual influence or viewshed. The viewshed is the topographically defined area that includes all the major observation sites from which the project *could* be visible. The boundary of the viewshed connects high points in the landscape and demarcates the zone of visual influence.

For the purposes of this study, the viewshed for each alternative is based on a modelling height 6 m above ground level (approximate height of casks) to determine the visibility of the TISF. A viewshed was generated for Alternative 1 (Figure 6-2) and Alternative 2 (Figure 6-3).

The method used in determining the zones of influence included GIS modelling based on 20 m contours.

The viewshed analysis assumes maximum visibility of the project in an environment stripped bare of vegetation and structures. It is therefore important to remember that the project is ***not necessarily visible from all points within the viewshed*** as views may be obstructed by visual elements such as localised variations or irregularities in topography, and/or built structures (see visibility from specific viewpoints in Section 6.8.2.2).

Analysis of the viewsheds of the TISF (Figure 6-2 and Figure 6-3) is instructive and leads to the following observations:

- The viewsheds indicate that Alternative 1 and Alternative 2 will be visible from isolated areas:
    - north of the site in the dunefield of the Koeberg Nature Reserve;
    - from areas immediately surrounding KNPS;
    - south of the site from Melkbosstrand; and
    - from higher elevations inland and south-east of the site (for Alternative 1 only);

  However, the viewsheds do not take into account the screening provided by the dunefield, the built fabric at Duynefontein and Melkbosstrand, and most significantly, the existing structures at KNPS.
- As expected, Alternative 1 and Alternative 2 will not be visible to the residents of Duynefontein or users of the R27 because of the screening provided by the primary dune.

6.8.2.2 Visual Absorption Capacity

The Visual Absorption Capacity (VAC) is the potential for the area to conceal the project. Factors contributing to the VAC include:

- Topography and vegetation that is able to provide screening and increase the VAC of a landscape;
- The degree of urbanisation compared to open space. A highly urbanised landscape is better able to absorb the visual impacts of similar developments, whereas an undeveloped rural landscape will have a lower VAC; and
- The scale and density of surrounding development.

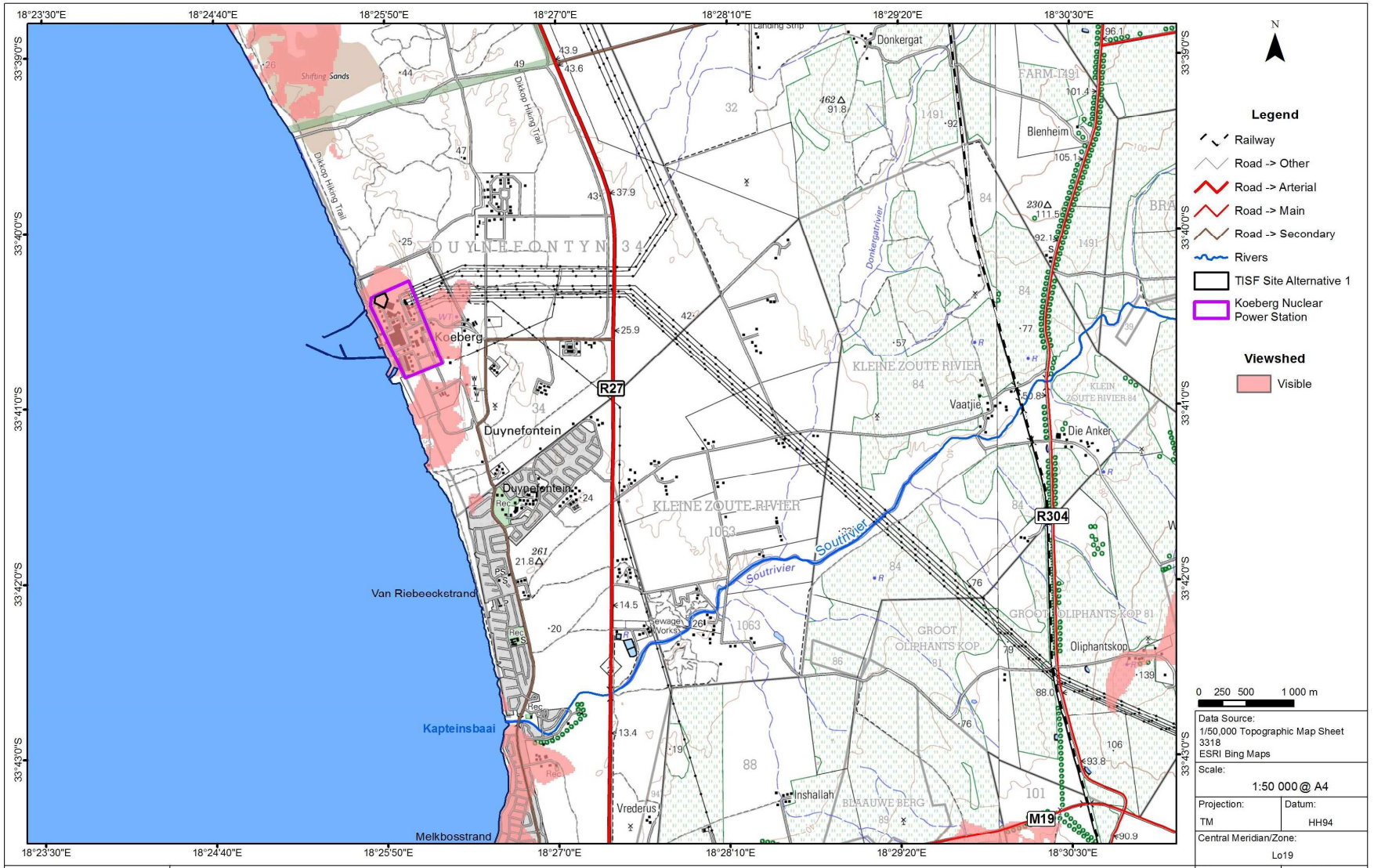
These factors frequently apply at different scales, by influencing the VAC in the foreground (e.g. dense bush, small structures), middleground and background (e.g. tall forests, hills, cityscapes). Criteria used to determine the VAC of the affected area are defined in Table 6-21.

The VAC of the area is increased by:

- Topography, particularly the dunefield extending north from KNPS and the dominant north-south ridgeline (vegetated dune) inland of KNPS; and
- Existing structures at KNPS.

The low, wind-pruned vegetation of the area provides very limited visual screening.

Overall, the area is rated as having a ***moderate*** VAC mainly due to local topographical variations in the landscape and the existing structures at KNPS being able to absorb the project to a considerable degree.



srk consulting

KOEBERG TISF VIA

SITE ALTERNATIVE 1: VIEWSHED (1M)

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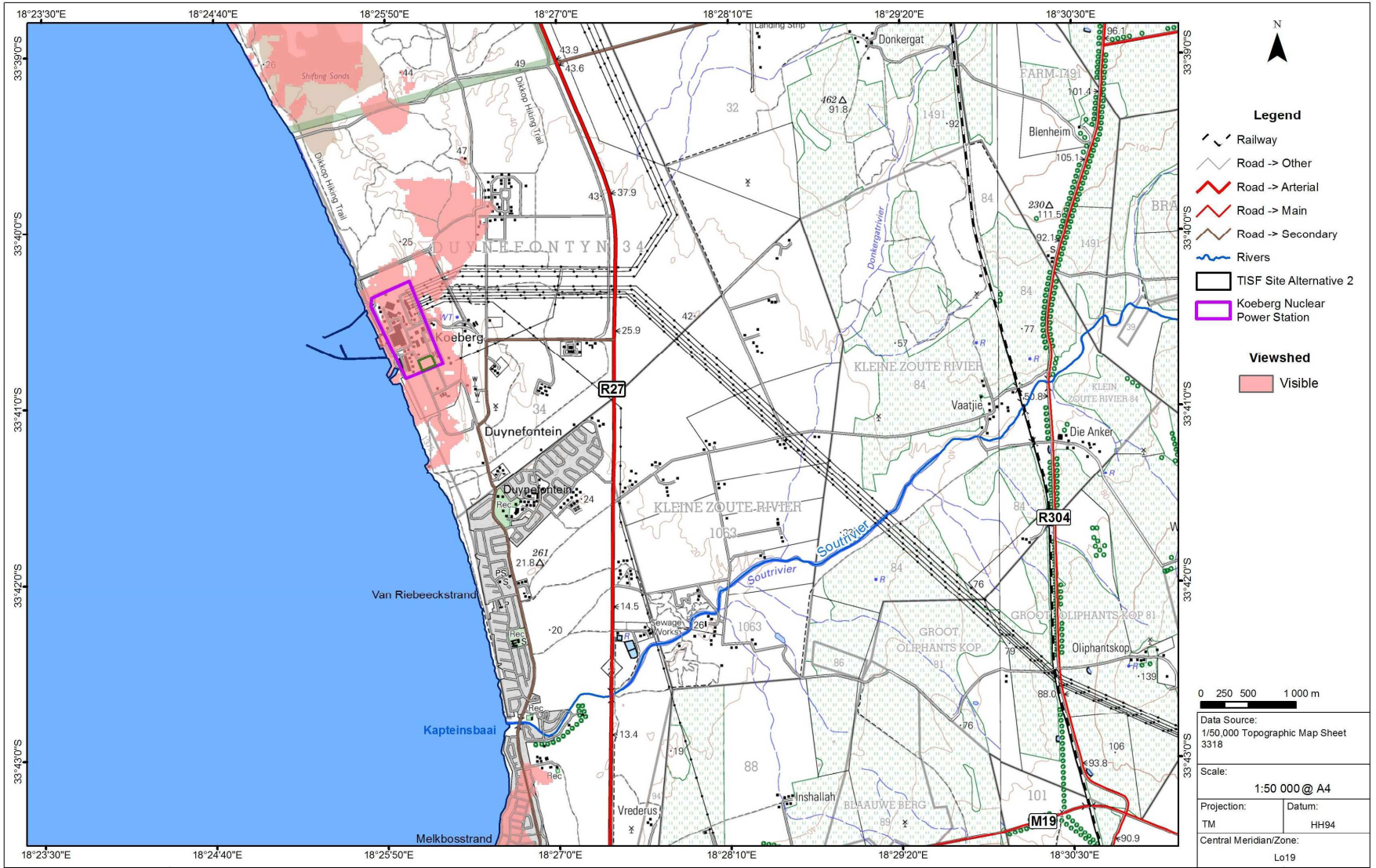
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Legend
Railway
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Road -> Arterial
Road -> Main
Road -> Secondary
Rivers
TISF Site Alternative 2
Koeberg Nuclear Power Station
Viewshed
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Koeberg
Duynefontein
Van Riebeeckstrand
Kapteinsbaai
Melkbosstrand
Donkergat
Blenheim
Vaatjie
Die Anker
Oliphantskop
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Vrederus
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R304
M19
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Date: 23/09/2015
Compiled by: FUBM
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srk consulting
KOEBERG TISF VIA
SITE ALTERNATIVE 2: VIEWSHED (1M)
Path: G:\New Proj\478317 Koeberg TISF EIA\8GIS\GISPROJ\MXD\478317_FigX_KoebergTISF EIA_Alt2Viewshed_A4L_20150923.mxd
Revision: A Date: 20 10 2016

Table 6-21: Visual absorption capacity criteria

High	Moderate	Low
An area is able to absorb the visual impact as it has: • Undulating topography and relief • Good screening vegetation (high and dense) • Is highly urbanised in character (existing development is of a scale and density to absorb the visual impact).	An area is moderately able to absorb the visual impact, as it has: • Moderately undulating topography and relief • Some or partial screening vegetation • A relatively urbanised character (existing development is of a scale and density to absorb the visual impact to some extent.	An area is not able to absorb the visual impact as it has: • Flat topography • Low growing or sparse vegetation • Is not urbanised (existing development is not of a scale and density to absorb the visual impact to some extent.)
 *http://www.franschhoek.co.za*	 *http://wikipedia.org*	 *http://www.butbn.cas.cz*
 *http://commons.wikimedia.org*	 *http://blogs.agu.org*	 *http://fortheinterim.com*

6.8.2.3 Visual Receptors

Visual receptors around KNPS are described in Section 4.2.5.4. The ridgeline ensures that most of KNPS SPA, and therefore the site alternatives, are screened from receptors. The TISF is unlikely to be readily distinguishable from existing KNPS infrastructure. The sensitivity of viewers or visual receptors potentially affected by the visual impact of the project is considered to be ***very low*****.**

6.8.2.4 Landscape Integrity

Landscape (or townscape) integrity refers to the compatibility of the development/visual intrusion with the existing landscape. The landscape integrity of the TISF is rated based on the relevant criteria listed in Table 6-22.

Table 6-22: Landscape integrity criteria

High	Moderate	Low
A project: • Is consistent with the existing land use of the area; • Is highly sensitive to the natural environment; • Is consistent with the urban texture and layout; • The buildings and structures are congruent / sensitive to the existing architecture / buildings; and • The scale and size of the development is similar to nearby existing development.	A project: • Is moderately consistent with the existing land use of the area; • Is moderately sensitive to the natural environment; • Is moderately consistent with the urban texture and layout; • The buildings and structures are moderately congruent / sensitive to the existing architecture / buildings; and • The scale and size of the development is moderately similar to nearby existing development.	A project: • Is not consistent with the existing land use of the area; • Is not sensitive to the natural environment; • Is very different to the urban texture and layout; • The buildings and structures are not congruent / sensitive to the existing architecture / buildings; and • The scale and size of the development is different to nearby existing development.

The TISF will be located within KNPS Security Protected Area and will be consistent with the existing land use of the area *viz*. nuclear power station. The scale and size of the TISF will be smaller than many existing structures at KNPS.

Overall, Alternative 1 and Alternative 2 are considered to have ***high*** landscape integrity.

6.8.2.5 Magnitude of the Overall Visual Impact

Based on the above criteria, the magnitude or intensity of the overall visual impact that is expected to result from the TISF has been rated. Table 6-23 provides a summary of the criteria, a descriptor summarizing the status of the criteria and projected impact magnitude ratings.

The overall magnitude of the visual impact of the TISF is rated as ***very low*** for Alternative 1 and Alternative 2. The VAC of the area, the limited number of sensitive receptors and the congruency of activities with those at KNPS will reduce the visual impact.

Table 6-23: Magnitude of overall visual impact

Criteria	Alternative	Rating	Comments
Visual Exposure (Viewshed)	*Alternative 1*	Very Low	Alternative 1 and Alternative 2 will be visible from isolated areas, but the viewsheds do not take into account the screening provided by the dunefield, the built fabric at Duynefontein and Melkbosstrand and the existing structures at KNPS.
	Alternative 2	Very Low	
Visual Absorption Capacity	*Alternative 1*	Moderate	Local topographical variations in the landscape and the existing structures at KNPS will be able to absorb the project to a certain degree.
	Alternative 2	Moderate	

Criteria	Alternative	Rating	Comments
Viewer Sensitivity (Receptors)	*Alternative 1*	Very Low	The ridgeline ensures that most of KNPS Security Protected Area, and therefore the site alternatives, are screened from receptors. The TISF is unlikely to be easily distinguishable from the rest of KNPS infrastructure.
	Alternative 2	Very Low	
Viewing Distance and Visibility	*Alternative 1*	Very Low	The sites are *Not Visible* or *Marginally Visible* from the identified viewpoints.
	Alternative 2	Very Low	
Landscape Integrity	*Alternative 1*	High	The TISF will be located within KNPS Security Protected Area and will be consistent with the existing land use of the area.
	Alternative 2	High	

6.8.3 Assessment of Impacts: Construction Phase

One direct construction phase impact on visual quality and sense of place was identified:

- V1: Altered Sense of Place and Visual Intrusion caused by Construction Activities.

6.8.3.1 Potential Impact V1: Altered Sense of Place and Visual Intrusion caused by Construction Activities at Alternative 1 and Alternative 2

Visual impacts will be generated by construction activities such as earthworks, which can cause scarring, and from construction infrastructure, plant and materials on site (e.g. site camp, cranes and stockpiles). Dust generated at the site will be visually unappealing and may further detract from the visual quality of the area. A loss of sense of place and visual quality is unlikely to occur since the nature of construction and the change in the state of the site are congruent with the current nature of the site, *viz*. nuclear power station.

The VAC of the study area greatly reduces the visual impact of the construction activities at Alternative 1 and Alternative 2.

The significance of the impact is assessed to be of ***very low*** significance for both site alternatives and with the implementation of mitigation is reduced to ***insignificant*** (Table 6-24).

Table 6-24: Significance of altered sense of place and visual intrusion caused by construction activities

	Extent	*Intensity*	*Duration*	*Consequence*	*Probability*	*Significance*	*Status*	*Confidence*
Without mitigation	Local 1	Low 1	Short-term 1	**Very Low 3**	Probable	**VERY LOW**	– ve	High
Essential mitigation measures: • Control litter and keep construction site as clean and neat as possible. • Avoid excavation, handling and transport of materials which may generate dust under high wind conditions. • Keep construction sites tidy and all activities, material and machinery contained within an area that is as small as possible. • Minimise the use of night-lighting during construction.								
With mitigation	Local 1	Low 1	Short-term 1	**Very Low 3**	Possible	**INSIGNIFICANT**	– ve	High

6.8.4 Assessment of Impacts: Operational Phase

One potential direct operational phase impact on the visual environment was identified:

- V2: Altered Sense of Place and Visual Intrusion caused by the TISF.

6.8.4.1 Potential Impact V2: Altered and Sense of Place and Visual Intrusion caused by the TISF at Alternative 1 and Alternative 2

The TISF will change the character of the site for Alternative 1 and Alternative 2 from an unbuilt site to a built site. However, due to the location of the sites within KNPS Protected Area, the TISF will be consistent with the current nature of KNPS resulting in a low level of visual change.

From within the foreground (<1 km), receptors can appreciate textures and form (individual components of the TISF) as well as the open spaces between the structures. However, there are no sensitive receptors within this zone.

Although the TSIF will comprise a number of dry storage casks on a concrete platform, the TISF will be viewed as a single built mass by receptors in the middleground/background. The massing and materials used for the TISF will be similar to existing infrastructure at KNPS, and the existing structures at KNPS (reactor units, buildings) will reduce the visibility of the TISF by providing visual enclosure to the TISF.

Visual (and sense of place) impacts of the TISF will be greatly reduced by the VAC (screening effect of topography, vegetation and existing infrastructure) of the surrounding area.

Loss of sense of place is unlikely to occur, since the TISF and the change in the state of the site (Alternative 1 or Alternative 2) are congruent with the current nature of the site, *viz*. nuclear power station.

The significance of the impact is thus assessed to be of ***low*** significance for both site alternatives and with the implementation of mitigation is reduced to ***very low*** (Table 6-25). The visual impact of Alternative 1 may be marginally lower than Alternative 2 as existing infrastructure will provide significant screening to more receptors to the south[26].

Table 6-25: Significance of altered sense of place and visual intrusion caused by the TISF

	Extent	***Intensity***	***Duration***	***Consequence***	***Probability***	***Significance***	***Status***	***Confidence***
Without mitigation	Local 1	Low 1	Long-term 3	**Low** **5**	Probable	**LOW**	– ve	High
Essential mitigation measures: • Reduce the footprint of the TISF and associated infrastructure to a workable minimum. • Ensure infrastructure is well maintained and neat. • Be sensitive towards the use of glass or material with a high reflectivity which may cause glare and increase visual impacts. • Keep all areas neat, clean and organised in order to portray a general tidy appearance. • Limit lighting only to essential activities and facilities. Direct lighting inwards and downwards towards activities and facilities to avoid light spillage and trespass.								
With mitigation	Local 1	Low 1	Long-term 3	**Low** **5**	Possible	**VERY LOW**	– ve	High

6.8.5 The No-Go Alternative

The No-Go alternative entails no change in the *status quo*. Both site alternatives will remain as unbuilt vegetated sites and neither would be visible to surrounding receptors e.g. residents of Duynefontein.

[26] This is considered to be an insignificant variance and significance rating remains the same for Alternative 1 and Alternative 2.

6.8.6 Mitigation Measures: Potential Visual Impacts

Essential visual mitigation measures during **construction** are as follows:

- Control litter and keep construction site as clean and neat as possible.
- Avoid excavation, handling and transport of materials which may generate dust under high wind conditions.
- Keep construction sites tidy and all activities, material and machinery contained within an area that is as small as possible.
- Minimise the use of night-lighting during construction.

Essential visual mitigation measures to address **operations** impacts are as follows:

- Reduce the footprint of the TISF and associated infrastructure to a workable minimum.
- Ensure infrastructure is well maintained and neat.
- Be sensitive towards the use of glass or material with a high reflectivity which may cause glare and increase visual impacts.
- Keep all areas neat, clean and organised in order to portray a general tidy appearance.
- Limit lighting only to essential activities and facilities. Direct lighting inwards and downwards towards activities and facilities to avoid light spillage and trespass.

6.9 Cumulative Impacts

6.9.1 Introduction

Anthropogenic activities can result in numerous and complex effects on the natural and social environment. While many of these are direct and immediate, the environmental effects of individual activities (or projects) can combine (additive impact) and interact (synergistic impact) with other activities in time and space to cause incremental or aggregate effects. Effects from disparate activities may accumulate or interact to cause **additional** effects that may not be apparent when assessing the individual activities in isolation (Canadian Environmental Protection Agency, no date). Cumulative effects can also be defined as the total impact that a series of developments, either present, past or future, will have on the environment within a specific region over a particular period of time (DEAT IEM Guideline 7, Cumulative effects assessment, 2004). The International Finance Corporation (IFC, 1998) states that environmental assessment should include consideration of *"… cumulative impacts of existing projects, the proposed project and anticipated future projects".*

The IFC's Good Practice Handbook for *Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets,* published in 2012, provides further guidance for comprehensive stand-alone Cumulative Impact Assessment (CIA). It places further emphasis on biodiversity and socio-economic conditions and introduces the concept of Valued Environmental and Social Components (VECs).

The IFC recommends that cumulative assessment should (a) "*be **commensurate with the incremental** contribution, source, extent, and severity of the cumulative impacts anticipated*," and (b) "*determine if the project is incrementally responsible for adversely affecting an ecosystem component or specific characteristic beyond an acceptable predetermined **threshold** (carrying capacity) …"*

For the purposes of this report, cumulative impacts are defined as 'direct and indirect impacts that act together with existing or future potential impacts of other activities or proposed activities in the area/region that affect the same resources and/or receptors'.

To define the level of cumulative impact, it is critical to look beyond the geographical boundaries and environmental impacts of a single development/project and consider the area of influence of the specific project as well as other developments currently in or proposed in the area and their understood impacts and area of influence. It may be that impacts generated by a single development are not considered to be significant, but when considered as part of a cumulative impact assessment, these require mitigation.

Key considerations for the assessment of cumulative impacts as part of the environmental impact assessment are:

- The cumulative impact assessment will need to give consideration to developments that may have contributed to cumulative effects in the past, may be contributing or are anticipated to contribute in the foreseeable future. This needs to be relevant to the timeframe within which impacts are to be experienced as a result of the project itself (i.e. all phases for which the project specific impact assessment is being undertaken). Given that the baseline environment will already be impacted on by the historical and current contributors to the cumulative impact, it is only necessary when undertaking the cumulative impact assessment to place an emphasis on an identified future cumulative baseline environment;
- Cumulative impacts may not be applicable to all aspects, as project related impacts may be confined to the project area and not subject to or contributing to impacts in the broader area of influence as a whole. For example, if the project area is confined to a water catchment which is not anticipated to be impacted on by other developments (past, present or foreseeable future) then a cumulative impact assessment need not be considered for this environmental aspect;
- A cumulative impact assessment will consider a specific area of influence which will be determined by the impact itself and the baseline environment in which it is proposed; e.g. where one or more projects affect the same ecosystem, the whole area in which the ecosystem is found may be considered the area of influence for the cumulative assessment. This will vary across project aspects and therefore a single area of influence for the cumulative impact assessment cannot be set; and
- The cumulative impact assessment can only be undertaken where information is readily available and as such will only be an initial assessment of the likely cumulative impact in terms of knowledge available at the time of the assessment. It is critical to understand the information sources and limitations that exist.

For the most part, cumulative effects or aspects thereof are too uncertain to be quantifiable, due mainly to a lack of data availability and accuracy. This is particularly true of cumulative effects arising from potential or future projects, the design or details of which may not be finalised or available and the direct and indirect impacts of which have not yet been assessed.

6.9.2 Scope of the Cumulative Assessment

For cumulative effects analysis to be a useful tool to decision makers and stakeholders, it must be limited to effects that can be meaningfully evaluated, rather than expanded to the point where the resource or receptors are no longer significantly affected or the effects are no longer of interest to stakeholders. To this end, four important aspects require consideration prior to the evaluation of cumulative effects:

- The determination of an appropriate area of influence, i.e. spatial and, to a lesser extent, temporal boundaries for evaluation of cumulative effects of the project;
- Identification of VECs;
- External natural and social stressors; and
- The evaluation of relevant projects for consideration in the cumulative effects analysis.

Each of the four aspects listed above is discussed below.

6.9.2.1 Area of Influence

The IFC defines the area of influence (AoI) to encompass "*cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned, or reasonably defined developments at the time the risks and impact identification process is conducted.*" Consequently, the spatial and temporal boundaries for analysis of cumulative effects are dependent on a number of factors, including:

- The size and nature of the project and its potential effects;
- The size, nature and location of past and (known) future projects and activities in the area, and the significance of their adverse or beneficial environmental effects;
- Relevant ecological boundaries, including landform, vegetation, land use, habitat, soil and surface materials and climate;
- Relevant aquatic boundaries, including catchments, sub-catchments and hydrogeological discontinuities;
- The aspect of the environment impacted by the cumulative effect (boundaries selected for cumulative environmental effects on, for example, air quality might be different from those relevant to the effects on a particular species of plant or animal); and
- The period of occurrence of effects (temporal boundaries may extend beyond the timing of construction and operations) (Canadian Environmental Protection Agency, no date).

The AoI does not include potential impacts that would occur without the project or independently of the project.

For this project the AoI includes the following:

- Areas potentially impacted by the project and facilities which are directly owned, operated, or managed (including by contractors) and that are a component of the project;
- Areas potentially impacted by unplanned but predictable developments caused by the project that may occur later or at a different location;
- Areas potentially impacted by cumulative impacts from additional planned development or other sources of similar impacts in the geographical area, any existing project or condition, and other project-related developments that can realistically be; and
- Areas and communities potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.

The TISF site alternatives are both situated within the existing boundaries of the KNPS SPA, which is located within the Koeberg Nature Reserve and various development exclusion zones. Impacts are likely to be mostly of local extent. The spatial scope of this analysis is generally aligned with the zone of influence of the project and potential projects (if any) in the vicinity that may have impacts overlapping with the proposed project (see Figure 6-4).

6.9.2.2 Identification of VECs

VECs are environmental and social attributes that are considered to be important in assessing risks; they may be: physical features, habitats, wildlife populations (e.g. biodiversity), ecosystem services, natural processes (e.g. water and nutrient cycles, microclimate), social conditions (e.g. health, economics) or cultural aspects (e.g. traditional spiritual ceremonies).

While VECs may be directly or indirectly affected by a specific development, they often are also affected by the cumulative effects of several developments. VECs are the ultimate recipient of impacts because they tend to be at the ends of ecological pathways.

VECs for this project were selected based on an understanding of the project activities, the vulnerability/sensitivity of the receiving environment; and the potential interactions between project activities and the biophysical and socioeconomic environment.

The project is located within the KNPS SPA, within portions of the site identified for development. Access to both site alternatives is limited due to strict security requirements. Although previously disturbed, natural vegetation has re-established on both site alternatives including some SCC. As such the VECs considered in the cumulative assessment are as follows:

- Air quality;
- Ambient noise levels;
- Existing road traffic;
- Surface and groundwater resources;
- Terrestrial habitats; and
- Visual quality and sense of place.

The baseline presented in Section 4 describes the current state of environmental attributes, including air quality, surface and groundwater quality and quantity, terrestrial ecology and habitats as well as socio-economic characteristics of the area, including cultural and aesthetic characteristics.

6.9.2.3 External Natural and Social Stressors

Natural and social stressors can also contribute to cumulative impacts. Natural stressors are limited and may include fynbos fires. Development exclusions zones surrounding KNPS limit social stressors and none have been identified for the TISF project.

6.9.2.4 Past, Existing and Planned Activities that may affect VECs

In addition to the project, other past, present and future activities might have caused or may cause impacts and may interact with impacts caused by the project under review.

- **Cumulative impacts of past and existing activities:** It is reasonably straightforward to identify significant past and present projects and activities that may interact with the project to produce cumulative impacts, and in many respects, these are taken into account in the descriptions of the biophysical and socio-economic baseline, especially since there is almost no other development in the region (see respective sections in Section 4);
- **Potential cumulative impacts of planned and foreseen activities:** Relevant future projects that will be included in the assessment are defined as those that are ‘reasonably foreseeable’, i.e. those that have a high probability of implementation in the foreseeable future; speculation is not sufficient reason for inclusion. Such projects may include those for which authorisations have already been granted, that are currently subject to environmental assessment processes or that have been identified in planning documents.

Projects that fall in the above categories and that may result in cumulative impacts with the proposed development and therefore have been considered in the cumulative impact analysis are listed below:

- **Past and existing projects / activities:**
  - The development of KNPS in the 1980s in what was at the time a relatively remote location, and the subsequent establishment of associated facilities and infrastructure, as well as declaration of the Koeberg Nature Reserve.
  - The establishment of the Duynefontein residential area, south of KNPS, largely inhabited by employees of KNPS.
  - The construction of the new Simulator Building adjacent to the Edusec Building, an element of the Koeberg Training Centre Complex and Administrative Centre.
- **Future projects / activities:**
  - Numerous developments are proposed/anticipated within the Koeberg Nature Reserve that require EA, including those identified in Table 6-26 and Figure 6-4.

Table 6-26: Proposed developments within Koeberg Nature Reserve and their status

Project	Status	Reference Number
Koeberg Training Centre Complex and Admin Centre	EA obtained	DEA Ref no: 12/12/20/997
KBG Ankerlig 132 kV powerline	EA obtained	NEAS Ref no: DEA/EIA.0000723/2011 DEA Ref no: 14/12/16/3/3/1/329
Ankerlig 400kV powerline	EA obtained	DEA Ref no: 14/12/16/3/3/1/1182
Weskusfleur substation	EA obtained	DEA Ref no: 14/12/16/3/3/2/508
New nuclear facility (Nuclear 1)	EIA in progress	DEA Ref no: 12/12/20/944
Koeberg Diesel Storage project (on-site Koeberg and Bulk Stores Extension)	BA process in 2016	*Reference number still to be issued*
Potable water storage tanks (on-site Koeberg)	BA process in 2016	*Reference number still to be issued*
New Koeberg Insulator Pollution Testing Station (KIPTS) and decommissioning of the existing KIPTS	BA process in 2016	*Reference number still to be issued*
Car park area extension project	BA process in 2016	*Reference number still to be issued*

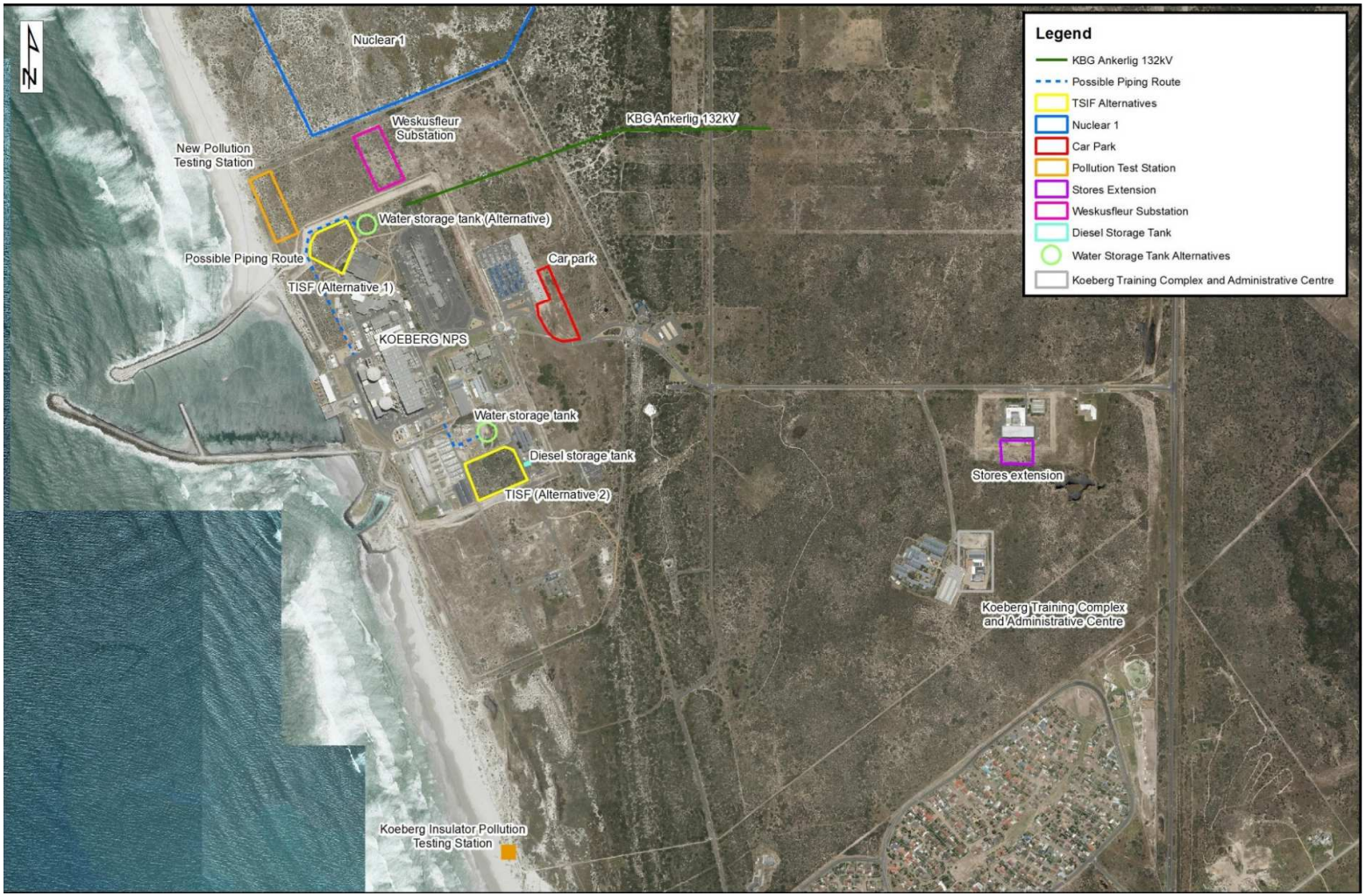

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Figure 6-4: Approved and proposed developments within the Koeberg Nature Reserve

Source: Eskom, 2016

6.9.3 Cumulative Impacts Analysis

The IFC (2012) defines CIA as a process of (a) analysing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and natural environmental and social external drivers on the chosen VECs over time, and (b) proposing tangible measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible. The key task is to ascertain how the potential impacts of a proposed development might combine, cumulatively, with the potential impacts of the other human activities and other natural stressors such as droughts or extreme climatic events.

For the most part, cumulative impacts or aspects are too uncertain to be quantifiable, mainly due to lack of (accurate) data. This is particularly true of cumulative impacts arising from potential or future projects.

6.9.3.1 Cumulative Impact Significance Rating Methodology

Figure 6-5 presents the matrix used to evaluate the cumulative impacts of the project. This matrix presents the relationship between two quantities; severity of impacts (importance and magnitude) and extent of impact (geographic size). The severity of the impact for VECs is rated as severe, moderate or mild, and wide, medium and restricted with respect to impact extent. The result of the assessment, which is either, high, medium or low, presents the overall significance.

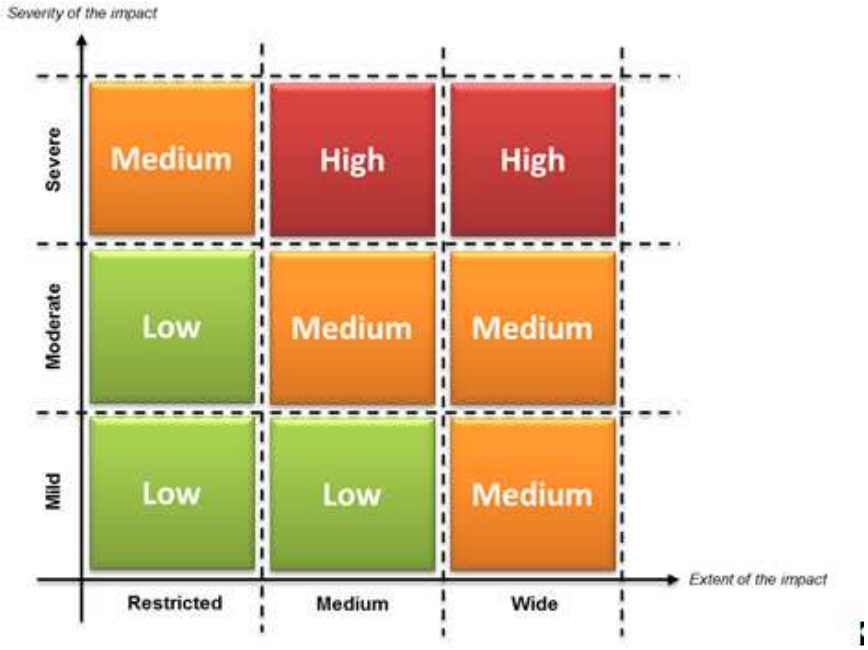

Figure 6-5: Evaluation matrix

By systematically applying the cumulative impact significance rating methodology it is possible to assign a rating to each of the identified cumulative impacts.

6.9.3.2 Identification of potential cumulative impacts

For practical reasons, the identification and management of cumulative impacts are limited to those effects generally recognised as important on the basis of scientific concerns and/or concerns of affected communities.

Cumulative impacts for this project have been identified based on the extent and nature of the area of influence of the projects, status quo of VECs and understanding of external natural and social

stressors. These insights have been informed by engagements with project stakeholders, review of existing documentation, field observations and data collection. The cumulative impacts considered relevant are:

- Decline in air quality conditions caused by emissions from projects and construction activities;
- Increase in noise levels from projects and construction activities;
- Increased traffic and incidents of accidents arising from movement of goods and products to and from the projects;
- Increase potential for contamination of groundwater and surface water;
- Loss of terrestrial vegetation and habitats; and
- Impacts on visual quality and sense of place.

By and large, the cumulative impacts of past and existing projects are incorporated in the baseline (Section 4) and impact assessment (Sections 6.2 to 6.8) and the focus hereafter is on planned and foreseen projects and activities.

6.9.4 Cumulative Impact Assessment

6.9.4.1 Cumulative Air Quality Impacts

Discrete impacts of the project were rated as insignificant (see Section 6.2.1). Air quality in the AoI is generally good; furthermore, the other developments planned for the area are unlikely to result in substantial emissions during and the additive effect on air quality is also estimated to be low. In the case that two or more of the projects are constructed simultaneously the potential for nuisance effects caused by dust during construction would be increased. Since the timing of the construction of various projects surrounding KNPS is unknown, it is assumed to be likely that at times construction phases of various projects are likely to overlap. The *severity* of the impact on the Air Quality VEC is rated as moderate, and is assessed to be of a restricted *extent*.

The cumulative impact is thus assessed to be of ***low*** significance.

6.9.4.2 Cumulative Noise Impacts

Discrete impacts of the project were rated as insignificant (see Section 6.2.2). Existing noise levels in the area are expected to be low, with noise mostly generated by the movement of vehicles on the R27 and in Duynefontein and operations at KNPS. Wave action also contributes to the ambient noise level of the area. The noise levels associated with each of the proposed development in the areas are unknown at this stage, but are not expected to be excessive given the nature of the developments. The additive effect of the developments on ambient noise levels could however be moderate, especially given the potentially substantial increase in the number of vehicles accessing the area should the development of the Nuclear 1 power station go ahead.

In the case that two or more of the projects are constructed simultaneously the potential for increased noise and associated nuisance effects to e.g. the employees at KNPS would be increased. Since the timing of the construction of various projects surrounding KNPS is unknown, it is assumed to be likely that at times construction phases of various projects are likely to overlap. The *severity* of the impact on the Ambient Noise VEC is rated as moderate, and is assessed to be of a restricted *extent*.

The cumulative impact is thus assessed to be of ***low*** significance.

6.9.4.3 Cumulative Traffic Impacts

Discrete impacts of the project were rated as insignificant (see Section 6.2.4). Traffic in the area is currently modest, and while the majority of the planned developments are unlikely to lead to a substantial increase in traffic either during construction or operations, the development of the Nuclear 1 power plant is expected to contribute quite substantially to traffic volumes both during construction (which is likely to be for a number of years) as well as operations due to the likely number of employees. Once again, the possibility of more than one of the proposed development being constructed simultaneously could have additive effects on short term traffic volumes. The *severity* of the impact on existing road traffic is rated as moderate, and is assessed to be of a medium *extent,* given the relatively remote location of KNPS.

The cumulative impact is thus assessed to be of ***medium*** significance.

6.9.4.4 Cumulative Impacts on Surface and Groundwater Quality

Discrete impacts of the project on surface and groundwater quality were rated as insignificant (see Sections 6.2.3 and 6.3). While no surface water features occur in close proximity to either of the TISF site alternatives, some wetlands occur in surrounding areas and may be impacted by run-off from the other developments proposed in the area. Cumulatively, the construction and operation of the various developments will increase the risk of contamination of ground and surface water resources, although none of the developments are likely to involve particularly noxious substances and it is assumed that all nuclear facilities will be strictly managed in terms of the requirements of the NNR to prevent and radioactive leaks. The *severity* of the impact on the Surface and Groundwater VEC is rated as mild, and is assessed to be of a restricted *extent*.

The cumulative impact is thus assessed to be of ***low*** significance.

6.9.4.5 Cumulative Loss of Terrestrial Vegetation and Habitats

Discrete impacts of the project were rated as low (see Section 6.4). The development of KNPS and associated facilities as well as the proposed additional activities will all contribute to the cumulative loss of Endangered Cape Flats Dune Strandveld vegetation, faunal habitat and well as protected floral and SCC. In the context of the larger Koeberg Nature Reserve in which 16% of the West Coast Form of the Cape Flats Dune Strandveld is already conserved, the area disturbed by development of the TISF would lead to a relatively small loss of this vegetation type. However, the collective footprints of the proposed developments, especially the footprint of the Nuclear 1 site which is relatively large could lead to a substantial loss of this vegetation and habitat type within the Koeberg Nature Reserve and as such the overall conservation targets for this vegetation type.

The *severity* of the impact on the Terrestrial habitats VEC is rated as moderate, and is assessed to be of a medium *extent*.

The cumulative impact is thus assessed to be of ***medium*** significance.

6.9.4.6 Cumulative Visual Impacts

Discrete impacts of the project were rated as very low (see Section 6.8). KNPS was developed in the 1970s and have been the dominant landscape feature in the area since. The majority of the proposed developments around KNPS are associated with KNPS, are relatively small in scale and would be considered congruent with the current nature of the site viz. nuclear power station. An increase in the number of structures, and particularly the development of an additional large nuclear power plant would increase the bulk and the distance from which the facilities will be a dominant feature, increasing the visual intrusion and further altering the sense of place.

The *severity* of the impact on the visual quality and sense of place VEC is rated as moderate, and is assessed to be of a medium *extent*.

The cumulative impact is thus assessed to be of ***medium*** significance.

6.9.5 Management of Cumulative Impacts

The management of cumulative impacts will depend on the context in which the development is occurring, i.e. the impacts from other projects and natural drivers that affect the VECs, and the characteristics of the of the TISF project impacts. Since cumulative impacts result from the actions of multiple stakeholders, the responsibility for their management is collective.

6.9.5.1 Project Design and Mitigation

In the context of the TISF project, cumulative impacts relating to air quality, noise, traffic and groundwater quality impacts can be reduced through proactive management of construction activities, which the cumulative visual impacts can be limited through proactive project design.

6.9.5.2 Mitigation of Project Impacts by other Projects

While none of the cumulative impacts are considered unacceptable, proactive project design and management will be required on a project level to limit the contribution of each to the cumulative impacts on the area surrounding KNPS. Development on the Nuclear 1 power plant would be by far the largest contributor to cumulative impacts. Since this development is subject to an EIA process (currently underway) it is anticipated that the impacts will be adequately assessed and mitigation measures identified. It is further expected that the cumulative impacts of the developments will be further explored in the Nuclear 1 EIA.

7 Conclusions and Recommendations

This chapter evaluates the impact of the proposed TISF at KNPS in the Western Cape Province. The principal findings are presented in this chapter, followed by an analysis of the need and desirability of the project and a discussion of the key factors DEA will have to consider in order to take a decision which is aligned with the principles of sustainable development. Key recommendations are also presented.

As is to be expected, the TISF has the potential to cause impacts, both negative and positive. However, since the development is of low intensity and confined in extent, very few (if any) project impacts are predicted to be of major concern.

The EIA has examined the available project layout information and drawn on both available (secondary) and specifically collected (primary) baseline data to identify and evaluate environmental (biophysical and socio-economic) impacts of the proposed project. The EIA Report aims to inform decision-makers of the key considerations by providing an objective and comprehensive analysis of the potential impacts and benefits of the project, and has created a platform for the formulation of mitigation measures to manage these impacts, presented in the EMPr presented in Appendix Q**.**

This chapter presents the general conclusions drawn from the S&EIR process, which should be considered in evaluating the project. It should be viewed as a supplement to the detailed assessment of individual impacts presented in Chapter 6.

7.1 Environmental Impact Statement

The EIA Regulations, 2014 prescribe the required content of an EIA Report, including, *inter alia*, an EIS, which is presented in the section below.

7.1.1 Evaluation and Summary of Positive and Negative Impacts

The evaluation is undertaken in the context of:

- The project information provided by the proponent;
- The assumptions made for this EIA Report;
- The assumption that the recommended (essential) mitigation measures will be effectively implemented; and
- The assessments provided by specialists.

This evaluation aims to provide answers to a series of key questions posed as objectives at the outset of this report, which are repeated here:

- Assess in detail the environmental and socio-economic impacts that may result from the project;
- Identify environmental and social mitigation measures to address the impacts assessed; and
- Produce an EIA Report that will assist DEA to decide whether (and under what conditions) to authorise the proposed development.

The evaluation and the basis for the subsequent discussion are represented concisely in Table 7-1, which summarises the potentially significant impacts and their significance ratings before and after application of mitigation and/or optimisation measures.

Table 7-1: Summary of potential impacts of the TISF and Associated Infrastructure

*Potential negative impacts are shaded in reds, benefits are shaded in greens. Insignificant impacts have not been shaded. Only **key (non-standard essential)** mitigation/optimisation measures are presented.*

ID #	Impact	Significance rating		Preferred Site	Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation		
CONSTRUCTION PHASE IMPACTS					
A	**Impacts on Air Quality**				
A1	Changes in air quality due to project related emissions	Insignificant	Insignificant	-	• Maintain all vehicles and equipment in good working order. • Avoid excavation, handling and transport of dust generating materials during windy conditions. • Water exposed areas and roads and cover stockpiles during windy conditions.
N	**Noise Impacts**				
N1	Increased noise due to project activities	Insignificant	Insignificant	-	• Limit noisy construction activities to daylight hours from Monday to Saturday. • Comply with the applicable municipal and / or industry noise regulations. • Notify adjacent residents or business premises before particularly noisy construction activities. • Enclose diesel generators if required on site for power supply. • Respond rapidly to complaints and take appropriate corrective action.
S	**Surface Water Impacts**				
S1	Contamination of surface water	Insignificant	Insignificant	-	• Refuel and service vehicles on an impermeable surface and use drip trays during refuelling or under vehicles or equipment parked overnight or longer. • Immediately clean oil and fuel spills and dispose of contaminated material at licensed disposal sites. • Do not release any effluents into the environment. • Compile and implement a procedure for the storage, handling and transport of hazardous materials. • Implement the stormwater management plan developed for the construction and operational phases.
T	**Traffic Impacts**				
T1	Impacts of construction traffic	Insignificant	Insignificant	-	• Stagger deliveries of construction materials and arrange delivery outside of rush hours if possible. • Keep construction machinery at the construction site throughout the construction period. • Ensure that large construction vehicles are suitably visible to other road users and pedestrians. • Ensure that all safety measures are observed and that drivers comply with the rules of the road. • Ensure that vehicle axle loads do not exceed the technical design capacity of roads. • Investigate and respond to complaints about traffic. • Obtain the required abnormal load permits prior to the transport of casks to the site.

ID #	Impact	Significance rating		Preferred Site	Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation		
G	**Geohydrology Impacts**				
G1	Groundwater contamination due to construction activities	Very Low	Insignificant	-	• Refuel and service vehicles on an impermeable surface and use drip trays during refuelling or under vehicles or equipment parked overnight or longer. • Immediately clean oil and fuel spills and dispose of contaminated material at licensed disposal sites. • Do not release any effluents into the environment. • Compile and implement a procedure for the storage, handling and transport of hazardous materials. • Ensure vehicles are in good working order and drivers are trained to deal with fuel spills and leaks.
TE	**Terrestrial Ecology Impacts**				
TE1	Loss of Vegetation, Floral Biodiversity and protected Species	Medium	Low	*Alt. 1*	• Limit the footprint area of the construction activity to what is absolutely essential. • Demarcate and fence off construction site boundaries and treat all other areas as No Go areas. • Confine construction vehicles to designated roadways and the construction footprint. • Prohibit temporary storage of any material on natural vegetation outside of the construction footprint. • Appoint a suitably qualified person to locate SCC and mark protected species within the construction boundaries and a suitably experienced person to oversee the removal and relocation of the SCC. • Undertake rescue and relocation of SCC prior to the commencement of construction activities in consultation with a suitably qualified person and/or CapeNature. • Obtain a floral permit from CapeNature for removal of SCC and protected species if required. • Remove all alien and weed species encountered within areas disturbed by construction activities. • Rehabilitate the development footprint with species indigenous to the vegetation type during the decommissioning phase of the development.
TE2	Loss of faunal habitat, faunal biodiversity and protected species	Medium	Very Low	-	• Limit the footprint area of the construction activity to what is absolutely essential. • Demarcate and fence off construction site boundaries and treat all other areas as No Go areas. • Confine construction vehicles to designated roadways and the construction footprint. • Flush any fauna within the construction footprint towards more suitable habitat the surrounding areas, if possible. Clear vegetation towards the security fence line, allowing natural faunal relocation. • Prohibit trapping harming or killing of animals.

ID #	Impact	Significance rating		Preferred Site	Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation		
SE	**Socio-Economic Impacts**				
SE1	Decline in quality of life caused by construction activities	Very Low	Insignificant	-	• Comply with mitigation measures intended to reduce noise, visual and traffic impacts.
SE2	Generation of employment, income and skills during construction	Insignificant	Very Low	-	• Prioritise the employment of local people. • Procure locally produced goods (plant and materials) and services, where possible. • Promote on-the-job training wherever possible. • Specify the above-mentioned optimisation measures in construction contract documents.
SE3	Increased revenue to government and economic investment during construction	Insignificant	Insignificant	-	• No optimisation possible.
SE4	Decrease in resource value from a loss of floral habitat and species	Very Low	Very Low	-	• No mitigation is necessary.
H	**Heritage Impacts**				
H1	Loss or destruction of archaeological sites	Very Low	Very Low	-	• Empower staff to stop works on (chance) discovery of archaeological or palaeontological artefacts. • Report the presence of graves, human remains or historical artefacts to HWC or an archaeologist. • Agree on suitable mitigation with HWC or the archaeologist. • Obtain a permit for the removal of artefacts from the site if any are discovered during construction.
V	**Visual Impacts**				
V1	Altered Sense of Place and Visual Intrusion caused by Construction Activities	Very Low	Insignificant	-	• Avoid excavation, handling and transport of materials which may generate dust under windy conditions. • Keep construction sites tidy and contain all activities, material and machinery within site boundaries • Minimise the use of night-lighting.
OPERATIONAL PHASE IMPACTS					
A	**Impacts on Air Quality**				
A1	Changes in air quality due to project related emissions	Insignificant	Insignificant	-	• Maintain all vehicles and equipment in good working order to minimise exhaust fumes.

ID #	Impact	Significance rating		Preferred Site	Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation		
N	**Noise Impacts**				
N1	Increased noise during operations	Insignificant	Insignificant	-	• No mitigation required.
T	**Traffic Impacts**				
T1	Impacts of Operational Traffic	Insignificant	Insignificant	-	• No mitigation required.
G	**Geohydrology Impacts**				
G2	Groundwater contamination due to project operations	Very Low	Insignificant	-	• Implement a monitoring system to monitor for radioactive emissions. • In the case of suspected emissions, return cask to fuel building for evaluation and repair and decontaminate cask storage pad. • Immediately clean oil and fuel spills and dispose of contaminated material at licensed disposal sites. • Use existing ablution and waste water treatment facilities at KNPS. • Do not release any effluents into the environment. • Ensure vehicles are in good working order and drivers are trained to deal with fuel spills and leaks.
TE	**Terrestrial Ecology Impacts**				
TE3	Loss of faunal biodiversity and protected species	Low	Insignificant	-	• Continue alien vegetation control throughout the operational phase of the development. • Restrict vehicles to designated roadways.
SE	**Socio-Economic Impacts**				
SE5	Decline in quality of life from altered sense of place and visual intrusion	Insignificant	Insignificant	-	• No mitigation required.
SE6	Generation of employment, income and skills during operations	Very Low	Very Low	-	• Favour local procurement.
SE7	Increased revenue to Government and economic investment during operations	Very Low	Very Low	-	• No optimisation possible.

ID #	Impact	Significance rating		Preferred Site	Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation		
HH	**Health Impacts**				
HH 1	Increased health risk due to radiation exposure	Low	Low	-	• No mitigation required/possible
V	**Visual Impacts**				
V2	Altered Sense of Place and Visual Intrusion caused by the TISF	Low	Very Low	*Alt. 1*	• Reduce the footprint of the TISF and associated infrastructure to a workable minimum. • Ensure infrastructure is well maintained and neat. • Be sensitive to the use of materials with a high reflectivity which may cause glare and visual impacts. • Keep all areas neat, clean and organised in order to portray a general tidy appearance. • Limit lighting only to essential activities and facilities. Direct lighting inwards and downwards and avoid light spillage and trespass.

Relevant observations with regard to the overall impact ratings, assuming mitigation measures are effectively implemented, are:

- The predicted *air quality* impacts, mainly associated with the creation of dust and exhaust emissions from vehicles and equipment, are rated as *insignificant* for both site alternatives largely due to limited emissions and the distance between the sites and the closest sensitive receptors.
- The predicted *noise* impacts mainly associated with the movement of vehicles and equipment are rated as *insignificant* for both site alternatives largely due to low levels of noise generated and the distance between the sites and the closest sensitive receptors.
- The predicted impacts on *surface water* resources, assuming stormwater is adequately managed, are rated as *insignificant* for both site alternatives since no surface water features occur on or in close proximity to either site.
- The predicted *traffic* impacts are rated as *insignificant* for both site alternatives given the modest existing traffic in the area.
- The predicted *geohydrology* impacts are rated as *insignificant* for either site alternative as the potential for groundwater contamination is extremely low.
- The predicted *terrestrial ecology* impacts are rated as *low* for both site alternatives during the construction phase, although the impact would be slightly higher for Alternative 2 which has a higher floral species diversity and is considered more sensitive. During operations, terrestrial ecology impacts will be *insignificant*.
- The predicted *socio-economic benefits* are rated as *very low* for both site alternatives. Adverse socio-economic impacts also v*ery low* to *insignificant*.
- The predicted *health* impacts associated with radiation exposure during operations of the TISF are rated as *low* for both site alternatives.
- The predicted *heritage* impacts are rated as *very low* for both site alternatives due to the previous disturbance of both areas during the construction of KNPS making it extremely unlikely that any intact archaeological or palaeontological material would be encountered during construction.
- The predicted *visual* impact is rated as *insignificant* during construction and *low* during operations for both site alternatives.

The impacts for both site alternatives are similar, and on social and environmental grounds, the construction of the TISF on either site would be considered acceptable. Alternative 1 is marginally preferred due to increase floral biodiversity on Alternative 2 and slightly reduced visual impacts.

Alternative 1 is also preferred by Eskom because it is situated adjacent to an existing radiological zone (low level waste facility) and less extensive haul road upgrades would be required than for Alternative 2.

Given the considerations above, implementation of Alternative 1 is supported by the EAP, although both alternatives are deemed acceptable and feasible.

Cumulative impacts in the region may derive from a number of developments currently proposed around (and largely related with) KNPS. Cumulative biophysical impacts are of relatively low significance apart from the cumulative loss of Endangered Cape Flats Dune Strandveld which is considered to be of medium significance. Cumulative impacts on traffic and visual quality of the area are also considered to be of medium significance, with the proposed Nuclear 1 development to the

north of KNPS (inside the Koeberg Nature Reserve) by far the greatest contributor to cumulative impacts.

7.1.2 Principal Findings

The proposed TISF will entail so-called triple bottom line costs, i.e. social, environmental and economic costs. The triple bottom line concerns itself with environmental (taken to mean biophysical) sustainability, social equity and economic efficiency and is typically employed by companies seeking to report on their performance. The concept serves as a useful construct to frame the evaluation of environmental impacts of the project.

The challenge for DEA is to take a decision which is sustainable in the long term and which will probably entail trade-offs between social, environmental and economic costs and benefits. The trade-offs are documented in the report, which assesses environmental impacts and benefits and compares these to the No-Go alternative. SRK believes it will be instructive to reduce the decision factors to the key points which the authorities should consider. These points constitute the principal findings of the EIA:

1. Eskom proposes to construct a Transient Interim Storage Facility (TISF) for the temporary storage of dry casks at Koeberg Nuclear Power Station (KNPS) to accommodate used nuclear fuel from the reactors of the power station.
2. The SFPs in which used fuel assemblies are stored at KNPS are nearing capacity. The SFPs serving Reactor Unit 1 and Reactor Unit 2 will reach capacity by March 2018 and September 2018, respectively. Development of the TISF will ensure the continued operation of KNPS.
3. The Radioactive Waste Management Policy and Strategy for the Republic of South Africa (2005) states that Government is responsible for investigating long-term options for the “safe management of used fuel and high level radioactive waste in South Africa” including the option of a CISF. Due to the uncertainty regarding the development of the CISF, only likely to be in operation by 2025, it has become imperative for Eskom to investigate interim options for the storage of used fuel on KNPS site, including the development of the TISF.
4. The TISF will comprise concrete pad(s) within a site footprint of approximately 1.28 ha (12 800 m^2) and will be designed to accommodate storage of not more than 160 casks, for used nuclear fuel generated at Koeberg up to the end of operational life of the plant.
5. KNPS is located on a sandy coastline of the West Coast, approximately 27 km north of the Cape Town Central Business District and 1.5 km north of the residential area of Duynefontein. KNPS is situated on Cape Farm Duynefontyn No. 1552, which is owned by Eskom and measures approximately 1 294 ha and is zoned for *Risk Industry* and *Agricultural*.
6. The topography of the area is relatively flat with an active dunefield extending north of KNPS. A stabilised primary dune inland of KNPS screens many of KNPS buildings although the two nuclear reactor units are prominent landmarks in the region. The vegetation of the area consists of low coastal shrub (Cape Dune Strandveld and Atlantis Fynbos), typical of much of the West Coast. KNPS is located within the Koeberg Nature Reserve, a 3 000 ha reserve managed by Koeberg Managing Authority. The Atlantic Ocean forms the western boundary of KNPS. The closest residential community is that of Duynefontein, situated 1.5km south of KNPS.
7. Two alternative sites have been identified for the TISF, both situated within the existing boundaries of the KNPS Security Protected Area. Alternative 1 is located adjacent to the CSB on the northern boundary of KNPS and Alternative 2 is located along the southern boundary of KNPS next to the Ekhaya Building.

8. The potential environmental impacts associated with the proposed TISF considered in the S&EIR process include air quality, noise, traffic, heritage, geohydrology, terrestrial ecology, socio-economic, health and visual impacts. Assuming that the recommended mitigation measures will be effectively implemented, the proposed development is not projected to have unacceptably significant adverse impacts, while socio-economic benefits are also fairly modest.
9. The impacts associated with the development of the TISF on either site alternative are considered to be acceptable. *Alternative 1* is marginally preferred from an environmental perspective, as *Alternative 2* has slightly higher floral species diversity and is thus considered marginally more sensitive. Alternative 1 is also Eskom's preferred alternative.
10. The No-Go alternative implies no change to the *status quo* and thus no additional biophysical or social impacts or benefits.
11. A number of mitigation and monitoring measures have been identified to avoid, minimise and manage potential environmental impacts associated with the proposed development. These are further laid out in the EMPr.

7.2 Analysis of Need and Desirability of the Project

Best practice as well as the EIA Regulations, 2014 (Appendix 3 Section 3 [f]) requires that the need and desirability of a project (including viable alternatives) are considered and evaluated against the tenets of sustainability. This requires an analysis of the effect of the project on *social, economic and ecological* systems; and places emphasis on consideration of a project's *justification* not only in terms of financial viability (which is often implicit in a [private] proponent's intention to implement the project), but also in terms of the specific needs and interests of the community and the opportunity cost of development (DEA&DP, 2013).

The principles in NEMA (see Section 2.1.1) serve as a guide for the interpretation of the issue of "need", but do not conceive "need" as synonymous with the "general purpose and requirements" of the project. The latter might relate to the applicant's project motivation, while the "need" relates to the interests and needs of the broader public. In this regard, an important NEMA principle is that environmental management must ensure that 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" (DEA, 2014).

There are various proxies for assessing the need and desirability of a project, notably national and regional planning documents which enunciate the strategic needs and desires of broader society and communities: project alignment with these documents must therefore be considered and reported on in the EIA process. With the use of these documents or - where these planning documents are not available - using best judgment, the EAPs (and specialists) must consider the project's strategic context, or justification, in terms of the needs and interests of the broader community (DEA&DP, 2013).

The consideration of need and desirability in EIA decision-making therefore requires the consideration of the strategic context of the project along with broader societal needs and the public interest (DEA, 2014). However, it is important to note that projects which deviate from strategic plans are not necessarily undesirable. The DEA notes that more important are the social, economic and ecological impacts of the deviation, and "the burden of proof falls on the applicant (and the EAP) to show why the impacts…might be justifiable" (DEA, 2010b).

The *social* component of need and desirability can be assessed using *regional* planning documents such as SDFs, IDPs and EMFs to assess the project's social compatibility with plans. These documents incorporate specific social objectives and emphasise the need to promote the social well-

being, health, safety and security of communities, especially underprivileged and/or vulnerable communities.

The development will create employment opportunities during the construction phase. By facilitating the ongoing operation of KNPS, the development will allow for ongoing power supply to the region promoting social well-being of the population.

The *economic* need and desirability of a project can be assessed using *national*, provincial, district and local municipal planning documents to assess the project's economic compatibility with plans. These documents describe specific economic objectives and emphasise the need to:

- Improve job creation opportunities;
- Create opportunities for the private and public sectors to grow the economy;
- Ensure appropriate economic growth;
- Develop human capital and a skilled and capable workforce; and
- Provide adequate and appropriate infrastructure to stimulate economic growth.

The proposed project is aligned with the above objectives, enhancing the medium-to-long term viability of KNPS thereby ensuring continued trade and investment and promoting economic growth. Without development of the TISF, the ongoing operation of KNPS and hence power supply in the Western Cape would be constrained, placing constraints on the local and regional economy.

It is essential that the implementation of social and economic policies takes cognisance of strategic *ecological* concerns such as climate change, food security, as well as the sustainability in supply of natural resources and the status of our ecosystem services. Sustainable development is the process that is followed to achieve the goal of sustainability (DEA, 2014).

Sustainable development implies that a project should not compromise natural systems. In this regard, the Best Practicable Environmental Option (BPEO) is that which provides the most benefit and causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term.

NEMA and the EIA Regulations, 2014 call for a hierarchical approach to the selection of development options, as well as impact management which includes the investigation of alternatives to avoid, reduce (mitigate and manage) and/or remediate (rehabilitate and restore) negative (ecological) impacts (DEA, 2014).

The investigation of alternatives included a number of site alternatives which were screened out prior to the EIA due to security, technical and ecological concerns. The two site alternatives selected for assessment in the EIA are both within the existing KNPS Security Protected Area, and land previously disturbed during construction of KNPS. The previously disturbed nature of the vegetation on Alternative 1, which is less sensitive that Alternative 2, as well as the location of the site within the existing site boundaries, means that the proposed site alternative is considered to be the BPEO.

In summary:

- Social, economic and ecological factors are considered and assessed during the EIA process, to ensure that the development is sustainable. Mitigation measures are recommended in the EIA Report to prevent, minimise (and optimise) impacts and to secure stakeholders' environmental rights. An EMPr has been drafted and will be implemented to ensure that potential environmental pollution and degradation can be minimised, if not prevented (see Appendix Q).

- The Project will generate impacts, both negative and positive (see Section 6) and these should be considered in evaluating the desirability of the Project. Section 6 demonstrates that most impacts can be adequately managed.

7.3 Recommendations

The specific recommended mitigation and optimisation measures are presented in Chapter 6 and the EMPr (Appendix Q) and key measures are summarised in Table 7-1 above. Eskom would need to implement these mitigation measures to demonstrate compliance and adherence to best practice. Although it is in theory possible that the potential impacts (or unintended consequences) of implementing mitigation and optimisation measures could offset their intended effect, the majority of the recommendations made in this EIA Report are procedural and/or can be implemented without resulting in any physical effects. The potential for such unintended consequences in the case of the TISF is therefore considered extremely negligible.

Key recommendations, which are considered essential, are:

1. Implement the EMPr to guide construction and operations activities and to provide a framework for the ongoing assessment of environmental performance;
2. Appoint an Environmental Control Officer (ECO) to oversee the implementation of the EMPr and supervise any construction activities;
3. Restrict the physical footprint of the development and areas disturbed by construction activities, to the footprint of the TISF;
4. Rehabilitate all areas outside of the TISF footprint disturbed by construction activities; and
5. Obtain other permits and authorisations as may be required, including, but not limited to
    a. Permits for the disturbance or translocation of species of conservation concern; and
    b. A permit for construction vehicles in the coastal zone (if required).

7.4 Conclusion and Authorisation Opinion

This Draft EIA Report has identified and assessed the potential biophysical and socio-economic impacts associated with the proposed development of a TISF at KNPS in the Western Cape.

In terms of Section 31 (n) of NEMA, the EAP is required to provide an opinion as to whether the activity should or should not be authorised. In this section, a qualified opinion is ventured, and in this regard SRK believes that sufficient information is available for DEA to take a decision.

The TISF will result in unavoidable adverse environmental impacts, although these are of very limited extent, given the limited footprint of the project infrastructure and the disturbed nature of the site. Consequently, none of these adverse impacts are considered unacceptably significant and all can be managed to tolerable levels through the effective implementation of the recommended mitigation measures. In addition, the project will indirectly benefit the local and regional economy by facilitating ongoing power supply by KNPS.

Working on the assumption that Eskom is committed to ensuring that the TISF is operated and constructed to high standards, achieved through implementation of the recommended mitigation measures and ongoing monitoring of performance, SRK believes and the EIA Report demonstrates that through effective implementation of the stipulated mitigation measures, the adverse impacts can be reduced to levels compliant with national (and international) standards or guidelines.

The fundamental decision is whether to allow the development, which brings economic benefits and is generally consistent with development policies for the area, but which may have very limited biophysical and social impacts.

SRK believes that the specialist studies have shown that the development of the TISF is generally acceptable. The EIA has also assisted in the identification of essential mitigation measures that will mitigate the impacts associated with these components to within tolerable limits.

In conclusion SRK is of the opinion that on purely 'environmental' grounds (i.e. the project's potential socio-economic and biophysical implications) the application as it is currently articulated should **be approved,** provided the essential mitigation measures are implemented. Though site *Alternative 1* is preferred, *Alternative 2* could also be approved. Ultimately, however, the DEA will need to consider whether the project benefits outweigh the potential impacts.

7.5 Way Forward

This Draft EIA Report is now available for public comment and SRK invites stakeholders to review the report and to participate in the public consultation process. An Executive Summary of this report has been distributed to registered stakeholders and is available from SRK on request (details below). Electronic copies of the full Draft EIA Report and Executive Summary are available on the SRK website: http://www.srk.co.za/en/koeberg-tisf-eia. Copies of this report are also available for review at the following venues:

- Koeberg Public Library, Duynefontein;
- Wesfleur Public Library, Atlantis;
- Cape Town Public Library;
- KNPS Visitors Centre; and
- SRK's office in Rondebosch.

A Public Open Day will also be held to present and discuss the findings of the EIA with key stakeholders and members of the public. Since there will be no formal presentation, stakeholders can come at any time during the open day hours. Details are as follows:

Public Open Day:

Venue: *KNPS Visitors Centre*

Date: *30 November 2016*

Time: *15h00 – 18h00*

The Public Open Day will be advertised and all stakeholders already registered on the project database will be invited to attend.

Comments on the EIA Report can be submitted to:

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Stakeholders' comments on the EIA Report will assist DEA in making a decision regarding the application. The public is therefore urged to submit comment. If you require assistance in compiling and submitting comments, please contact us and we will ensure that you receive appropriate support.

Comments must be submitted by **14 December 2016** to be incorporated into the Final EIA Report.

Comments received will be submitted to DEA along with the EIA Report for a decision. Once a decision is taken by authorities, this decision will be communicated to registered I&APs.

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All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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Appendices

Appendix A:

Curriculum Vitae of Environmental Assessment Practitioners

Appendix B:

Comment from Department of Water and Sanitation

Appendix C:

Notification of Intent to Develop and Record of Decision from Heritage Western Cape

Appendix D:

Permission from Department of Energy for the establishment of the TISF

Appendix E:

Letter of Acceptance of Scoping Report from DEA

Appendix F:

Conceptual Stormwater Management Plan and Independent Review

Appendix G:

Geohydrology Impact Assessment and Independent Review

Appendix H:

Terrestrial Ecology Impact Assessment

Appendix I:

Human Health Impact Assessment

Appendix J:

Heritage Assessment

Appendix K:

Stakeholder database

Appendix L:

Comments and Responses Summary

Appendix M:

Comments on Scoping Report (submitted during Scoping Phase)

Appendix N:

Independent Review of Radiological Assessment

Appendix O:

Independent Review of Socio-Economic Assessment

Appendix P:

Independent Review of Visual Impact Assessment

Appendix Q:

Environmental Management Programme

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