Environmental Impact Assessment of the Used Fuel Transient Interim Storage Facility at Koeberg Nuclear Power Station

Environmental Impact Assessment Report

Report Prepared for

Order Reference Number: 4600057255

SRK Report Number 478317/06

DEA Reference Number: 14/12/16/3/3/2/947

Project Location: Cape Farm Duynefontyn No. 1552

Report Prepared by

November 2016

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EXECUTIVE SUMMARY: ENVIRONMENTAL IMPACT ASSESSMENT REPORT ENVIRONMENTAL IMPACT ASSESSMENT OF THE USED FUEL TRANSIENT INTERIM STORAGE FACILITY AT KOEBERG NUCLEAR POWER STATION

DEA Reference Number: 14/12/16/3/3/2/947

1 INTRODUCTION

Eskom proposes to construct a Transient Interim Storage Facility (TISF) for the temporary storage of dry casks at Koeberg Nuclear Power Station (KNPS) (Figure 1). These casks will store used nuclear fuel from the reactors of the power station.

The TISF will comprise of concrete pad(s) within a site footprint of approximately 12 800 m² and will be designed to accommodate storage of not more than 160 casks, for used nuclear fuel generated at KNPS up to the end of operational life of plant.

SRK Consulting (South Africa) Pty Ltd (SRK) has been appointed by Eskom to undertake the Scoping and Environmental Impact Reporting (S&EIR, also referred to as Environmental Impact Assessment [EIA]) process required in terms of the National Environmental Management Act 107 of 1998, as amended (NEMA), and the EIA Regulations, 2014.

See page 8 for details on how you can participate in the process.

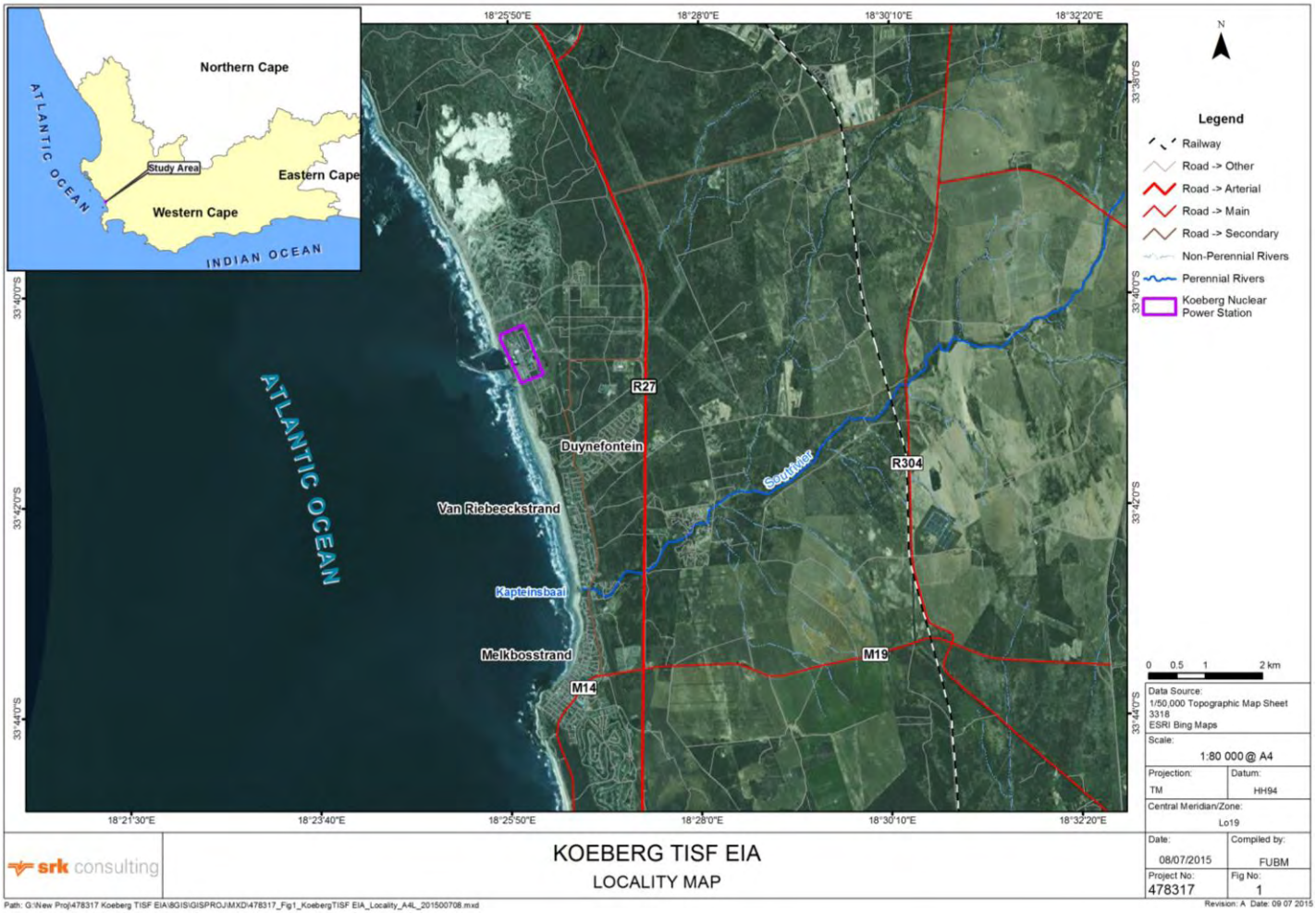

Figure 1: Locality Plan

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2 GOVERNANCE FRAMEWORK

Sections 24 and 44 of NEMA make provision for the promulgation of regulations that identify activities which may not commence without an EA issued by the competent authority, in this case, the National Department of Environmental Affairs (DEA). The Environmental Impact Assessment (EIA) Regulations, 2014 (Government Notice (GN) R982, which came into effect on 8 December 2014), promulgated in terms of NEMA, govern the process, methodologies and requirements for the undertaking of EIAs in support of EA applications. The EIA Regulations are accompanied by Listing Notices (LN) 1-3 that list activities that require EA.

The EIA Regulations, 2014 lays out two alternative authorisation processes. Depending on the type of activity that is proposed, either a BA process or a Scoping and Environmental Impact Reporting (S&EIR) process is required to obtain EA. LN 1 lists activities that require a BA process, while LN 2 lists activities that require S&EIR. LN 3 lists activities in certain sensitive geographic areas that require a BA.

SRK has determined that the proposed project triggers activities listed in terms of LN 1, LN 2 and LN 3 of the EIA Regulations, 2014, requiring a S&EIR. The equivalent activities in terms of the EIA Regulations, 2014 are included in Table 1.

Table 1: Listed activities triggered by the project

No	Description
LN1 (requiring BA)	
27	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation.
LN2 (requiring S&EIR)	
3	The development and related operation of facilities or infrastructure for nuclear reaction including energy generation, the production, enrichment, processing, reprocessing, storage or disposal of nuclear fuels, radioactive products, nuclear waste or radioactive waste.
LN3 (requiring BA in the sensitive areas)	
12	The clearance of an area of 300 square metres or more of indigenous vegetation. (a) In Western Cape: (i) Within any critically endangered or endangered ecosystem.

Consequently, the proponent is obliged to apply for EA for the project. Since activities listed under LN 2 apply to the project, a S&EIR process is required.

In addition to the EA, various other key authorisations, permits or licences may be required before the project may proceed (see Table 2).

Table 2: Key authorisations, permits and licences required for the project

Application	Authority	Status
Heritage Application	Heritage Western Cape (HWC)	HWC confirmed no further heritage studies required (Ref 16022313AS0224E, 16 March 2016)
Water Use Licence (WUL)	Department of Water and Sanitation (DWS)	DWS confirmed no WUL required for the project (Ref. 16/2/7G200/A/8, 10 May 2016)
NNR Licence Amendment	National Nuclear Regulator (NNR)	Planned to be submitted ~ September 2017

3 ENVIRONMENTAL PROCESS

The EIA Regulations, 2014 define the detailed approach to the S&EIR process, which consists of two phases: the Scoping Phase (completed in August 2016) and the Impact Assessment Phase (the current phase) (see Figure 2).

The Scoping Phase was completed in August 2016 and the Final Scoping Report was accepted by the DEA on 28 September 2016. The Impact Assessment Phase is being undertaken in accordance with the Plan of Study for EIA, included in the Scoping Report accepted by the DEA.

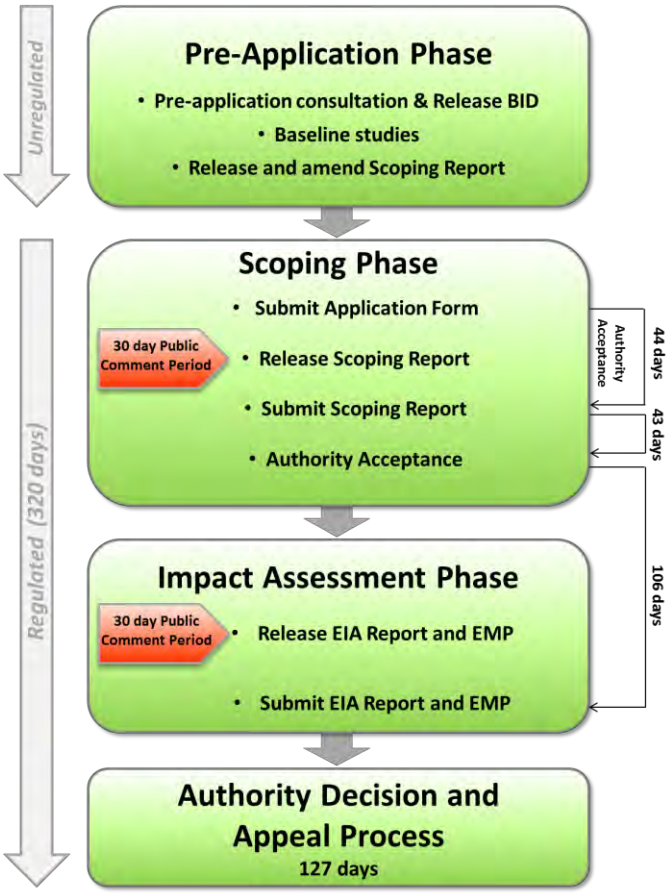

Figure 2: S&EIR Process

***Note:** EMP = Environmental Management Programme*

The key objectives of the EIA are to:

- Inform Interested and Affected Parties (IAPs) about the proposed Project and the EIA process followed;
- Obtain comments from IAPs (including the relevant authorities and the public) and ensure that all issues, concerns and queries raised are fully documented and addressed in the EIA Report;
- Identify and assess potential significant impacts associated with the proposed development;
- Formulate mitigation measures to avoid and/or minimise impacts and enhance benefits of the Project; and
- Produce a Final EIA Report which will provide all the necessary information for the DEA to decide whether (and under what conditions) to authorise the proposed Project.

4 DESCRIPTION OF THE SITE AND ENVIRONMENT

KNPS is located on Cape Farm Duynefontyn No. 1552 along the 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 (Figure 1). Access to KNPS is via the R27 which runs along the property's eastern boundary or alternatively via Otto du Plessis Drive.

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 (Figure 3).

Figure 3: KNPS as viewed from the Duynefontein residential area

The vegetation of the area consists of low coastal shrub (Cape Dune Strandveld and Atlantis Fynbos), typical of much of the West Coast region (Figure 3).

KNPS is located within the Koeberg Nature Reserve, a 3 000 ha reserve managed by the Koeberg Managing Authority. The Atlantic Ocean forms the western boundary of KNPS.

There are a variety of land uses immediately surrounding KNPS including the Duynefontein residential area to the south, the Koeberg Nature Reserve to the north, south and east.

KNPS is located within a predominantly natural environment, although there are existing built elements throughout the property including powerlines, office buildings, a visitors' centre, weather station, roads and parking areas.

The TISF will be located within the Security Protected Area (SPA) of KNPS, a flat area disturbed by previous construction activities and by current operations at KNPS.

5 PROJECT AND PROCESS DESCRIPTION

The TISF will be constructed on a portion of vacant land within the KNPS SPA. The TISF will comprise of concrete pad(s) within a site footprint of approximately 12 800 m^2.

*The **Security Protected Area** is a restricted area surrounding the reactor units to which only authorised personnel have access. The SPA is distinct from the protected area status of Koeberg Nature Reserve.*

The TISF will be constructed to accommodate up to 160 dry storage casks, which will be placed on the pad(s) in a modular manner over time.

***Dry cask storage** is a method of storing used fuel that has already been cooled in the SFP. Casks are typically concrete or steel cylinders which are either welded or bolted closed to provide leak-tight containment of the used fuel. The used fuel assemblies within the casks are surrounded by inert gas and each cylinder is surrounded by additional steel, concrete, or other material to provide radiation shielding to workers and members of the public. Heat generated from used fuel radioactive decay will dissipate through the external surface of the dry casks.*

The dry storage casks will be either metal or concrete casks or concrete assemblies and will be approximately 6 m in height and 3 m in diameter. Each cask can hold up to 37 assemblies depending on the cask design. The dry storage casks are robust

and can withstand significant external impact forces such as an aircraft crash.

The design of the concrete pad(s) of the TISF lends itself to various types of dry storage casking systems. The TISF site will also include an auxiliary building to house ancillary equipment.

A secure perimeter fence will be erected around the TISF site with controlled access.

The TISF will meet the requirements of the NNR and will be built and managed in accordance with the International Atomic Energy Agency safety standards. Construction of the TISF will commence in 2018 and will take approximately 12 months to complete. The construction laydown area will be located within the proposed TISF site to reduce the disturbance footprint.

Temporary site offices and a parking area for construction vehicles and equipment will also be located in this area.

The dry storage casks will be transferred from the SFP to the TISF on the existing KNPS internal road network. The existing KNPS internal road network will be used to transfer casks from the SFP to the TISF. A portion of existing gravel road, approximately 20 m in length and approximately 6 m in width, will be resurfaced/tarred to connect the existing haul road at the entrance to Alternative 1.

The TISF will be decommissioned in accordance with the KNPS decommissioning plan.

6 ALTERNATIVES

Appendix 2 Section 2 (h)(i) of the EIA Regulations, 2014, requires that all S&EIR processes must identify and describe feasible and reasonable alternatives. Different types or categories of alternatives can be identified, e.g. location alternatives, type of activity, design or layout alternatives, technology alternatives and operational alternatives. Not all categories of alternatives are applicable to all projects.

Eskom identified six potential sites at KNPS for the location of the TISF, which were evaluated against various criteria. The site selection process identified two viable site locations for the TISF (refer to Figure 4) - the CSB site, the preferred alternative (Alternative 1), and the Ekhaya site (Alternative 2). 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.

Alternative 1 is Eskom's preferred alternative because:

- It is situated adjacent to an existing radiological zone (low level waste facility);
- It is located within a more ecologically disturbed area compared to Alternative 2; and
- Less extensive haul road upgrades will be required than for Alternative 2.

Figure 4: TISF Location alternatives

The No Go alternative was 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 proposed TISF will not be built.

7 STAKEHOLDER ENGAGEMENT

Stakeholder engagement is a key component of the S&EIR process and is being undertaken in accordance with Chapter 6 of the EIA Regulations, 2014. The key stakeholder engagement activities during the Impact Assessment Phase are summarised in Table 3 below.

Relevant local, provincial and national authorities, conservation bodies, local forums and surrounding landowners and occupants have been directly notified of the S&EIR process and the release of the EIA Report for comment.

Table 3: Stakeholder Engagement during Impact Assessment Phase.

Activity	Date
Release EIA Report to registered IAPs for comment	14 November 2016
Comment period	14 November – 14 December 2016
Finalise EIA Report, collate comments and submit Final EIA Report to DEA	February 2016

Key comments and concerns raised by stakeholders predominantly relate to:

- **Project Motivation**: Used nuclear fuel should be stored at a CISF and not at KNPS,
- **Project Description**: The length of time fuel will be stored on site;
- **Alternatives**: The possibility of reprocessing of used nuclear fuel instead of storage;
- **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, and cumulative exposure of radiation from the KNPS site;
- **EIA process**: The need for external peer review of in-house specialist studies; and
- **Regulatory requirements**: The TISF must meet the requirements of the NNR and the IAEA.

8 ASSESSMENT OF POTENTIAL IMPACTS

Specialist studies were undertaken to investigate key potential direct, indirect and cumulative impacts, as follows:

- Geohydrology Specialist Study;
- Terrestrial Ecology Specialist Study;
- Socio-economic Specialist Study;
- Review of Radiological Study;
- Human Health Specialist Study;
- Heritage Specialist Study; and
- Visual Specialist Study.

For all potentially significant impacts, the significance of the anticipated impact was rated without and with recommended mitigation measures. These impacts are presented in Table 4.

The significance of potential impacts of the proposed project was determined in order to assist decision-makers. 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 *very 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.

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.

Table 4 below summarises:

- The impacts assessed in the EIA;
- Their significance before and following the implementation of essential mitigation measures, on which the significance rating is based; and
- The key (non-standard essential) mitigation measures.

Impact Significance Ratings Legend:

Rating	+ve	-ve
Insignificant	I	I
Very Low	VL	VL
Low	L	L
Medium	M	M
High	H	H
Very High	VH	VH

Where applicable, the preferred alternative is indicated in bold text.

Table 4: Summary of Impacts

Impact	Significance rating		Key mitigation/optimisation measures
	Without	With	
CONSTRUCTION PHASE IMPACTS			
Changes in Air Quality due to Project Related Emissions	I	I	• Avoid excavation and transport of dust generating materials during windy conditions. • Water exposed areas and roads and cover stockpiles during windy conditions.
Increased noise due to project activities	I	I	• Limit noisy construction activities to daylight hours from Monday to Saturday. • Comply with the applicable municipal and / or industry noise regulations. • Respond rapidly to complaints and take appropriate corrective action.
Contamination of surface water	I	I	• Refuel and service vehicles on an impermeable surface and use drip trays. • Immediately clean oil and fuel spills and dispose of contaminated material appropriately. • Compile and implement procedures for hazardous materials. • Implement the stormwater management.
Impacts of construction traffic	I	I	• Ensure that large construction vehicles are visible to other road users and pedestrians. • Investigate and respond to complaints about traffic. • Obtain the required abnormal load permits prior to the transport of casks to the site.
Groundwater contamination due to construction activities	VL	I	• 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. • Compile and implement a procedure for the storage, handling and transport of hazardous materials.
Loss of Vegetation, Floral Biodiversity and protected Species	M	L	• Demarcate construction site boundaries and treat all other areas as No Go areas. • Appoint suitably qualified individuals to locate SCC and (in consultation with the specialist and/or CapeNature) relocate protected species and SCC within construction boundaries prior to the commencement of construction. • Obtain a floral permit from CapeNature for removal of SCC and protected species if required. • Rehabilitate the development footprint with indigenous species during decommissioning.
Loss of faunal habitat, faunal biodiversity and protected species	M	VL	• Limit the footprint area of the construction activity to what is absolutely essential. • 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.

Impact	Significance rating Without	With	Key mitigation/optimisation measures
Decline in quality of life caused by construction activities	VL	I	• Comply with mitigation measures intended to reduce noise, visual and traffic impacts.
Generation of employment, income and skills during construction	I	VL	• 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.
Increased revenue to government and economic investment during construction	I	I	• No optimisation possible.
Decrease in resource value from a loss of floral habitat and species	VL	VL	• No mitigation is required.
Loss or destruction of archaeological sites	VL	VL	• Empower staff to stop works on discovery of archaeological or palaeontological artefacts. • Report 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 required.
Altered Sense of Place and Visual Intrusion by Construction Activities	VL	I	• Avoid dust generating activities under windy conditions. • Contain all activities, material and machinery within site boundaries • Minimise the use of night-lighting.
OPERATIONS PHASE IMPACTS			
Changes in air quality due to project related emissions	I	I	• Maintain all vehicles and equipment in good working order to minimise exhaust fumes.
Increased noise during operations	I	I	• No mitigation required.
Impacts of Operational Traffic	I	I	• No mitigation required.
Groundwater contamination due to project operations	VL	I	• 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. • Ensure vehicles are in good working order and drivers are trained to deal with fuel spills.
Loss of faunal biodiversity and protected species	L	I	• Continue alien vegetation control throughout the operational phase of the development. • Restrict vehicles to designated roadways.
Decline in quality of life from altered sense of place and visual intrusion	I	I	• No mitigation required.
Generation of employment, income and skills during operations	VL	VL	• Favour local procurement.
Increased revenue to Government and economic investment during operations	VL	VL	• No optimisation possible.
Increased health risk due to radiation exposure	L	L	• No mitigation required/possible
Altered Sense of Place and Visual Intrusion caused by the TISF	L	VL	• 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. • Limit lighting only to essential activities and facilities.

9 CONCLUSIONS AND WAY FORWARD

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.

SRK believes that sufficient information is available for DEA to take a decision regarding authorisation of the development.

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.

HOW YOU CAN YOU PARTICIPATE IN THE EIA PROCESS

The Draft EIA Report is not a final report and can be amended based on comments received from stakeholders. Stakeholders' comments on the EIA Report will assist the DEA in making a decision regarding the application. The public is therefore urged to submit comment. Once stakeholders have commented on the information presented in the EIA Report, the Final EIA Report will be prepared and submitted to the DEA for approval. Once a decision is taken by authorities, this decision will be communicated to all registered IAPs.

REVIEW THE REPORT

Copies of the complete report are available for public review at the following:

- Koeberg Public Library, Duynefontein;
- Wesfleur Public Library, Atlantis;
- Cape Town Public Library;
- KNPS Visitors Centre;
- SRK's office in Rondebosch; and
- SRK's website: www.srk.co.za – click on the 'Library' and then 'Public Documents' links.

REGISTER OR PROVIDE YOUR OPINION

Register or send written comment to:

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Rondebosch, 7701

Tel: + 27 21 659 3060

Fax: +27 21 685 7105

Email: jedutoit@srk.co.za

IAPs are invited to comment, and/or to register on the project database. IAPs should refer to the DEA reference number, and must provide their comments together with their name, contact details (preferred method of notification, e.g. email), and an indication of any direct business, financial, personal or other interest which they have in the application, to the contact person below, by **14 December 2016**.

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

Please confirm your intention to attend.

Profile and Expertise of EAPs

SRK Consulting (South Africa) Pty Ltd (SRK) has been appointed by the Eskom to undertake the Environmental Impact Assessment (EIA) process required in terms of the National Environmental Management Act 107 of 1998 (NEMA).

SRK Consulting comprises over 1 300 professional staff worldwide, offering expertise in a wide range of environmental and engineering disciplines. SRK's Cape Town environmental department has a distinguished track record of managing large environmental and engineering projects, extending back to 1979. SRK has rigorous quality assurance standards and is ISO 9001 accredited.

As required by NEMA, the qualifications and experience of the key independent Environmental Assessment Practitioners (EAPs) undertaking the EIA are detailed below and Curriculum Vitae provided in Appendix A.

Project Director and Reviewer: Christopher Dalgliesh, BBusSc (Hons); MPhil (EnvSci)

Certified with the Interim Board for Environmental Assessment Practitioners South Africa (CEAPSA)

Chris Dalgliesh is a Partner and Principal Environmental Consultant with over 23 years' experience, primarily in South Africa, Southern Africa, West Africa and South America (Suriname). Chris has worked on a wide range of projects, notably in the natural resources, Oil & Gas, waste, infrastructure (including rail and ports) and industrial sectors. He has directed and managed numerous Environmental and Social Impact Assessments (ESIAs) and associated management plans, in accordance with international standards. He regularly provides high level review of ESIAs, frequently directs Environmental and Social Due Diligence studies for lenders, and also has a depth of experience in Strategic Environmental Assessment (SEA), State of Environment Reporting and Resource Economics. He holds a BBusSci (Hons) and M Phil (Env) and is a CEAPSA.

Project Manager: Sharon Jones, BSc Hons (Env. Sci); MPhil (EnviroMan)

Certified with the Interim Board for Environmental Assessment Practitioners South Africa

Sharon Jones is a Principal Environmental Consultant with over 18 years' experience. Sharon has managed a broad range of projects in South Africa, Mozambique, Angola, Suriname, Namibia and the DRC, with particular experience in Port and marine-based projects, mining and large infrastructure projects (e.g. airports and dams). In addition to managing various ESIAs, her experience includes the development of Environmental Management Frameworks, Environmental Management Plans and due diligence reviews and gap analysis studies against IFC and World Bank Standards. Sharon holds a BSc (Hons) and MPhil (Env) and is a registered Professional Natural Scientist (Environmental Science) with SACNASP and a CEAPSA.

Statement of SRK Independence

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

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

Disclaimer

The opinions expressed in this report have been based on the information supplied to SRK by Eskom. SRK has exercised all due care in reviewing the supplied information, but conclusions from the review are reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

Environmental Impact Assessment of the Transient Interim Storage Facility at Koeberg: EAP Affirmation

Section 16 (1) (b) (iv), Appendix 1 Section 3 (1) (r), Appendix 2 Sections 2 (j) and (k) and Appendix 3 Section 3 (s) of the Environmental Impact Assessment (EIA) Regulations, 2014 (promulgated in terms of the National Environmental Management Act 107 of 1998, as amended - NEMA), require an undertaking under oath or affirmation by the Environmental Assessment Practitioner (EAP) in relation to:

- The correctness of the information provided in the report;
- The inclusion of comments and inputs from stakeholders and interested and affected parties;
- Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties; and
- The level of agreement between the EAP and interested and affected parties on the Plan of Study for undertaking the Environmental Impact Assessment.

SRK and the EAPs managing this project hereby affirm that:

- To the best of our knowledge the information provided in the report is correct, and no attempt has been made to manipulate information to achieve a particular outcome. Some information, especially pertaining to the project description, was provided by the applicant and/or their sub-contractors. In this respect, SRK's standard disclaimer (inserted in this report) pertaining to information provided by third parties applies.
- To the best of our knowledge all comments and inputs from stakeholders and interested and affected parties have been captured in the report and no attempt has been made to manipulate such comment or input to achieve a particular outcome. Written submissions are appended to the report while other comments are recorded within the report. For the sake of brevity, not all comments are recorded verbatim and are mostly captured as issues, and in instances where many stakeholders have similar issues, they are grouped together, with a clear listing of who raised which issue(s).
- Information and responses provided by the EAP to interested and affected parties are clearly presented in the report. Where responses are provided by the applicant (not the EAP), these are clearly indicated.
- With respect to EIA Reports, SRK will take account of interested and affected parties' comments on the Plan of Study and, insofar as comments are relevant and practicable, accommodate these during the Impact Assessment Phase of the EIA process.

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Acronyms and Abbreviations

ACP	Access Control Point
AoI	Area of Influence
ALARA	As Low As Reasonably Achievable
ASR	Age-standardised average annual incident risk
BA	Basic Assessment
BID	Background Information Document
Ca	Calcium
CBA	Critical Biodiversity Area
CISF	Centralised Interim Storage Facility
Cl	Chloride
CIA	Cumulative Impact Assessment
CoCT	City of Cape Town
COMARE	Committee on Medical Aspects of Radiation in the Environment
CSB	Cask Storage Building
DEA	National Department of Environmental Affairs
DEA:O&C	Department of Environmental Affairs: Oceans and Coasts
DEA&DP	Department of Environmental Affairs and Development Planning (Western Cape)
DoE	Department of Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
ERP	Emergency Response Plan
ESA	Ecological Support Area
ESL	Environmental Survey Laboratory
GDP	Gross Domestic Product
GDPR	Regional Gross Domestic Product
GIS	Geographic Information Systems
GN	Government Notice
GRU	Groundwater Resource Unit
GWh	gigawatt hour
Gy	Gray
HCO_3	Bicarbonate
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
HWM	High Water Mark

I&AP	Interested and Affected Party
IAEA	International Atomic Energy Agency
IAIA	International Association for Impact Assessment
ICRP	International Commission on Radiological Protection
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IFC	International Finance Corporation
KIPTS	Koeberg Insulator Pollution Testing Station
KNEP	Koeberg Nuclear Emergency Plan
KNPS	Koeberg Nuclear Power Station
kwh	kilowatt hour
LAA	Limited Access Area
LPZ	Long-term Protective Action Planning Zone
L/s	Litres per second
MAP	Mean Annual Precipitation
mbgl	Metres Below Ground Level
m/d	Metres per day
Mg	Magnesium
Mm^3/a	Million cubic metres per annum
msl	Mean Sea Level
mS/m	Millisiemens per metre
mSv	MilliSievert
MW (e)	MegaWatt (electrical)
Na	Sodium
NEA	Nuclear Energy Act 46 of 1999
NEMA	National Environmental Management Act 107 of 1998 as amended
NEM:BA	National Environmental Management: Biodiversity Act 10 of 2004
NEM:PAA	National Environmental Management: Protected Areas Act 57 of 2003
NEM:WA	National Environmental Management: Waste Act 59 of 2008
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act 25 of 1999
NID	Notice of Intent to Develop
NNR	National Nuclear Regulator
NNRA	National Nuclear Regulator Act 47 of 1999
NRWDI	National Radioactive Waste Disposal
NRWDIA	National Radioactive Waste Disposal Institute Act 53 of 2008
NWA	National Water Act 36 of 1998
OCA	Owner Controlled Area
OHSA	Occupational Health and Safety Act 85 of 1993
PAZ	Precautionary Action Planning Zone
PBMR	Pebble Bed Modular Reactor
PGWC	Provincial Government of the Western Cape

PSA	Probabilistic Safety Assessment
PSDF	Provincial Spatial Development Framework
RD	Requirement Document
RP	Radiation Protection
S&EIR	Scoping and Environmental Impact Reporting
SABAP	South African Bird Atlas Project
SAHRA	South African Heritage Resources Agency
SAS	Scientific Aquatic Services cc
SCC	Species of Conservation Concern
SDF	Spatial Development Framework
SES	Socio-economic Status
SFP	Spent Fuel Pool
SHEQ	Safety, Health, Environmental and Quality
SPA	Security Protected Area (Inside Access Control Point 2)
SO_4	Sulfate
SRK	SRK Consulting (South Africa) (Pty) Ltd
SSR	Site Safety Report
StatsSA	Statistics South Africa
Sv	Sievert
ToR	Terms of Reference
TISF	Transient Interim Storage Facility
UPZ	Urgent Protective Action Planning Zone
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
VEC	Valued Environmental and Social Components
WCNCLAA	Western Cape Nature Conservation Laws Amendment Act 3 of 2000
WUL	Water Use Licence

Glossary

Aquifer	An underground body of permeable rock or unconsolidated materials (gravel, sand or silt) which can contain or transmit groundwater.
Avifauna	The collective birds of a given region.
Baseline	Information gathered at the beginning of a study which describes the environment prior to development of a project and against which predicted changes (impacts) are measured.
Benguela Current	The broad, northward flowing ocean current that forms the eastern portion of the South Atlantic Ocean.
Biodiversity	The diversity, or variety, of plants, animals and other living things in a particular area or region. It encompasses habitat diversity, species diversity and genetic diversity.
Collective Radiation Exposure	The total radiation exposure for all individuals involved in the activity. It is the sum of all individual exposures.
Committed Effective Radiation Dose	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.
Community	Those people who may be impacted upon by the construction and operation of the project. This includes neighbouring landowners, local communities and other occasional users of the area.
Construction Phase	The stage of project development comprising site preparation as well as all construction activities associated with the development.
Consultation	A process for the exchange of views, concerns and proposals about a project through meaningful discussions and the open sharing of information.
Cumulative Impacts	Direct and indirect impacts that act together with current or future potential impacts of other activities or proposed activities in the area/region that affect the same resources and/or receptors.
Electrical Conductivity (in water)	Reflects the capacity of water to conduct electrical current, and is directly related to the concentration of salts dissolved in water.
Ecology	The study of the interrelationships of organisms with and within their physical surroundings.
Ecosystem	The interconnected assemblage of all living organisms that occupy a given area and the physical environment with which they interact.
Environment	The external circumstances, conditions and objects that affect the existence of an individual, organism or group. These circumstances include biophysical, social, economic, historical and cultural aspects.
Environmental Impact Assessment	A process of evaluating the environmental and socio-economic consequences of a proposed course of action or project.
Environmental Impact Assessment Report	The report produced to relay the information gathered and assessments undertaken during the Environmental Impact Assessment.

Environmental Management Programme	A description of the means (the environmental specification) to achieve environmental objectives and targets during all stages of a specific proposed activity.
Ephemeral (watercourse)	A water body that does not flow or contain water year-round, in response to seasonal rainfall and run-off.
Fauna	The collective animals of a particular region, habitat or geological period.
Feasibility study	The determination of the technical and financial viability of a proposed project.
Fossil	Rare objects that are preserved due to unusual circumstances.
Flora	The collective plants of a particular region, habitat or geological period.
Fuel assemblies	Bundles of fuel rods, containing nuclear fuel.
Fuel rods	Pellets of enriched uranium dioxide encased in long metal tubes.
Geohydrology	The study of the character, source and mode of occurrence of groundwater.
Heritage Resources	Refers to something tangible or intangible, e.g. a building, an area, a ritual, etc. that forms part of a community's cultural legacy or tradition and is passed down from preceding generations and has cultural significance.
Hydrology	(The study of) surface water flow.
Impact	A change to the existing environment, either adverse or beneficial, that is directly or indirectly due to the development of the project and its associated activities.
Independent EAP	An independent person with the appropriate qualifications and experience appointed by the Applicant to manage the Environmental Impact Assessment process on behalf of the Applicant.
Integrated Environmental Management	The practice of incorporating environmental management into all stages of a project's life cycle, namely planning, design, implementation, management and review.
Kilowatt hour	The kilowatt hour is a unit of energy equivalent to one kilowatt (1 kW) of power expended for one hour.
Koeberg Nature Reserve	The 3 000ha nature reserve surrounding KNPS, managed by the Koeberg Managing Authority.
Limited Area Access	The area inside the Access Control Point 1 (ACP 1) barrier and includes the entire intake basin area.
Long-term Protective Action Zone	A pre-designated area, within an 80km radius of KNPS, where preparations for effective implementation of protective actions to reduce the risk of deterministic and stochastic health effects from long term exposure to deposition and ingestion must be developed in advance.
Megawatt	A unit of power equivalent to one million watts.
Mitigation measures	Design or management measures that are intended to avoid and / or minimise or enhance an impact, depending on the desired effect. These measures are ideally incorporated into a design at an early stage.
Operational Phase	The stage of the works following the construction phase, during which the development will function or be used as anticipated in the Environmental Authorisation.

Owner Controlled Area	The total area owned by Eskom SOC Limited at Koeberg Nuclear Power Station. Access to this area is controlled by the West Coast and Duynefontein entrances. This area includes the Limited Access Area (LAA) and Security Protected Area (SPA).
Precautionary Action Zone	A designated area, within a 5km radius of KNPS, where the risk of deterministic effects is sufficiently high to warrant the establishment of plans for the implementation of pre-emptive protective actions based on plant conditions, before a release or shortly thereafter.
Radioactive waste	Waste that contains, or is contaminated with, radionuclides at concentrations or activities greater than clearance levels as established by the regulatory body.
Reactor Units	Nuclear reactor units in which nuclear fuel is used to generate heat used for the generation of electricity. KNPS has two Reactor Units.
Recharge	The addition of water to the zone of saturation, either by the downward percolation of precipitation or surface water and / or the lateral migration of groundwater from adjacent aquifers.
Release	When referring to the PAZ, UPZ and LPZ, it is a radiological release in an accident that can give rise to an off-site public exposure of 1 milliSievert.
Scoping	A procedure to consult with stakeholders to determine issues and concerns and for determining the extent of and approach to an EIA and EMPr (one of the phases in an EIA and EMPr). This process results in the development of a scope of work for the EIA, EMPr and specialist studies.
Security Protected Area	A restricted area surrounding the reactor units to which only authorised personnel have access. This is the area within the ACP 2 security fence. The SPA is distinct from the protected area status of the Koeberg Nature Reserve in terms of the NEM:PAA.
Sievert	Unit of absorbed radiation.
Specialist study	A study into a particular aspect of the environment, undertaken by an expert in that discipline.
Stakeholders	All parties affected by and/or able to influence a project, often those in a position of authority and/or representing others.
Sustainable development	Sustainable development is generally defined as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. NEMA defines sustainable development as the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations.
Transfer	The movement of filled dry storage casks from the nuclear reactors to the TISF, inside the boundaries of the Owner Controlled Area.
Urgent Protective Action Planning Zone	A pre-designated area, within a 16 km radius of KNPS, where the risks for stochastic effects is sufficiently high to warrant the establishment of plans to implement protective actions based on environmental monitoring or on plant conditions.
Used fuel	Nuclear fuel that has been used in the fission process to the point where it is no longer useful in sustaining a nuclear reaction.

1 Introduction

1.1 Background and Introduction

Eskom proposes to construct a Transient Interim Storage Facility (TISF) for the temporary storage of dry casks at Koeberg Nuclear Power Station (KNPS) (Figure 1-1) to accommodate used nuclear fuel from the reactors of the power station (now referred to as the "project"), thereby ensuring the continued operation of KNPS. The TISF will comprise concrete pad(s) within a site footprint of approximately 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 plant.

The National Environmental Management Act 107 of 1998, as amended (NEMA), and the Environmental Impact Assessment (EIA) Regulations, 2014 (promulgated in terms of NEMA) warrant that listed activities require Environmental Authorisation (EA) from the National Department of Environmental Affairs (DEA). A Scoping and Environmental Impact Reporting (S&EIR, also referred to as an EIA) process is required to support an application for EA.

SRK Consulting (South Africa) (Pty) Ltd (SRK) has been appointed by Eskom to undertake the S&EIR process required in terms of the NEMA and the EIA Regulations, 2014.

1.2 Purpose of the Report

In terms of relevant legislation, the project may not commence prior to obtaining a suite of authorisations (see Section 2). This report has been compiled in support of these applications. The EIA Report documents the steps undertaken during the Impact Assessment Phase to assess the significance of potential impacts and determine measures to mitigate the negative impacts and enhance the benefits (or positive impacts) of the proposed project. The report presents the findings of the Impact Assessment Phase and the public participation that forms part of the process.

The EIA Report is accompanied by an Environmental Management Programme (EMPr), which documents the management and monitoring measures that need to be implemented during the design, construction and operational phases of the project to ensure that impacts are appropriately mitigated and benefits enhanced.

More specifically, the objectives of this EIA Report are to:

- Inform the stakeholders about the proposed project and the S&EIR (also referred to as EIA) process followed;
- Obtain contributions from stakeholders (including the applicant, consultants, relevant authorities and the public) and ensure that all issues, concerns and queries raised are fully documented and addressed;
- Assess in detail the potential environmental and socio-economic impacts of 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.

18°26'0"E 18°28'0"E 18°30'0"E 18°32'0"E

33°40'0"S 33°42'0"S 33°44'0"S

ATLANTIC OCEAN

Van Riebeeckstrand

Kapteinsbaai

Melkbosstrand

Duynefontein

Southmer

R27 R304 M19 M14

18°22'0"E 18°24'0"E 18°26'0"E 18°28'0"E 18°30'0"E 18°32'0"E

N

Legend

- Railway
- Road -> Other
- Road -> Arterial
- Road -> Main
- Road -> Secondary
- Non-Perennial Rivers
- Perennial Rivers
- KNPS

0 0.5 1 2 km

Data Source: 1/50,000 Topographic Map Sheet 3318 ESRI Bing Maps	
Scale: 1:50 000 @ A3	
Projection: TM	Datum: HH94
Central Meridian/Zone: Lo19	
Date: 01/11/2016	Compiled by: FUBM
Project No: 478317	Fig No: 1-1

srk consulting

KOEBERG TISF EIA

LOCALITY MAP

Path: G:\New Proj\478317 Koeberg TISF EIA\8GIS\GISPROJ\MXD\478317_Fig1-1_KoebergTISF EIA_Locality_A3L_20161101.mxd

Revision: A Date: 11 07 2014

1.3 Structure of this Report

This report discusses relevant environmental legislation and its application to this project, outlines the S&EIR process, presents a detailed project description and environmental baseline, details the stakeholder engagement process followed and assesses the potential impacts of the project before concluding the report with a set of pertinent findings and key recommendations. The report consists of the following sections:

Section 1: Introduction

Provides an introduction and background to the project and outlines the purpose of this document and the assumptions and limitation applicable to the study.

Section 2: Governance Framework and Environmental Process

Provides a brief summary and interpretation of the relevant legislation as well as pertinent strategic planning documents, and outlines the approach to the environmental process.

Section 3: Project Description

Describes the location and current status of the site and provides a brief summary of the surrounding land uses as well as background to, motivation, and description of, the project.

Section 4: Description of the Affected Environment

Describes the biophysical and socio-economic characteristics of the affected environment against which potential project impacts are assessed.

Section 5: Stakeholder Engagement

Details the stakeholder engagement approach and summarises stakeholder comments that informed the impact assessment.

Section 6: Environmental Impact Assessment

Describes the specialist studies undertaken and assesses the potential impacts of the project utilising SRK's proven impact assessment methodology.

Section 7: Conclusions and Recommendations

Provides an Environmental Impact Statement (EIS), describes the need and desirability of the project, summarises the recommendations of the EIA Report, and outlines further opportunities for stakeholder engagement.

The EIA Report has been prepared in accordance with Section 23 of the EIA Regulations, 2014.

1.4 Content of Report

The EIA Regulations, 2014 (Government Notice (GN) 982, Appendix 3, Part 3) prescribe the required content in an EIA Report. These requirements and the sections of this EIA Report in which they are addressed, are summarised in Table 1-1.

Table 1-1: Content of EIA Report as per EIA Regulations, 2014

GN 982, Appendix 3 Ref.:	Item	Section Ref.:
(3) (a) (i)	Details of the Environmental Assessment Practitioner (EAP) who prepared the report	p. ii
(3) (a) (ii)	The expertise of the EAP, including a Curriculum Vitae	p. ii, App A
(3) (b) (i)	The 21 digit Surveyor General code of the property	3

GN 982, Appendix 3 Ref.:	Item	Section Ref.:
(3) (b) (ii)	The physical address and farm name (where available)	3
(3) (b) (iii)	The coordinates of the boundary of the property (where (3) (b) (i) and (3) (b) (ii) are not available)	N/A
(3) (c)	A plan indicating the location of the proposed activity and associated infrastructure, or:	Figure 3.1 & Figure 3.3
(3) (c) (i)	For linear activities: a description and coordinates of the corridor in which the proposed activity is to be undertaken	N/A
(3) (c) (ii)	On land where the property has not been defined, the coordinates within which the activity is to be undertaken	N/A
(3) (d)	A description of the scope of the proposed activity, including:	3
(3) (d) (i)	All listed and specified activities trigger and being applied for	2.1.2
(3) (d) (ii)	A description of the associated structures and infrastructure related to the development	3.5
(3) (e)	A description of the policy and legislative context and an explanation of how the proposed development complies with and responds to the legislative and policy context	2
(3) (f)	A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location	7.2
(3) (g)	A motivation for the preferred development footprint within the approved site	7.4
(3) (h)	A full description of the process followed to reach the proposed development footprint within the approved site, including:	3.3 & 3.4
(3) (h) (i)	Details of the development footprint alternatives considered	3.3
(3) (h) (ii)	Details of the public participation process undertaken, including copies of the supporting documents and inputs	5, App K, L, M
(3) (h) (iii)	A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them	5, App L
(3) (h) (iv)	The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	4
(3) (h) (v)	The impacts and risks identified, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts can be reversed, may cause irreplaceable loss of resources, and can be avoided, managed or mitigated	6
(3) (h) (vi)	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks	6.1.4
(3) (h) (vii)	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected, focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	6.2-6.8
(3) (h) (viii)	The possible mitigation measures that could be applied and level of residual risk	6.2-6.8
(3) (h) (ix)	If no alternative development locations for the activity were investigated, the motivation for not considering such	3.4
(3) (h) (x)	A concluding statement indicating the preferred alternative development location within the approved site	7.4
(3) (i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including:	6
(3) (i) (i)	A description of all environmental issues and risks that were identified during the environmental impact assessment process	6.2-6.8
(3) (i) (ii)	An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures	6.2-6.8
(3) (j)	An assessment of each identified potentially significant impact and risk, including:	6.2-6.8
(3) (j) (i)	Cumulative impacts	6.9

GN 982, Appendix 3 Ref.:	Item	Section Ref.:
(3) (j) (ii)	The nature, significance and consequences of the impact and risk	6.2-6.8
(3) (j) (iii)	The extent and duration of the impact and risk	6.2-6.8
(3) (j) (iv)	The probability of the impact and risk occurring	6.2-6.8
(3) (j) (v)	The degree to which the impact and risk can be reversed	6.2-6.8
(3) (j) (vi)	The degree to which the impact and risk may cause irreplaceable loss of resources	6.2-6.8
(3) (j) (vii)	The degree to which the impact and risk can be mitigated	6.2-6.8
(3) (k)	Where applicable, a summary of the findings and recommendations of any specialist report and an indication as to how these findings and recommendations have been included in the final assessment report	6.2-6.8
(3) (l)	An EIS which contains	7.1
(3) (l) (i)	A summary of the key findings of the environmental impact assessment	7.1
(3) (l) (ii)	A map at an appropriate scale which superimposes the proposed activity and its associated structures and the infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers	N/A[1]
(3) (l) (iii)	A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives	7.1.1
(3) (m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMP as well as for inclusion as conditions of authorisation	6.2-6.8, 7.3
(3) (n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment	3.4, 7.4
(3) (o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation	7.3
(3) (p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	1.5
(3) (q)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	7.4
(3) (r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised	N/A
(3) (s)	An undertaking under oath or affirmation by the EAP in relation to	piii
(3) (s) (i)	The correctness of the information provided in the reports	piii
(3) (s) (ii)	The inclusion of comments and inputs from stakeholders and I&APs	piii
(3) (s) (iii)	The inclusion of inputs and recommendations from the specialist reports where relevant	piii
(3) (s) (iv)	Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties	piii

[1] Given the relatively small extent of the site (1.28 ha), its proximity within the existing boundaries of the KNPS Security Protected Area, the limited ecological sensitivity and the intention that the entire site will be used for the construction of the TISF, such a map has not been produced.

1.5 Assumptions and Limitations

As is standard practice, the report is based on a number of assumptions and is subject to certain limitations. These are as follows:

- It is assumed that information provided by Eskom and other consultants and specialists is accurate;
- SRK's assessment of the significance of impacts of the proposed development on the affected environment has been based on the assumption that the activities will be confined to those described in Section 3. If there are any substantial changes to the project description, impacts may need to be reassessed;
- Where detailed design information is not available, the precautionary principle, i.e. a conservative approach that overstates negative impacts and understates benefits, has been adopted;
- It is assumed that the stakeholder engagement process undertaken during the S&EIR process has identified all relevant concerns of stakeholders;
- The EIA does not constitute a risk assessment addressing e.g. risk of rupture, explosion and/or fire;
- This facility will be decommissioned in accordance with the approved Koeberg Decommissioning Plan. Decommissioning of the facility has not been considered in this EIA; and
- Eskom will in good faith implement the agreed mitigation measures identified in this report. To this end it is assumed that Eskom will commit sufficient resources and employ suitably qualified personnel.

Notwithstanding the above, SRK is confident that these assumptions and limitations do not compromise the overall findings of the report.

2 Governance Framework and Environmental Process

2.1 South African Legislation

There are a number of regulatory requirements at local, provincial and national level with which the proposed project must conform. Some of the key environmental legal requirements include the following:

- National Environmental Management Act 107 of 1998, as amended (NEMA);
- EIA Regulations 2014, promulgated in terms of NEMA;
- National Water Act 36 of 1998 (NWA);
- National Heritage Resources Act 25 of 1999 (NHRA);
- National Environmental Management: Biodiversity Act 10 of 2004 (NEM:BA);
- National Environmental Management: Protected Areas Act 57 of 2003 (NEM:PAA);
- National Nuclear Regulator Act 47 of 1999 (NNRA);
- Nuclear Energy Act 46 of 1999 (NEA); and
- National Radioactive Waste Disposal Institute Act 53 of 2008 (NRWDIA).

The National Environmental Management: Waste Act 59 of 2008 (NEM:WA) aims to (amongst other things) regulate waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation. NEM:WA does not apply to radioactive waste, which is regulated by the NNRA, NRWDIA and the NEA, and is thus not discussed further below.

A brief summary of SRK's understanding of the relevant Acts and Regulations that are applicable to this study is provided below. Note that other legislative requirements may also pertain to the project. As such, the summary provided below is not intended to be definitive or exhaustive, and serves only to highlight key environmental legislation and obligations.

2.1.1 National Environmental Management Act 107 of 1998, as Amended

NEMA establishes a set of principles which all authorities have to consider when exercising their powers. These include the following:

- Development must be sustainable;
- Pollution must be avoided or minimised and remedied;
- Waste must be avoided or minimised, reused or recycled;
- Negative impacts must be minimised; and
- Responsibility for the environmental consequences of a policy, project, product or service applies throughout its life cycle.

Section 28(1) states that "*every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring*". If such degradation/pollution cannot be prevented, then appropriate measures must be taken to minimise or rectify such pollution.

These measures may include:

- Assessing the impact on the environment;
- Informing and educating employees about the environmental risks of their work and ways of minimising these risks;
- Ceasing, modifying or controlling actions which cause pollution/degradation;
- Containing pollutants or preventing movement of pollutants;
- Eliminating the source of pollution; and
- Remedying the effects of the pollution.

***Legal requirements for this project**:*

Eskom (the proponent) has a responsibility to ensure that the proposed activities and the S&EIR process conform to the principles of NEMA. The proponent is obliged to take actions to prevent pollution or degradation of the environment in terms of Section 28 of NEMA, and to ensure that the environmental impacts associated with the project are considered, and mitigated where possible.

2.1.2 EIA Regulations, 2014

Sections 24 and 44 of NEMA make provision for the promulgation of regulations that identify activities which may not commence without an EA issued by the competent authority (DEA). In this context, the EIA Regulations, 2014 (GN R982, which came into effect on 8 December 2014), promulgated in terms of NEMA, govern the process, methodologies and requirements for the undertaking of EIAs in support of EA applications. Listing Notices 1-3 in terms of NEMA list activities that require EA ("NEMA listed activities").

GN R982 of the EIA Regulations lays out two alternative authorisation processes. Depending on the type of activity that is proposed, either a Basic Assessment (BA) process or a S&EIR process is required to obtain EA. Listing Notice 1[2] lists activities that require a BA process, while Listing Notice 2[3] lists activities that require S&EIR. Listing Notice 3[4] lists activities in certain sensitive geographic areas that require a BA process.

The regulations for both processes – BA and S&EIR - stipulate that:

- Public participation must be undertaken as part of the assessment process;
- The assessment must be conducted by an independent EAP;
- The relevant authorities must respond to applications and submissions within stipulated time frames;
- Decisions taken by the authorities can be appealed by the proponent or any other Interested and Affected Party (I&AP); and
- A draft Environmental Management Programme (EMPr) must be compiled and released for public comment.

GN R982 sets out the procedures to be followed and content of reports compiled during the BA and S&EIR processes.

[2] GN R983 of 2014
[3] GN R984 of 2014
[4] GN R985 of 2014

The NEMA National Appeal Regulations[5] make provision for appeal against any decision issued by the relevant authorities. In terms of the Regulations, an appeal must be lodged with the relevant authority in writing within 20 days of the date on which notification of the decision (EA) was sent to the applicant or I&AP (as applicable). The applicant, the decision-maker, interested and affected parties and organ of state must submit their responding statement, if any, to the appeal authority and the appellant within 20 days from the date of receipt of the appeal submission.

The project includes activities that are listed in terms of the EIA Regulations, 2014 and thus need EA (see Table 2-1).

Table 2-1: NEMA Listed Activities applicable to the project

No.	Listed activity
Listing Notice 1	
27	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation.
Listing Notice 2	
3	The development and related operation of facilities or infrastructure for nuclear reaction including energy generation, the production, enrichment, processing, reprocessing, storage or disposal of nuclear fuels, radioactive products, nuclear waste or radioactive waste.
Listing Notice 3	
12	The clearance of an area of 300 square metres or more of indigenous vegetation. (a) In Western Cape: (i) Within any critically endangered or endangered ecosystem.

***Legal requirements for this project**:*

As such, the proponent is obliged to apply for EA for these listed activities and to undertake an S&EIR process in support of the application, in accordance with the procedure stipulated in GN R982 under NEMA.

2.1.3 National Water Act 36 of 1998

Water use in South Africa is controlled by the NWA. The executive authority is the Department of Water and Sanitation (DWS). The NWA recognises that water is a scarce and unevenly distributed national resource in South Africa. Its provisions are aimed at achieving sustainable and equitable use of water to the benefit of all users and to ensure protection of the aquatic ecosystems associated with South Africa's water resources. The provisions of the Act are aimed at discouraging pollution and wastage of water resources.

In terms of the Act, a land user, occupier or owner of land where an activity that causes or has the potential to cause pollution of a water resource has a duty to take measures to prevent pollution from occurring. If these measures are not taken, the responsible authority may do whatever is necessary to prevent the pollution or remedy its effects, and to recover all reasonable costs from the responsible party.

Section 21 of the NWA specifies a number of water uses, including:

(a) taking water from a water resource; and

(j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

[5] GN R993 of 2014, as amended by GN R205 of 2015.

These water uses require authorisation in terms of Section 22 (1) of the Act, unless they are listed in Schedule 1 of the NWA, are an existing lawful use, fall under a General Authorisation issued under section 39 or if the responsible authority waives the need for a licence.

***Legal requirements for this project**:*

In a letter dated 10 May 2016, DWS confirmed that the proposed project activities, as described in the Scoping Report do not trigger a water use in terms of Section 21 of the NWA, and therefore a WUL is not required (Appendix B).

2.1.4 National Heritage Resources Act 25 of 1999

The protection and management of South Africa's heritage resources are controlled by the NHRA. The enforcing authority for this act is the South African National Heritage Resources Agency (SAHRA). In the Western Cape, SAHRA has delegated this authority to Heritage Western Cape (HWC). In terms of the Act, historically important features such as graves, trees, archaeological artefacts/sites and fossil beds are protected. Similarly, culturally significant symbols, spaces and landscapes are also afforded protection.

Section 38 of the NHRA requires that any person who intends to undertake certain categories of development must notify SAHRA and/or HWC at the very earliest stage of initiating such a development and must furnish details of the location, nature and extent of the proposed development. HWC has designed a Notification of Intent to Develop (NID) to assist the developer in providing the necessary information to enable HWC to decide whether a Heritage Impact Assessment (HIA) will be required.

Section 38 also makes provision for the assessment of heritage impacts as part of an EIA process and indicates that, if such an assessment is deemed adequate, a separate HIA is not required. There is, however, the requirement in terms of Section 38 (8) for the consenting authority (in this case the DEA) to ensure that the evaluation of impacts on the heritage resources fulfils the requirements of the relevant heritage resources authority (HWC), and that the comments and recommendations of the heritage resources authority are taken into account prior to the granting of the consent.

Section 38(1) of the NHRA specifies activities that trigger the need for a NID. The proposed project triggers a number of these activities, including:

(c) Any development or activity that will change the character of a site (i) exceeding 5 000 m^2 in extent.

***Legal requirements for this project**:*

A NID was submitted to HWC in February 2016. The proposed development will change the character of the project site, in addition to which transfer routes will be required to move casks from the reactors and Spent Fuel Pools (SFPs) to the TISF. These are, however, likely to follow existing roads.

Since there is no reason to believe that the proposed development will impact on heritage resources, HWC confirmed that a further application process under Section 38 of NHRA will not be required (Appendix C).

2.1.5 National Environmental Management: Biodiversity Act 10 of 2004

The purpose of the NEM:BA is to provide for the management and conservation of South Africa's biodiversity and the protection of species and ecosystems that warrant national protection. The NEM:BA makes provision for the publication of bioregional plans and the listing of ecosystems and species that are threatened or in need of protection. Threatened or Protected Species Regulations (2007), Guidelines for the determination of bioregions and the preparation and publication of bioregional plans (2009) and a National List of Ecosystems that are Threatened and in Need of Protection (2011) have been promulgated in terms of NEM:BA.

A published bioregional plan is a spatial plan indicating terrestrial and aquatic features in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning. These areas are referred to as Critical Biodiversity Areas (CBAs) in terms of NEM:BA. Bioregional plans provide guidelines for avoiding the loss or degradation of natural habitat in CBAs with the aim of informing EIAs and land-use planning (including Environmental Management Frameworks [EMFs], Spatial Development Frameworks [SDFs], and Integrated Development Plans [IDPs]).

Permits to carry out a restricted activity involving listed threatened or protected species or alien species may only be issued after an assessment of risks and potential impacts on biodiversity has been undertaken.

Legal requirements for this project:

Although no CBAs or Ecological Support Areas (ESAs) are located in the project area, KNPS is located in the original extent of an endangered ecosystem and the impacts of the project on the biodiversity of the area will need to be assessed.

2.1.6 National Environmental Management: Protected Areas Act 57 of 2003

The protection and management of South Africa's protected areas are controlled by the NEM:PAA. The Act provides for:

- Declaration of nature reserves and determination of the type of reserve declared;
- Cooperative governance in the declaration and management of nature reserves;
- A system of protected areas to manage and conserve biodiversity; and
- The utilization and participation of local communities in the management of protected areas.

In designating a protected area, the relevant competent authority is obliged to follow an appropriate consultation process. The Act requires that local protected areas must be managed by the relevant Management Authority. A management plan for the protected area must be approved by the provincial MEC.

Legal requirements for this project:

KNPS is located within the Koeberg Nature Reserve, proclaimed as a private nature reserve in 1991. The Koeberg Nature Reserve Management Plan has been approved by the MEC. The construction and operational phases of the TISF will adhere to the conditions of the Koeberg Nature Reserve Management Plan.

2.1.7 National Nuclear Regulator Act 47 of 1999

The NNRA establishes and enforces procedures to protect people who work with radioactive materials.

The National Safety Standards and Regulatory Practices of South Africa require that authorised practices involved in nuclear related activities shall perform a prospective radiological public hazard assessment. Radiological protection standards are criteria set to ensure compliance with the basic principles of radiation safety. The National Nuclear Regulator (NNR) of South Africa adopted these standards and promulgated regulations to ensure the protection of individual members of the public and their surrounding environment.

All used fuel storage facilities fall under the regulatory authority of the NNR. The Regulator‘s responsibilities include exercising regulatory control related to safety over the siting, design, construction, operation, manufacture of component parts, and decontamination, decommissioning and closure of nuclear installations.

***Legal requirements for this project**:*

Eskom operates KNPS in accordance to the existing NNR license NIL-001. The proponent must amend their existing NNR licence to include the TISF and must undertake a radiological assessment (safety case) to determine the potential radiological effects on the public. Following the approval of the licensing strategy for the development of the TISF, it is anticipated that the licence amendment application will be submitted to the NNR in September 2017.

2.1.8 Nuclear Energy Act 46 of 1999

The NEA stipulates that the Minister of Energy has the authority over the management and disposal of radioactive waste and the storage of used nuclear fuel.

Section 34 (s) stipulates that authorisation by the Minister is required for any person, institution, organisation or body to dispose of, store or reprocess any radioactive waste or irradiated fuel (when the latter is external to the spent fuel pool).

***Legal requirements for this project**:*

Eskom received written permission (ref E2/5/9/3) from the Minister of Energy (on 21 April 2011) in terms of the Nuclear Energy Act, to establish the TISF at Koeberg, to store used fuel and for the transfer of used fuel between the SFPs and the TISF (Appendix D).

2.1.9 National Radioactive Waste Disposal Institute Act 53 of 2008

The NRWDIA provides for the establishment of a National Radioactive Waste Disposal Institute to manage radioactive waste disposal on a national basis. According to the NRWDIA, the proposed establishment of a Centralised Interim Storage Facility (CISF)[6] for the storage of all radioactive waste generated in South Africa at a high level waste disposal facility is the responsibility of the National Radioactive Waste Disposal Institute (NRWDI).

Legal requirements for this project:

Eskom has no legal requirement for the CISF associated with disposal of radioactive waste in terms of this Act. However, since the establishment of a CISF is the responsibility of the NRWDI, Eskom has little control over the timing of this, and as such needs to make allowance for the storage of used fuel in the interim.

[6] It is possible that a CISF may be constructed in the foreseeable long term future. If constructed, high level nuclear waste and used nuclear fuel from KNPS may in future be stored at the CISF.

2.2 Planning Policy Framework

This section discusses a number of key formal planning policies relevant to the project. The policies and plans briefly discussed below include key industry related policies and regional and local development and spatial plans, including the:

- International Atomic Energy Agency Safety Standards;
- Energy Security Master Plan – Electricity (2007 – 2025);
- White Paper on the Energy Policy of the Republic of South Africa (1998) and the Nuclear Energy Policy for the Republic of South Africa (2008);
- Radioactive Waste Management Policy and Strategy for the Republic of South Africa (2005);
- Western Cape Provincial Spatial Development Framework (2014);
- City of Cape Town Integrated Development Plan (2012 - 2017); and
- City of Cape Town Spatial Development Framework (2012).

2.2.1 International Atomic Energy Agency Safety Standards

South Africa has been a member state of the International Atomic Energy Agency (IAEA) since it was established in 1957. The Agency works with its member states worldwide to promote the safe, secure and peaceful use of nuclear technologies.

The IAEA safety standards provide a system of Safety Fundamentals, Safety Requirements and Safety Guides, which reflect an international consensus on what constitutes a high level of safety for protecting people and the environment from harmful effects of ionising radiation. The IAEA safety standards are applicable throughout the lifetime of nuclear facilities.

The Safety Fundamentals, General Safety Requirements and General Safety Guides are applicable to all nuclear facilities and activities. These are complemented by Specific Safety Requirements and Specific Safety Guides applicable to specific facilities and activities including:

- Nuclear power plants;
- Fuel cycle facilities;
- Research reactors;
- Radioactive waste disposal facilities;
- Mining and milling;
- Application of radiation sources; and
- Transport of radioactive material.

The TISF will be designed and operated to comply with the general and specific safety requirements (where relevant) applicable to used fuel storage facilities and safe transport of radioactive material in accordance to the IAEA safety standards. Since the TISF will be located within KNPS, it will also comply with requirements applicable to nuclear power plants.

2.2.2 Energy Security Master Plan – Electricity (2007 – 2025)

The Energy Security Master Plan addresses all aspects of the electricity sector including generation, transmission, distribution and energy efficiency initiatives for the period 2007 - 2025.

The goals of the Master Plan are to:

- Support economic growth and development;
- Improve the reliability of electricity infrastructure;
- Provide a reasonably priced electricity supply;
- Ensure the security of electricity supply as set by a security of supply standard;
- Diversify the primary energy sources of electricity;
- Meet the renewable energy targets as set in the White Paper on Energy Policy;
- Increase access to affordable energy services;
- Reduce energy usage through energy efficiency interventions;
- Accelerate household universal access to electricity; and
- Clarify some of the policy issues in the context of an evolving electricity sector.

The TISF will assist in achieving these goals by facilitating the ongoing operation of KNPS.

2.2.3 White Paper on the Energy Policy of the Republic of South Africa (1998) and the Nuclear Energy Policy for the Republic of South Africa (2008)

Nuclear Energy Policy of the Republic of South Africa is guided by the White Paper on Energy Policy (1998), where nuclear energy was retained as one of the policy options for electricity generation. In order to achieve a balance between energy demand and resource availability, the Energy Policy identifies the need to undertake an Integrated Energy Planning process, while also taking into account health, safety and environmental parameters. In terms of the White Paper, the Government is responsible for investigating the long-term contribution nuclear power can make to the country's energy economy and, secondly, how the existing nuclear industrial infrastructure can be optimised.

Some of the main policy objectives of the White Paper relate to decisions regarding:

- Possible new nuclear power stations;
- The management of radioactive waste;
- Safety monitoring of the nuclear industry;
- Effectiveness and adequacy of regulatory oversight; and
- Review of bodies associated with the nuclear industry.

The Nuclear Energy Policy presents a framework within which prospecting, mining, milling and the use of nuclear materials as well as the development and utilisation of nuclear energy for peaceful purposes by South Africa takes place. Through this Policy, the South African Government aims to achieve the following objectives:

- Promotion of nuclear energy as an important electricity supply option through the establishment of a national industrial capability for the design, manufacture and construction of nuclear energy systems;
- Establishment of the necessary governance structures for an extended nuclear energy programme;
- Creation of a framework for safe and secure utilisation of nuclear energy with minimal environmental impact;

- Contribution to the country's national programme of social and economic transformation, growth and development;
- To guide in the actions to develop, promote, support, enhance, sustain and monitor the nuclear energy sector in South Africa;
- Attainment of global leadership and self-sufficiency in the nuclear energy sector in the long term;
- Exercise control over un-processed uranium ore for export purposes for the benefit of the South African economy;
- Establishing of mechanisms to ensure the availability of land (nuclear sites) for future nuclear power generation;
- Allow for the participation of public entities in the uranium value chain;
- Promoting energy security for South Africa;
- Improvement of the quality of human life and to support the advancement of science and technology;
- Reduction of greenhouse gas emissions; and
- Skills development related to nuclear energy.

The Nuclear Energy Policy states that radioactive waste, including used nuclear fuel is to be managed in terms of the Radioactive Waste Management Policy and Strategy for South Africa.

2.2.4 Radioactive Waste Management Policy and Strategy for the Republic of South Africa (2005)

The Radioactive Waste Management Policy and Strategy for the Republic of South Africa (2005) establishes a national radioactive waste policy framework setting out the principles and structures for the management of radioactive waste in a coordinated and cooperative manner.

The Policy acknowledges that the disposal of high level waste presents the greatest challenges and investigations into the best long-term option for the management of used fuel are ongoing. In the interim, the Policy states that used nuclear fuel is and shall continue to be stored in authorised facilities within the generator's sites. The Policy does recognise that such storage is finite and storing used fuel on these sites is not sustainable.

The Policy states that Government is responsible for ensuring that investigations are conducted within set timeframes to consider the various options for safe management of used fuel and high level radioactive waste in South Africa. Included in the options for investigation are the following:

- Long-term above ground storage at a central off-site storage facility, e.g. a CISF;
- Reprocessing, conditioning and recycling; and
- Deep geological disposal.

2.2.5 Western Cape Provincial Spatial Development Framework (2014)

The Western Cape Provincial Spatial Development Framework (SDF) is a spatial planning document that guides district and local spatial initiatives such as Integrated Development Plans (IDPs) and SDFs. The Western Cape Provincial SDF sets out to put in place a coherent framework for the Province's urban and rural areas that:

- Gives spatial expression to the national and provincial development agendas;

- Serves as basis for coordinating, integrating and aligning 'on the ground' delivery of national and provincial departmental programmes;
- Supports municipalities in fulfilling their municipal planning mandate in line with the national and provincial agendas; and
- Communicates government's spatial development intentions to the private sector and civil society.

The Western Cape Provincial SDF does not discuss KNPS, but it is assumed that as an approved nuclear facility, consideration is given to KNPS, its operations and related exclusion zones.

2.2.6 City of Cape Town Integrated Development Plan (2012-2017)

The City of Cape Town's (CoCT's) IDP (2012-2017) is a strategic plan that is used to guide the development of the City for a specific period. It guides the planning, budgeting, implementation, management and future decision making processes of the CoCT.

The strategic focus areas (or pillars) of the CoCT's IDP include:

1. The opportunity city;
2. The safe city;
3. The caring city;
4. The inclusive city; and
5. The well-run city.

These five pillars help focus the City's purpose of delivery. The IDP is the City's principal strategic planning instrument, from which various other strategic documents will flow. It informs planning and development in the City.

The CoCT IDP does not discuss KNPS, but it is assumed that as an approved nuclear facility, consideration is given to KNPS, its operations and related exclusion zones.

2.2.7 City of Cape Town Spatial Development Framework (2012)

The CoCT SDF (2012) is a long-term plan to guide and manage urban growth, and to balance competing land use demands, by putting in place a "logical development path that will shape the spatial form and structure of Cape Town".

In the medium- to long-term, the CoCT would like to reduce the development impediments and safety risks associated with KNPS. Specific actions related to this objective include:

- The CoCT, in conjunction with Eskom and the Provincial Government of the Western Cape (PGWC), must update the Integrated Koeberg Nuclear Emergency Plan (KNEP) as required;
- The CoCT, in conjunction with Eskom and the PGWC, must continue to optimise, with a view to sustainability, the requirements in respect of the KNEP; and
- The CoCT must review and update the town planning assessment criteria to ensure that the processing and assessment of development applications within KNPS emergency planning zones do not compromise the effective implementation of the KNEP.

Key strategies have been identified to guide the preparation of sector plans, lower-order spatial plans, detailed policies, guidelines and implementation plans, and are used to assess development applications. A sub-strategy within Key Strategy 2 is relevant to this EIA: "*Appropriately protect the*

citizens of Cape Town from hazardous areas/activities" in which Policy 24 advises to: "*Direct urban growth away from hazardous areas/activities"*.

Relevant guidelines to KNPS within Policy 24 are:

- All development within KNPS exclusion zones: Precautionary Action Planning Zone (PAZ): 5 km and Urgent Protective action planning Zone (UPZ): 5-16km from the nuclear reactors must comply with the development controls (Policy 24.4); and
- Any new nuclear power station being developed in Cape Town must be located on the Eskom controlled area at the Koeberg site, and its exclusion zones must be smaller or equal to the existing KNPS' 5 km exclusion zone (Policy 24.5).

***Development controls** on development in exclusion zones around KNPS:*

- *No new development is permissible within the PAZ other than development that is directly related to the siting, construction, operation and decommissioning of KNPS or that is a result of the exercising of existing zoning rights.*
- *New development within the UPZ may only be approved subject to demonstration that the proposed development will not compromise the adequacy of disaster management infrastructure required to ensure the effective implementation of the Koeberg Nuclear Emergency Plan.*

These development controls will be superseded by the national regulations on development in the Formal Emergency Planning Zone of KNPS, when approved.

2.3 Environmental Assessment Process

The general approach to this study is guided by the principles contained in Section 2 of NEMA and those of Integrated Environmental Management (IEM).

NEMA lists a number of principles that apply to the actions of organs of state and that also serve as reference for the interpretation of environmental legislation and administration of environmental processes. The principles most relevant to environmental assessment processes and projects for which authorisation is required are summarised below.

Principles relevant to the EIA process:

- *Adopt a risk-averse and cautious approach;*
- *Anticipate and prevent or minimise negative impacts;*
- *Pursue integrated environmental management;*
- *Involve stakeholders in the process; and*
- *Consider the social, economic and environmental impacts of activities.*

Principles relevant to the project:

- *Place people and their needs at the forefront of concern and serve their needs equitably;*
- *Ensure development is sustainable, minimises disturbance of ecosystems and landscapes, pollution and waste, achieves responsible use of non-renewable resources and sustainable exploitation of renewable resources;*
- *Assume responsibility for project impacts throughout its life cycle; and*
- *Polluter bears remediation costs.*

This S&EIR process complies with these principles through its adherence to the EIA Regulations, 2014 and associated guidelines, which set out clear requirements for, *inter alia,* impact assessment and stakeholder involvement (see below), and through the assessment of impacts and identification of mitigation measures during the Impact Assessment Phase. An initial analysis of the project's compliance with the aims of sustainable development is provided in the impact assessment.

In accordance with the IEM Information Series (DEAT, 2004), an open, transparent approach, which encourages accountable decision-making, has been adopted.

The underpinning principles of IEM require:

- *Informed decision making;*
- *Accountability for information on which decisions are made;*
- *A broad interpretation of the term "environment";*
- *An open participatory approach in the planning of proposals;*
- *Consultation with interested and affected parties;*
- *Due consideration of alternatives;*
- *An attempt to mitigate negative impacts and enhance positive impacts of proposals;*
- *An attempt to ensure that the social costs of development proposals are outweighed by the social benefits;*
- *Democratic regard for individual rights and obligations;*
- *Compliance with these principles during all stages of the planning, implementation and decommissioning of proposals; and*
- *The opportunity for public and specialist input in the decision-making process.*

The study will also be guided by the requirements of the EIA Regulations, 2014 (see Section 2.1.2), which are more specific in their focus and define the detailed approach to the S&EIR process, as well as relevant guidelines published by the DEA and in the absence of national guidelines, the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP), including:

- DEA's Draft Companion to Environmental Impact Assessment Regulations of 2010 (DEA, 2010);
- DEA&DP's EIA Guideline and Information Document Series (DEA&DP, 2013), which includes guidelines on Generic Terms of Reference (ToR) for EAPs and Project Schedules, Public Participation, Alternatives, Need and Desirability, Exemption Applications and Appeals, an information; and

- DEA&DP's "One Environmental Management System" and the 2014 EIA Regulations Circular (DEA&DP, 2014).

The lead authority for this project will be the DEA. Supplementary applications will be made as required for the remaining authorisations.

2.3.1 Submission of Applications

Various environmental authorisations, permits or licences are required before the project may proceed. Some application forms must be submitted at the outset of the S&EIR process (e.g. in terms of the EIA Regulations and NHRA) while licences and permits in terms of the NWA and NNRA are only issued after EA and are submitted towards the end of the EIA process. The required authorisations and their status are listed in Table 2-2.

Table 2-2: EA, permits and licences required for the project

Application	Authority	Status
EA	DEA	Application was submitted to the DEA in July 2016 in compliance with Section 16 of the EIA Regulations, 2014. Reference number **14/12/16/3/3/2/947** was issued for the application. The Final Scoping Report was submitted to DEA in August 2016 on conclusion of the Scoping Phase. The Acceptance of the Scoping Report was received from DEA on 28 September 2016 (Appendix E).
WUL	DWS	DWS confirmed in May 2016 that no WUL will be required for the project (Appendix B).
Heritage Application (NID)	HWC	A NID was submitted to HWC in February 2016. HWC confirmed in March 2016 that no further heritage studies will be required (Appendix C).

An amendment application to include the TISF in KNPS' licence will be submitted to the NNR. The amendment application, as well as all stakeholder engagement process required in terms of the NNRA will be separate from those undertaken for the EIA, and falls outside the scope of the EIA.

2.3.2 S&EIR Process and Phasing

The S&EIR process consists of three phases, namely the Pre-Application and Scoping Phases (which have been completed) and an Impact Assessment Phase (the current phase) (see Figure 2-1 below).

The objectives of the Pre-Application Phase are to:

- *Identify stakeholders, including neighbouring landowners/ residents and authorities;*
- *Compile draft Scoping Report describing the affected environment and present an analysis of the potential environmental issues and benefits arising from the proposed project that may require further investigation in the Impact Assessment Phase; and*
- *Develop ToR for specialist studies to be undertaken in the Impact Assessment Phase.*

The objectives of the Scoping Phase are to:

- *Inform stakeholders of the proposed activity, feasible alternatives and the S&EIR process;*
- *Provide stakeholders with the opportunity to participate effectively in the process and identify any issues and concerns associated with the proposed activity, review specialist study ToR and the Plan of Study for EIA; and*
- *Submit a Scoping Report to the relevant authorities (in this case, DEA and DWS).*

The objectives of the Impact Assessment Phase are to:

- *Inform and obtain contributions from stakeholders, including relevant authorities, the public and local communities and address their relevant issues and concerns;*
- *Build capacity amongst stakeholders during the S&EIR process so that they may actively and meaningfully participate;*
- *Document and contextualise the biophysical baseline conditions of the study area and the socio-economic conditions of affected communities;*
- *Assess in detail the potential environmental and socio-economic impacts of the project;*
- *Identify environmental and social mitigation measures to avoid and/or address the impacts assessed; and*
- *Develop and/or amend environmental and social management plans based on the mitigation measures developed in the EIA Report and EMPr.*

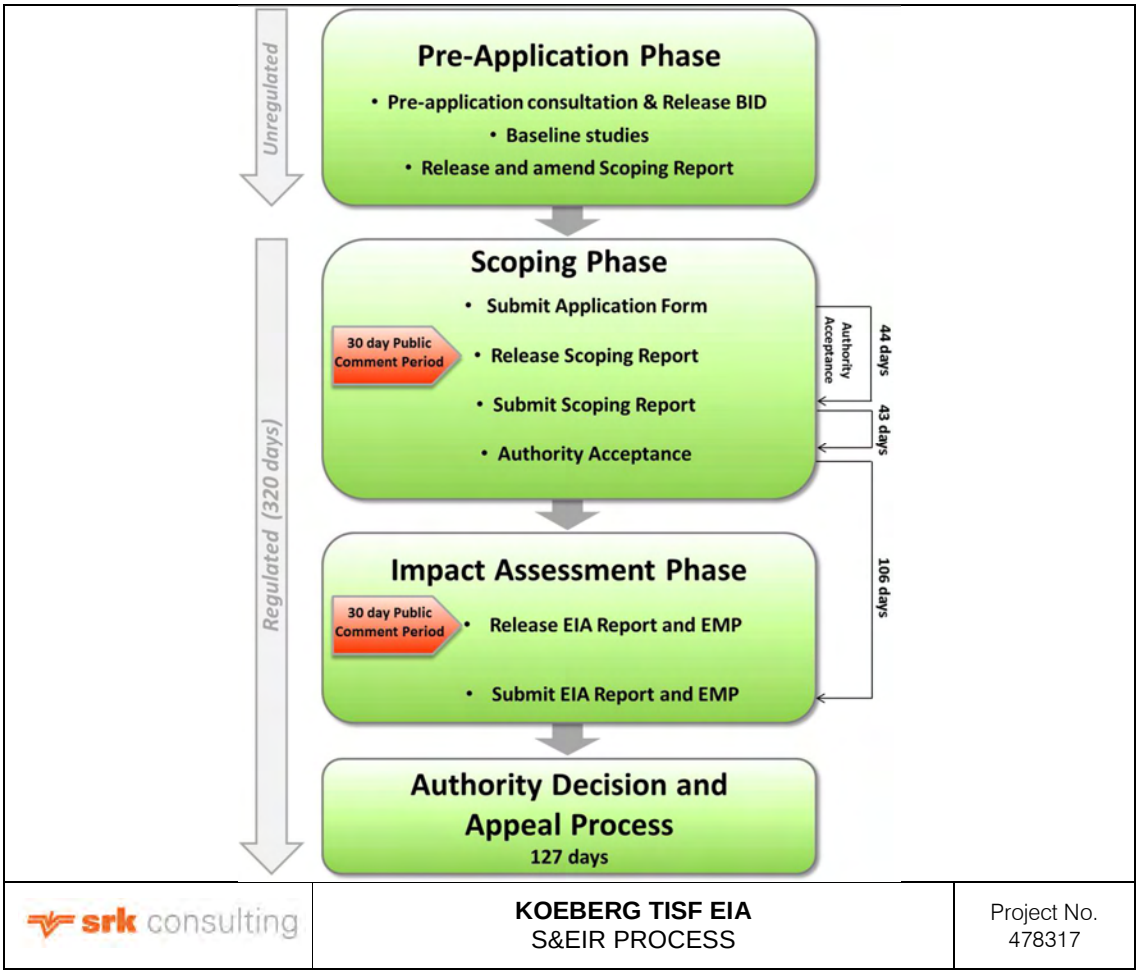


Figure 2-1: S&EIR Process

Further detail about activities undertaken or planned during the S&EIR process is presented in Section 4.1.7.

3 Project Description

3.1 Introduction

KNPS is the only nuclear power station on the African continent. Commencing operations in 1984, it has operated safely for over 31 years and has a further active lifespan of 30 – 40 years.

Eskom's KNPS has two nuclear reactor units (Reactor Unit 1 and Reactor Unit 2) each generating in excess of 900 MW (e). KNPS supplies approximately 6% of South Africa's total electricity needs and the majority of the requirements of the Western Cape (Eskom fact sheet: Koeberg Power Station). KNPS has produced more than 81 000 million kWh of electricity since 1984.

How is electricity generated by a nuclear power station?

A nuclear reactor is essentially a heat source. Heat is generated through the nuclear fission process, making use of uranium which is slightly enriched in the isotope uranium-235. Heat is transferred by the primary coolant (water at KNPS) to steam generators where water from a secondary loop is turned into steam. This steam drives a turbine which is connected to a generator, which uses the rotational energy to generate electricity (Eskom fact sheet: Koeberg Power Station).

Nuclear fuel in the reactor core consists of pellets of enriched uranium dioxide encased in about 4 m long metal tubes, called fuel rods. These fuel rods are bundled in an array to form fuel assemblies. Each reactor at KNPS uses approximately 157 assemblies over a period of approximately 1.5 years. KNPS refuels its reactors approximately every 18 months, at which stage approximately one third of the fuel is replaced with new fuel. On average, fuel stays in the reactor for three cycles (i.e. 5 years).

Nuclear waste *is classified as low, intermediate or high level waste. Vaalputs, situated approximately 600 km north of Cape Town, is the national nuclear waste disposal site for low and intermediate level waste. (Eskom fact sheet: Nuclear Waste). There is currently no national nuclear waste disposal site for high level waste.*

Used fuel is nuclear fuel that has been used in the fission process to the point where it is no longer useful in sustaining a nuclear reaction. KNPS generates approximately 32 tons of used fuel each year i.e. 1 280 tons over a 40-year lifetime. At KNPS, the volume of used fuel generated is small by industrial standards and is stored safely so that it does not constitute a health risk to surrounding communities.

At KNPS, used fuel assemblies are stored under water in storage racks in Spent Fuel Pools (SFPs). Each reactor has a dedicated SFP which can hold approximately 1 500 assemblies. Water cools the used fuel assemblies and serves as an effective shield to protect workers from radiation in the fuel storage building. A limited number of used fuel assemblies are also stored in the Cask Storage Building (CSB) at KNPS in 4 dry storage casks.

The ***Centralised Interim Storage Facility*** *is a proposed central storage facility for used nuclear fuel and waste, to be established by the National Radioactive Waste Disposal Institute.*

The used fuel will ultimately either be sent to a reprocessing facility when uranium and plutonium extraction becomes economically viable, or it will be disposed of at an approved repository or the long-term off-site storage facility, such as the proposed CISF.

What is Radiation?

Radiation is the process whereby certain atoms emit energy in the form of electromagnetic waves or particles in order to become more stable. Radiation that can produce charged particles ("ions") in both inanimate and living matter can present a health hazard. There are various types of ionising radiation: alpha, beta, neutron and gamma radiation. Alpha radiation is unable to penetrate clothing or skin but can penetrate eyes and open wounds or alpha-emitting substances can be taken into the body by inhalation or with food/water. Beta radiation can pass through 1-2 cm of water or human flesh but a sheet of aluminium a few millimetres thick can stop beta radiation. Neutron radiation occurs inside a nuclear reactor, but efficient shielding against neutrons can be provided by, for example, water. Gamma radiation can pass through the human body but would be almost completely absorbed by one metre of concrete.

Radiation from used fuel assemblies starts decreasing immediately after the fission reaction has stopped and will have decreased by more than 95% within approximately 10 years. (Eskom fact sheet: Radiation).

3.2 Proponent's Project Motivation

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.

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. Additional storage capacity will be required to accommodate any further used fuel generated at KNPS. Eskom consequently developed the *Koeberg Spent Fuel Storage Project* strategy to cater for KNPS' needs until 2025 and comprises three phases described below:

- ***Phase 1:***
  - *Phase 1A*: Procurement of seven dry storage metal casks to ensure the Koeberg Reactor Units can operate beyond 2018, without exceeding SFP capacity. A number of used fuel assemblies will be transferred from the SFPs into the new dry storage casks. These casks will be stored with the four existing dry storage casks in the on-site CSB.
  - *Phase 1B*: Procurement and placement of spent fuel inserts to gain back the currently unoccupied storage cells in the SFPs due to a checker-boarding arrangement. This will open up previously unusable storage cells in the

***Dry cask storage** is a method of storing used fuel that has already been cooled in the SFP. Casks are typically concrete or steel cylinders which are either welded or bolted closed to provide leak-tight containment of the used fuel. The used fuel assemblies within the casks are surrounded by inert gas and each cylinder is surrounded by additional steel, concrete, or other material to provide radiation shielding to workers and members of the public (www.wikipedia.org).*

SFPs, allowing for an increase in the total number of used fuel assemblies that can be stored in the SFPs.

- ***Phase 2:*** Procurement of approximately 30 - 40 additional dry storage casks to allow ongoing operation of KNPS until 2025.
- ***Phase 3:*** Establishment of the TISF for the storage of the casks procured in Phase 2.

Used fuel assemblies generated beyond 2025 will also be stored in casks at the TISF should the CISF not be available.

The TISF will comprise of concrete pad(s) within a site footprint of approximately 12 800 m^2 (1.28 ha) and will be designed to accommodate storage of not more than 160 casks, for used nuclear fuel generated at KNPS up to the end of operational life of the plant.

It is an objective of Phase 3 to commence construction of the TISF by 2018 for the storage of the above-mentioned casks. It is anticipated that the TISF will be operated under the existing KNPS NNR license in terms of the NNRA.

The facility may be established in a modular manner, depending on the availability of a CISF which is proposed for implementation by 2025. However, due to the uncertainty around the development of the CISF, the TISF may be required through to the end of the expected operational life of KNPS.

It is important to note that the strategy above assumes the CISF is unavailable for use before 2025.

3.3 Description of the Project Area

3.3.1 Site Description

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 (previously consisting of Farm Duynefontyn No. 34 and Farm No. 1375 which were consolidated by the City of Cape Town in 2015). Access to KNPS is via the R27 which runs along the property's eastern boundary or alternatively via Otto du Plessis Drive (Figure 3-1).

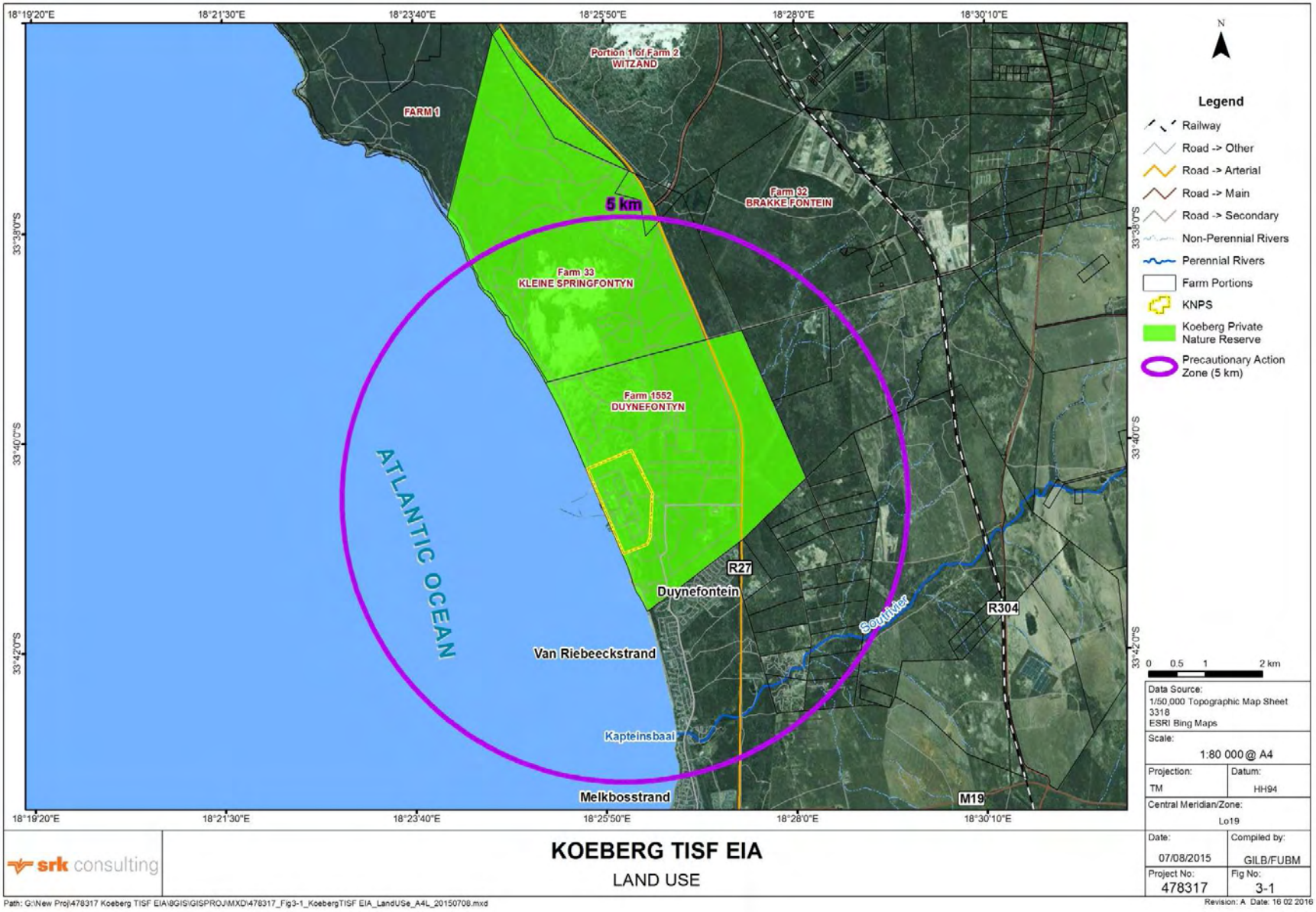
Cape Farm Duynefontyn No. 1552 (Table 3-1) is owned by Eskom and measures approximately 1 294 ha and is zoned for *Risk Industry* and *Agricultural*.

Table 3-1: Property details

Farm Name/ Erf Number	Cape Farm Duynefontyn No. 1552
SG 21 Digit Code	C01600000000155200000
Physical Address	Koeberg Operating Unit, Trunk Road R27, Off West Coast Road, Melkbosstrand, Western Cape

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.


18°19'20"E
18°21'30"E
18°23'40"E
18°25'50"E
18°28'0"E
18°30'10"E
33°38'0"S
33°40'0"S
33°42'0"S
N
Portion 1 of Farm 2
WITZAND
FARM 1
Farm 32
BRAKKE FONTEIN
5 km
Farm 33
KLEINE SPRINGFONTYN
Farm 1552
DUYNEFONTYN
ATLANTIC OCEAN
R27
Duynefontein
R304
Sout kuil
Van Riebeeckstrand
Kapteinsbaal
Melkbosstrand
M19
Legend
Railway
Road -> Other
Road -> Arterial
Road -> Main
Road -> Secondary
Non-Perennial Rivers
Perennial Rivers
Farm Portions
KNPS
Koeberg Private Nature Reserve
Precautionary Action Zone (5 km)
0 0.5 1 2 km
Data Source:
1/50,000 Topographic Map Sheet 3318
ESRI Bing Maps
Scale:
1:80 000 @ A4
Projection:
TM
Datum:
HH94
Central Meridian/Zone:
Lo19
Date:
07/08/2015
Compiled by:
GILB/FUBM
Project No:
478317
Fig No:
3-1
srk consulting
KOEBERG TISF EIA
LAND USE
Path: G:\New Proj\478317 Koeberg TISF EIA\8GIS\GISPROJ\MXD\478317_Fig3-1_KoebergTISF EIA_LandUSe_A4L_20150708.mxd
Revision: A Date: 16 02 2016

The TISF will be located within the Security Protected Area (SPA) of KNPS (Figure 3-3), a flat area disturbed by previous construction activities and by current operational activities at KNPS

*The **Security Protected Area** is a restricted area surrounding the reactor units to which only authorised personnel have access. The SPA is distinct from the protected area status of Koeberg Nature Reserve in terms of the NEM:PAA.*

3.3.2 Surrounding Land Use

There are a variety of land uses surrounding KNPS including the Duynefontein residential area to the south (~ 1.4 km from KNPS), the Koeberg Nature Reserve to the north, south and east, and the R27 along the property's eastern boundary (~ 1.8 km from KNPS) with agricultural activities further east (Figure 3-2).

KNPS is located within a predominantly natural environment, although there are existing built elements throughout the property including powerlines, office buildings, a visitors centre, weather station, roads and parking areas (Figure 3-2).

Koeberg Nature Reserve

The primary drive for proclaiming the Koeberg Nature Reserve (Figure 3-1) was to support the operation of KNPS while conserving the natural habitat as far as possible; providing a buffer around KNPS and maintaining land for future development.

The Koeberg Nature Reserve is surrounded by a private nature reserve, *viz*. Witzands Aquifer Nature Reserve (northeast), the R27 West Coast Road (east), the Duynefontein residential area (south) and the Atlantic Ocean (west). The area incorporates a number of environments which include small wetlands, coastal dune fields, strandveld dune vegetation, sand plain fynbos as well as areas infested with alien vegetation.

KNPS Emergency Planning Zones

There are three emergency planning zones around KNPS: KNPS **Precautionary Action Zone (PAZ)** (area within a 5 km radius of KNPS) (Figure 3-1) and the **Urgent Protective Action Zone (UPZ)** (area within a 16 km radius of KNPS). All development within these emergency planning zones must comply with the relevant development controls (see Section 2.2.7) to ensure the integrity of the Koeberg Nuclear Emergency Plan. The **Long Term Protective Action Zone (LPZ)**, within a radius of 80 km of KNPS has no specific development restrictions but preparations have been made for emergency procedures in this zone.

KNPS from Duynefontein beach

Ridgeline of the primary dune with Duynefontein in the background

Land use east of KNPS with the R27 in the background

Agricultural land east of the R27 (foreground), Duynefontein left of photo and KNPS right of photo

Duynefontein right of photo and KNPS property left of photo

Existing structures in the landscape including administration buildings, radio/cell masts and KNPS

srk consulting	**KOEBERG TISF EIA** SITE DESCRIPTION AND LAND USES	Project No. 478317

Figure 3-2: Site description and land uses

Source: SRK, 2015

3.4 Project Alternatives

Appendix 2 Section 2 (h)(i) of the EIA Regulations, 2014, require that all S&EIR processes must identify and describe 'alternatives to the proposed activity that are feasible and reasonable'. Different types or categories of alternatives can be identified, e.g. location alternatives, type of activity, design or layout alternatives, technology alternatives and operational alternatives. The 'No Go' or 'No Project' alternative must also be considered.

Not all categories of alternatives are applicable to all projects. However, the consideration of alternatives is inherent in the detailed design and the identification of mitigation measures, and therefore, although not specifically assessed, alternatives have been and will be taken into account in the design and S&EIR processes.

3.4.1 Location Alternatives

Six location alternatives on the Koeberg property were identified and considered during the early feasibility phase of the project, and evaluated by Eskom in an informal matrix. These included (see Figure 3-3):

- Conservation Area Site;
- Old Car Park Site;
- Dog Kennels Site;
- Old KTC Site;
- CSB Site; and
- Ekhaya Site.

The feasibility of the location alternatives was evaluated against the following key criteria:

- **Security and safeguards**: the need for adequately controlled land with on-site security staff and procedures;
- **Radiation protection**: aiming to reduce radiation exposure to as low as reasonably achievable, and avoid, reduce or eliminate any adverse effects on the environment, the public and workers at the facility due to storage activities during the storage timeframe;
- **Environmental impact and human factors**: aiming to develop the TISF on disturbed land, with minimal impact on terrestrial ecology, and aiming to preserve groundwater and air quality. Human factors considered included human activities, cultural and historical land uses, heritage resources, political, socio-economic and aesthetic acceptability;
- **Site characteristics**: compatibility of the site with the construction and operation of the TISF without major constraints e.g. geological faults, floodplains, habitats for endangered species or exploitable mineral or energy resources;
- **Land size**: adequate land to accommodate storage facilities, infrastructure and heavy vehicle movement;
- **Protection of used nuclear fuel**: protection of the TISF against external threats and hazards including natural phenomena (e.g. earthquakes, potential tsunamis, ground stability, floods etc.) and man-made hazards (e.g. aircraft crashes and chemical explosions);
- **Accessibility of the site**: including availability of routes and modes of transport allowing for the stored fuel to be moved off-site in the long term; and
- **Cost and development time**: offering opportunities for cost effective design of the required infrastructure including radiation protection and security requirements.


18°24'40"E
18°25'8"E
18°25'36"E
18°26'4"E
18°26'32"E
18°27'0"E
33°39'56"S
33°40'24"S
33°40'52"S
33°41'20"S
N
Conservation Site
Alternative 1 (CSB)
ACP2
ACP1
Old Car Park Site
Alternative 2 (Ekhaya)
Dog Kennel Site
Old KTC Site
Legend
Access Control Points
Road -> Other
TISF Selected Location Alternatives
TISF Location Alternatives
Security Protected Area
0 100 200 400 m
Data Source:
1/50,000 Topographic Map Sheet 3318
ESRI Bing Maps
Scale:
1:18 000 @ A4
Projection:
TM
Datum:
HH94
Central Meridian/Zone:
Lo19
srk consulting
KOEBERG TISF EIA
LOCATION ALTERNATIVES CONSIDERED IN THE FEASIBILITY PHASE
Date:
04/08/2015
Compiled by:
GILB/FUBM
Project No:
478317
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3-3
Path: G:\New Proj\478317 Koeberg TISF EIA\8GIS\GISPROJ\MXD\478317_Fig3-3_KoebergTISF EIA_LocationAlternatives_A4L_20150804.mxd
Revision: A Date: 16 02 2016

The site selection process eliminated four sites and identified two viable site locations for the TISF i.e. the CSB site - the preferred alternative (Alternative 1) - and the Ekhaya site (Alternative 2) (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.

Key characteristics of the two sites that were selected as alternatives are that they are:

- Not situated in geological fault areas, or wetlands;
- Not situated in areas with industries presenting high physical risks;
- In areas meeting the national key point security requirements;
- In areas with existing radiological control infrastructure;
- Vacant unused land within KNPS, zoned as Risk Industry; and
- Situated on KNPS site[7].

Alternative 1 is Eskom's preferred alternative for the following reasons:

- It is situated adjacent to an existing radiological zone (low level waste facility);
- It is located within a more ecologically disturbed area compared to Alternative 2; and
- Less extensive haul road upgrades will be required than for Alternative 2.

3.4.2 The No Go Alternative

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 proposed TISF will not be built.

3.5 Project Construction and Infrastructure

3.5.1 The TISF

The TISF will be constructed on a portion of vacant land within KNPS (SPA). The TISF will comprise of concrete pad(s) within a site footprint of approximately 12 800m^2. The TISF will be constructed to accommodate 160 dry storage casks, though the dry storage casks will be placed on the pad in a modular manner.

The dry storage casks will be either metal or concrete casks (see Figure 3-4) or concrete assemblies and will be approximately 6 m in length and 3 m in width or diameter. Each cask can hold up to 37 assemblies depending on the cask design. The dry storage casks are robust and can withstand significant external impact forces such as an aircraft crash.

The design of the concrete pad(s) of the TISF lends itself to various types of dry storage casking systems. The TISF will also have an auxiliary building to house ancillary equipment.

The TISF will meet the requirements of the NNR and will be built and managed in accordance with the IAEA safety standards.

3.5.2 Perimeter Fence and Security

A secure perimeter fence of approximately 2.3 m in height will be erected around the TISF site with controlled security access. The perimeter fence will be a clear view fence with concrete plinths for supporting poles.

[7] The identified sites do not include any off-site alternatives.

srk consulting	**KOEBERG TISF EIA** EXAMPLE OF A TISF	Project No. 478317

Figure 3-4: Examples of TISFs
Source (top figure): http://gttsi.com/wp-content/uploads/2015/01/DryCaskStorage.jpg
Source (bottom figure): http://berniesteam.com/wp-content/uploads/2012/12/DSC02774.jpg
Note: These images are provided as examples and are not intended to indicate the selected technology.

3.5.3 Access Roads

No new roads will be constructed. The existing KNPS internal road network will be used to transfer casks from the SFP to the TISF. A portion of existing gravel road, approximately 20 m in length and approximately 6 m in width, will be resurfaced/tarred to connect the existing haul road at the entrance to Alternative 1 as indicated on Figure 3-5.

3.5.4 Construction Laydown Area

The construction laydown area will be located within the proposed TISF operational area to reduce the disturbance footprint. Temporary site offices and a parking area for construction vehicles and equipment will be located in this area.

3.5.5 Earthworks

Details of the earthworks (cut and fill) required are not yet available and will depend on site-specific conditions of the selected site alternative (once approved). Concrete piling may be required to comply with seismic requirements.

3.5.6 Stormwater Management

A conceptual stormwater management plan has been developed to ensure appropriate stormwater management during construction and operation of the TISF. The conceptual stormwater management plan, drafted in accordance with relevant CoCT guidelines, is attached as Appendix F.

3.5.7 Water Supply

Water usage (to be supplied by the CoCT Municipality) will be limited to the construction phase of the TISF only. Details of volumes of water required cannot be determined at this stage but are expected to be very low, since the main water use during construction would be for concrete production.

3.5.8 Power Supply

Power required for construction activities will be sourced from the existing KNPS site.

3.5.9 Ablution Facilities

Labour will make use of existing ablution facilities and no temporary ablution facilities are proposed.

3.5.10 Waste Management

Waste produced during the construction phase will be typical construction rubble (rock, sand, soil, asphalt and concrete), general waste, dirty / used oil and grease, polluted material and soil and polluted water. Waste management during construction will be the responsibility of the contractor.

All construction waste will be removed from work areas and disposed of at approved and licensed waste disposal facilities. Where possible, options for the reuse or recycling of waste materials will be favoured over disposal.

General waste and waste classified as hazardous (as per Category A, Section 15 of Schedule 3 of the National Environmental Management: Waste Act, 2008) will be separated on site and stored temporarily before being transported to a licenced disposal facility.

3.5.11 Air Quality Management

Sources of emissions during the construction phase will include dust generated by the movement of construction vehicles on cleared areas, drilling and blasting (where required) and bulk earthworks (where required) as well as exhaust emissions from construction vehicles and diesel generators.

Emissions during the construction phase of the project will be limited as far as possible through stabilisation and watering of any exposed/cleared areas where dust becomes problematic. Construction vehicles and generators will be maintained in good working order to minimise emissions.

3.5.12 Noise and Vibration Management

Sources of noise and vibration during construction include construction vehicles and generators, as well as drilling, piling and blasting where required. Nuisance impacts of noise, particularly closer to Duynefontein will need to be managed.

3.5.13 Construction Traffic

The construction haul routes will use the existing KNPS internal road network. Construction traffic will include large vehicles / trucks for material delivery. The access of passenger vehicles (for construction workers) will be in accordance with KNPS security procedures within ACP 2. The number of construction vehicle trips per day is unknown at this stage.

The equipment expected during the construction phase is shown in Table 3-2. This equipment would be delivered to the site (via truck, where required) and will remain on the site for the duration of the construction phase.

Table 3-2: Anticipated construction equipment

Equipment	Quantity
Mobile crane	2
Earth moving vehicle	1
Front end loader	2
Dump trucks	3
Pump trucks/batching plant	2
Site vehicle	2

Casks will be transported to the site by road on trucks, and would be classified as abnormal loads, requiring relevant abnormal load permits.

3.5.14 Workforce

It is estimated that the construction of the TISF could create 40 direct temporary jobs. Unskilled labour will be sourced from the surrounding communities. Workers will be trained to comply with the Eskom Safety, Health, Environmental and Quality (SHEQ) Policy.

3.5.15 Investment

The proposed establishment of the TISF will require an investment of approximately R 150 Million by Eskom.

3.5.16 Construction Schedule

It is anticipated that construction of the TISF will commence in 2018 and will take approximately 12 months.

Construction activities are expected to occur during normal working hours of 07h30 to 16h35 and will largely be limited to Mondays to Fridays. Construction activities will only be allowed outside these times where unavoidable, subject to the contractor successfully motivating for an extension in working hours.

3.6 Project Operations

3.6.1 Transfer and Storage of Used Fuel

The TISF will accommodate the storage of dry storage casks established in a modular manner as and when required. The 30 - 40 casks procured in Phase 2 of the Koeberg Spent Fuel Storage Project will be progressively placed on the concrete pad(s) once each phase of the TISF construction is complete (this may extend beyond Phase 2 if required).

The dry storage casks will accommodate used fuel assemblies removed from the reactor units and cooled in the SFPs. The dry storage system is a passive system which is not reliant on human action or active components to maintain a suitable safety level. Heat generated from used fuel radioactive decay will dissipate through the external surface of the dry casks.

The dry storage casks will be transferred from the SFP to the TISF on a vehicle specifically designed for this purpose. The sequence of loading one dry storage cask in the SFP and transferring the cask to the TISF will take approximately 10 working days.

3.6.2 Transfer Routes

The dry storage casks will be transferred from the SFP to the TISF on the existing Koeberg internal road network (Figure 3-5).

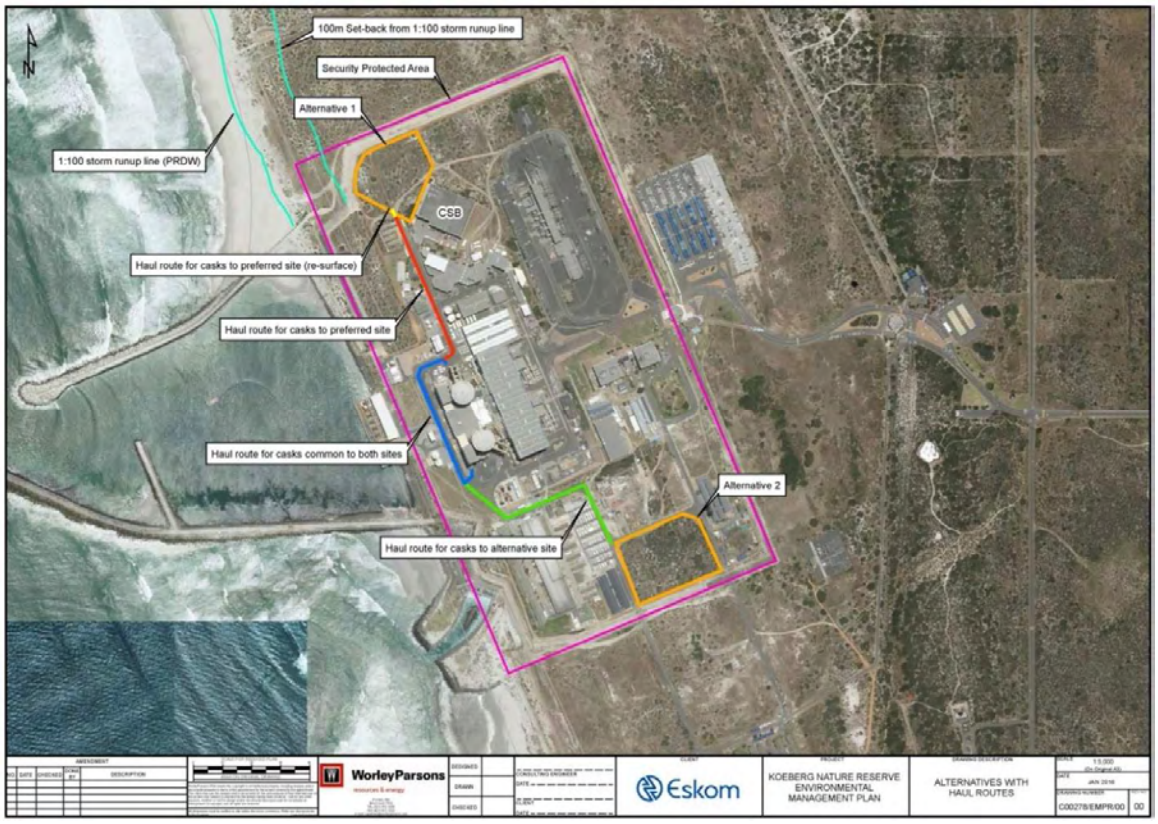


Figure 3-5: Transfer routes from the SFP to the TISF (Alternative 1 and 2)
Source: Eskom, 2016

3.6.3 Workforce

No additional job opportunities will be created during the operational phase as existing Eskom employees will be utilised.

3.6.4 Radiation Management and Monitoring

The current safety case at KNPS references dry storage casks as Type B(U) packages which are governed by IAEA Safety Standards that includes the implementation of shielding structures. The storage and surveillance of the casks are also performed in accordance with KNPS Radiation protection (RP) standard GGS 238-36, in order to ensure that the As Low As Reasonably Achievable (ALARA) principle for minimizing radiation exposure, is adhered to. The transportation of casks will be governed by the IAEA Transport Regulations. The edition of the Transport Regulations approved by the NNR at the time of the establishment of the TISF shall be applied.

Mandatory radiation control and monitoring measures are already in place in and around KNPS and will be amended as required to incorporate the TISF. Details regarding Eskom's Radiation Monitoring Plan are provided in the EMPr and include:

- **Worker dose monitoring** to measure the radiation accrued by personnel authorised to enter the TISF security area;
- **TISF dose rate area monitoring** to monitoring radiation within the general TISF area on an ongoing basis;
- **TISF contamination monitoring** through radiological monitoring of runoff water; and
- **Public boundary dose monitoring** which included direct radiation monitoring in three roughly concentric zones around KNPS:
    - the inner perimeter fence: 0,6 km to 1 km;
    - the public exclusion boundary: 1,5 km to 2,9 km; and
    - rural areas: 3,3 km to 10,5 km from Koeberg.

3.6.5 Emergency Response

Eskom has a comprehensive Emergency Response Plan (ERP) for KNPS, incorporating multiple procedures and interfaces with local authorities and international entities. The purpose of emergency response planning is to identify potential emergency situations and associated impacts and to define and document appropriate responses. The ERP is well documented and exercised/simulated regularly under the guidance of the NNR.

The introduction of the TISF project requires an update to the existing KNPS ERP. The ERP will address various types of emergency situations including security situations, human error and environmental disasters.

3.6.6 Stormwater Management

A conceptual stormwater management plan has been developed for the TISF (Appendix F). The plan will inform the detailed design of the stormwater system for the TISF once EA has been received and the final site for the TISF determined.

Stormwater will be diverted into the existing KNPS stormwater management system, which was designed with spare capacity and which Eskom has indicated will be able to accommodate additional stormwater volumes generated by the TISF. Suitably sized stormwater attenuation facilities will be developed, if required, within the site boundary footprint.

3.6.7 Water Supply

No water will be required for the operation of the TISF.

3.6.8 Power Supply

During operation of the TISF, power will be required for lighting, security and access control as well as equipment handling and will be sourced from the existing KNPS site.

3.6.9 Waste Management

No waste will be generated at the TISF during operations, as the TISF is only a storage facility.

3.6.10 Operational Procedures

Eskom has implemented a number of environmental management procedures to prevent the uncontrolled release of pollutants (solid, liquid and gaseous) into the environment, which will continue to be applied during the operational phase. These procedures are implemented by Eskom and its contractors.

3.6.11 SHEQ Policy

Eskom has adopted a SHEQ Policy, which is implemented and enforced on all Eskom sites (including KNPS). This policy ensures that SHEQ is an integral part of all operations at KNPS and that no operating condition, or urgency of service, justifies exposing anyone to negative risks, causing an incident or damage to the environment.

3.6.12 Environmental Awareness

Eskom has an effective environmental awareness communication programme (Public Safety Information Forum) in place for KNPS, which ensures that the surrounding community is well informed of existing operations and future development projects at KNPS. This system will be used to keep the surrounding community informed during the operation of the TISF.

3.7 Project Decommissioning

The TISF will be decommissioned in accordance with the approved KNPS decommissioning plan.

3.8 Environmental Factors Influencing Project Design

In addition to the potential impact of the proposed project on the surrounding environment, there are a number of environmental factors which could affect the project, and have thus been taken into consideration during the planning and design of the project. Key environmental factors which could influence the project include:

- Climate change and associated sea-level rise; and
- Geological and founding conditions.

These factors were considered during the early feasibility and design stages of the project. Eskom conducted a study to evaluate the feasibility of location alternatives against key criteria (Section 3.5.1) including the protection of the TISF against external environmental threats and hazards (e.g. earthquakes, potential tsunamis, ground stability, floods etc.) and man-made hazards.

Climate change is expected to raise sea level by approximately 1 m over the next century. The TISF will be located at least 150 m from the HWM (Figure 3-5) and inland of a dune system which provides a natural buffer to sea-level rise and potential storm surges/tsunamis.

The alternative sites for the TISF are both located in KNPS SPA, for which the geological and related hazard conditions are well understood. The TISF will be constructed to withstand the maximum expected earthquake magnitude of the area

4 Description of the Affected Environment

The following chapter presents an overview of the biophysical and socio-economic environment in which the proposed project is located, to:

- Understand the general sensitivity of and pressures on the affected environment;
- Inform the identification of potential issues and impacts associated with the proposed project, which will be assessed during the Impact Assessment section; and
- Start conceptualising practical mitigation measures.

The region has previously been studied to some extent and is recorded in various sources. Consequently, some components of the baseline have been generated based on literature review. However, where appropriate, baseline information has been supplemented or generated by specialists appointed to undertake baseline and impact assessments for the proposed Project.

Where site specific information is not available, information is reported on a regional scale, generally the CoCT municipal area.

The specialist baseline and impact studies undertaken for the EIA process are listed in Table 4-1.

Table 4-1: Specialist baseline studies undertaken for the EIA

Specialist Study	Specialists	Organisation
Geohydrology Impact Assessment (Appendix G)	Mr. Des Visser	SRK
Terrestrial Ecology Impact Assessment (Appendix H)	Ms. Louise Zdanow Mr. Stephen van Staden	Scientific Aquatic Services cc (SAS)
Socio-Economic Impact Assessment	Mr. Matthew Law	SRK
Human Health Impact Assessment (Appendix I)	Dr. Willie van Niekerk Dr. Marlene Fourie	Infotox (Pty) Ltd
Heritage Assessment (Appendix J)	Mr. Tim Hart	ACO Associates cc
Visual Impact Assessment	Mr. Scott Masson	SRK

Final specialist baseline and impact assessment reports are attached as Appendices G to J. The Socio-economic and Visual Assessments were not presented as stand-alone specialist reports and the relevant information has been incorporated directly into this EIA Report.

4.1 Biophysical Environment

4.1.1 Topography

The topography of KNPS site is relatively flat with a gentle slope towards the coast. The coastal strip is characterised by a sandy shoreline and a large dunefield (consisting of ancient dunes stabilised by vegetation, and more recent unconsolidated dunes) extending northward from KNPS. From the coastline moving inland, the topography rises gently to a dominant north-south ridgeline of a vegetated primary dune approximately 900 m inland, with an elevation of approximately 35 m above mean sea level (msl). A coastal plain extends east beyond this landform.

The topographical landscape of KNPS, located on the southern extent of the dunefield, has been significantly modified by previous construction activities. KNPS site is relatively flat, varying in elevation from 5 m above msl near the coast to approximately 20 m above msl along the eastern boundary.

Both alternative sites currently under investigation for the placement of the TISF are relatively flat but Alternative 1 has a more pronounced, albeit gentle, slope towards the coast.

4.1.2 Geology

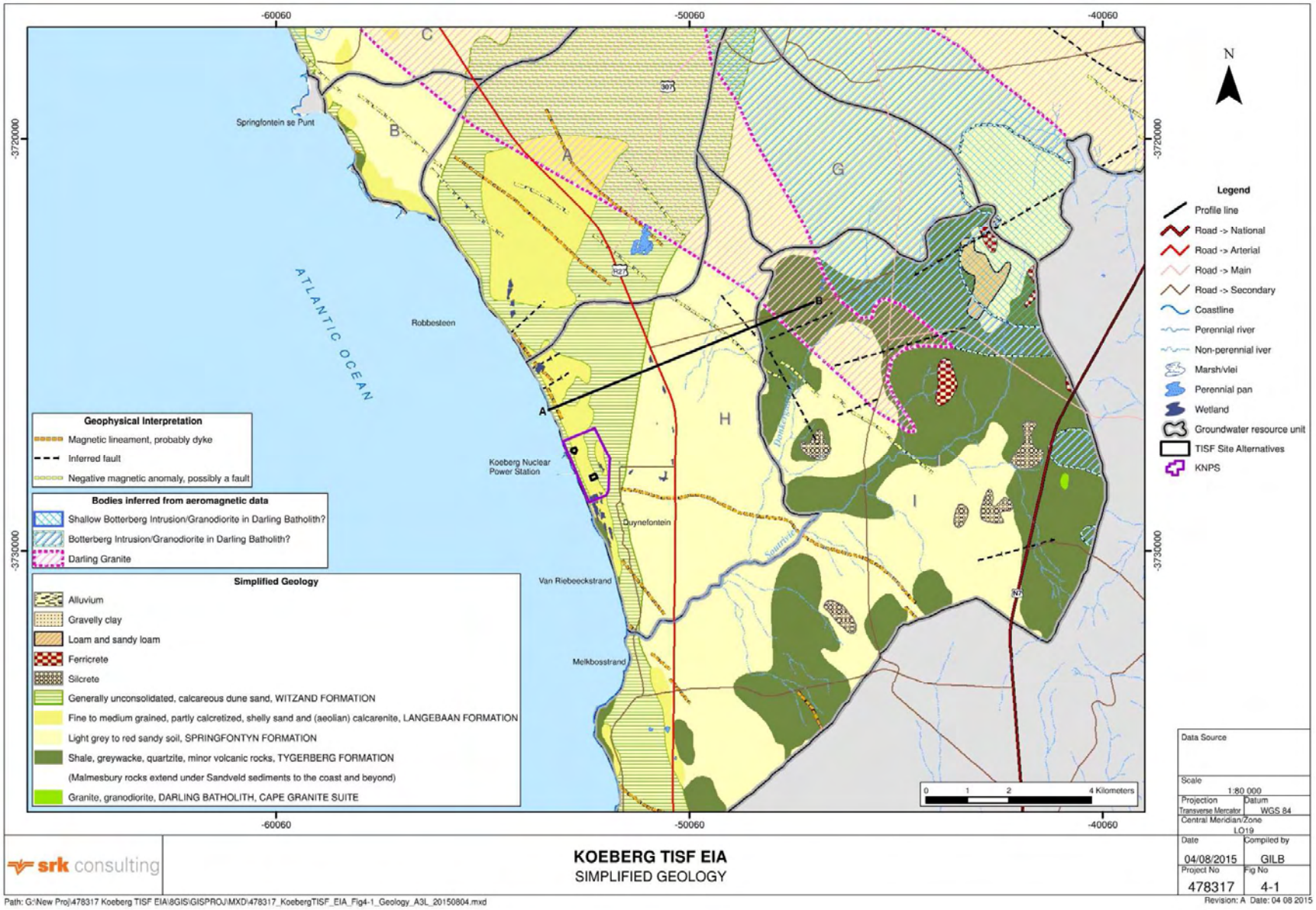
The unconsolidated to semi-consolidated sediments underlying KNPS site belong to the Sandveld Group, which is subdivided into the Elandsfontyn, Varswater, Velddrif, Langebaan, Springfontyn and Witzand formations. The lithostratigraphy of the Sandveld Group is summarised in Table 4-2 and the surface geology is shown in Figure 4-1. The sediment thickness varies considerably and reaches a maximum thickness of between 40 and 70 m (Dyke, 1992). Boreholes drilled at and around KNPS indicate a sediment thickness of approximately 22 m.

The sediments of the Sandveld Group are underlain by meta-sediments belonging to the Tygerberg Formation of the Malmesbury Group. The Tygerberg Formation consists mainly of alternating greyish, medium to fine grained greywacke and phyllitic shale. Where intruded by the Cape Granite Suite (not present on-site) and narrow dolerite dykes (present on-site), the sediments are baked to massive bluish-grey hornfels along their contacts. These dykes, as well as faults in the vicinity of the site, have been delineated by the Council for Geoscience. The bedrock at KNPS consists of a steeply dipping, interlaminated and bedded succession of greywacke, siltstone and mudstone, with occasional shale interbeds of the Malmesbury Group. Gradational sequences and contacts are characteristic and the beds grade mainly from coarse to fine grained in upward-fining successions. The degree and depth of weathering varies considerably across KNPS site. Unweathered greywacke is present within 6 m of the bedrock surface, while weathering of mudstone and siltstone extends to 26 m below ground level (mbgl) in some places. The bedrock is brecciated along fault zones, and is intensely jointed and often sheared along such fault planes. Quartz veins, pyrite and clay gouges are ubiquitous in the joints and faults, especially where the wall-rocks of the faults are brecciated.

Table 4-2: Summary of the Sandveld Group lithostratigraphy

Formation	Origin	Type	Description	Epoch	Age (Ma)
Witzand	Aeolian	SAND	Fine- to medium-grained, whitish grey to slightly reddish, calcareous, cross-stratified, dune snails, echinoid spicules, forams and comminuted sea shells	Holocene	0.01 to 0
Springfontyn	Aeolian	SAND	Fine- to medium-grained, quartzitic sand, muddy and peaty in places	Pleistocene to Holocene	1.8 to 0.01
Langebaan	Aeolian	CALCAREOUS SANDSTONE	Cross-bedded, fine- to medium-grained, with calcrete layers	Late Pliocene to Late Pleistocene	2 to 0.2
Velddrif	Shallow marine	GRAVEL and SAND	Shelly and pebbly, cross-bedding	Plio-Pleistocene to Late Pleistocene	1.8 to 0.2
Varswater	Estuarine / shallow-marine	SAND	Phosphatic, quartz-sand	Miocene to Pliocene	23 to 5
	Estuarine / shallow-marine	SAND	Non-phosphatic, carbonaceous clay and lignite lenses	Miocene to Pliocene	23 to 5
	Shallow-marine	GRAVEL	Pebbles and cobbles	Miocene to Pliocene	23 to 5
	Estuarine	SAND	Argillaceous (clayey sand / silt)	Middle Miocene	14
Elandsfontyn	Fluvial	SAND and GRAVEL	Angular clasts, carbonaceous clay and lignite lenses	Early to Middle Miocene	23 to 14

Source: after Johnson et al., 2006 in SRK, 2015a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ATLANTIC OCEAN
Robbesteen
Koeberg Nuclear Power Station
Duynefontein
Van Riebeeckstrand
Melkbosstrand
A
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Legend
Profile line
Road -> National
Road -> Arterial
Road -> Main
Road -> Secondary
Coastline
Perennial river
Non-perennial iver
Marsh/vlei
Perennial pan
Wetland
Groundwater resource unit
TISF Site Alternatives
KNPS
Geophysical Interpretation
Magnetic lineament, probably dyke
Inferred fault
Negative magnetic anomaly, possibly a fault
Bodies inferred from aeromagnetic data
Shallow Botterberg Intrusion/Granodiorite in Darling Batholith?
Botterberg Intrusion/Granodiorite in Darling Batholith?
Darling Granite
Simplified Geology
Alluvium
Gravelly clay
Loam and sandy loam
Ferricrete
Silcrete
Generally unconsolidated, calcareous dune sand, WITZAND FORMATION
Fine to medium grained, partly calcretized, shelly sand and (aeolian) calcarenite, LANGEBAAN FORMATION
Light grey to red sandy soil, SPRINGFONTYN FORMATION
Shale, greywacke, quartzite, minor volcanic rocks, TYGERBERG FORMATION
(Malmesbury rocks extend under Sandveld sediments to the coast and beyond)
Granite, granodiorite, DARLING BATHOLITH, CAPE GRANITE SUITE
0 1 2 4 Kilometers
Data Source
Scale 1:80 000
Projection Transverse Mercator
Datum WGS 84
Central Meridian/Zone LO19
Date 04/08/2015
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srk consulting
KOEBERG TISF EIA
SIMPLIFIED GEOLOGY
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4.1.3 Climate

The Western Cape has a semi-arid Mediterranean climate, which is strongly influenced by the cold Benguela Current and coastal winds. The Cape Town area is characterised by dry warm summer months (October to April) and wetter cool winter months (from May to September).

4.1.3.1 Rainfall

The average annual rainfall recorded at KNPS from 1980 to 2014 is 382 mm per annum (Table 4-3), whilst a maximum of 640 mm was recorded in 1987 and a minimum of 242 mm in 2000 (Figure 4-2). Maximum average rainfall occurs during June (*c*.70 mm), July (*c*.65 mm) and August (*c*.57 mm), while the lowest average rainfall occurs during January (*c*.10 mm) and February (*c*.8 mm). Maximum monthly rainfall measured during this period occurred during June 1994 (157.4 mm), July 2001 (162.4 mm) and August 2013 (160.7 mm).

Fog is a regular occurrence along the West Coast during the summer months and can drift as far as 3 km inland.

Table 4-3: Monthly rainfall data recorded at KNPS from 1980 to 2014

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	10.2	8.5	12.6	32.4	45.6	70.5	64.5	57.1	34.0	18.3	16.6	11.6	382.1
Minimum	0.0	0.0	0.0	2.8	1.3	12.0	22.8	12.8	2.5	0.6	0.4	0.3	242.4
Maximum	67.6	42.0	48.4	107.8	98.2	157.4	162.4	160.7	75.0	114.8	67.8	32.8	640.4
Median	5.5	5.5	7.2	29.0	38.9	68.5	57.3	54.2	30.0	13.4	13.0	8.6	365.0

Source: Eskom, 2014 in SRK, 2015

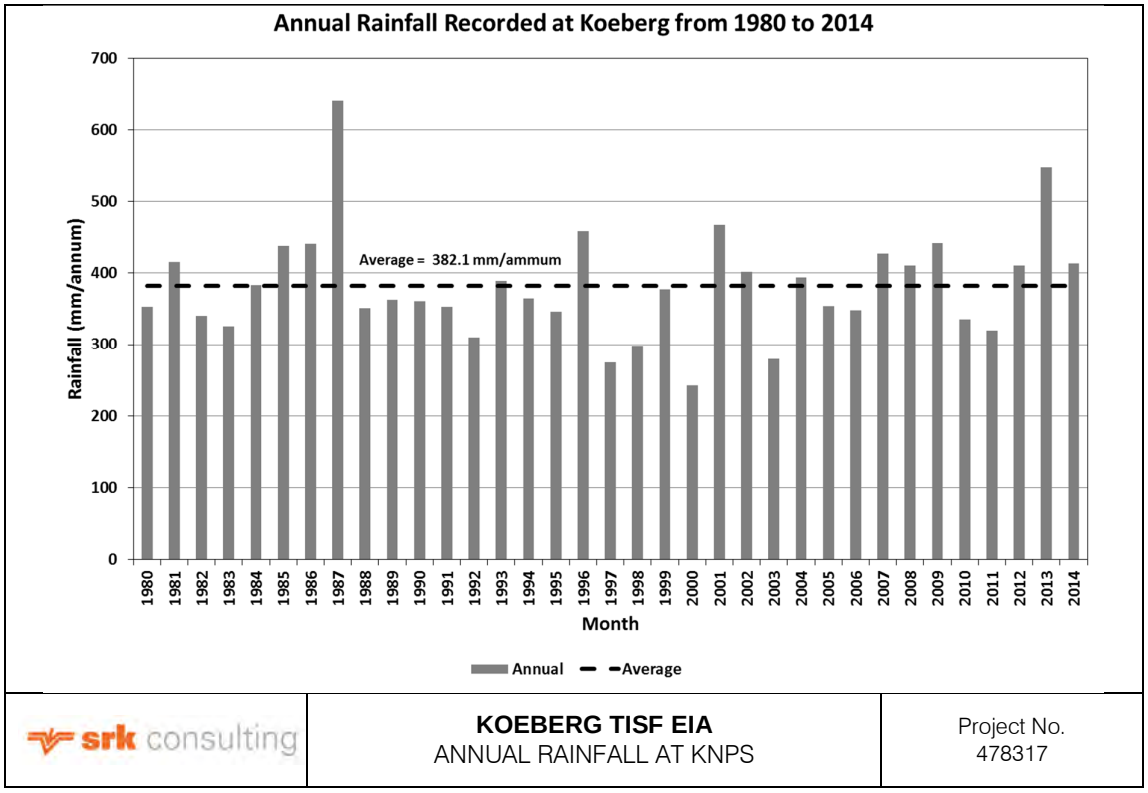


Figure 4-2: Variation in annual rainfall at KNPS

Source: SRK, 2015

4.1.3.2 Ambient Temperature

Summers are hot and dry with an average daily maximum temperature of 28 ºC in summer. Winter months are cold and wet with an average daily maximum temperature of 17°C. July is typically the coldest month and February the hottest month of the year.

4.1.3.3 Wind

The predominant wind in the area is from the south-west in summer, followed by winds from the north-east in winter. Summer wind speeds are generally higher than those during winter.

4.1.4 Air Quality

There are no significant sources of air pollution in the area. Farming activities generate limited emissions, mainly airborne particulates. It is therefore expected that air quality in the project area is good.

4.1.5 Noise

There are no significant sources of noise in the area, aside from noise propagated by vehicles travelling along the R27. Along the coast, noise generated by wave action is likely to result in higher than normal ambient noise levels, especially during rough sea conditions. The residents of Duynefontein are the closest sensitive noise receptors to KNPS.

4.1.6 Hydrology and Surface Water

KNPS falls within quaternary catchment G21B and in the Berg Water Management Area.

No watercourses flow through KNPS or the surrounding Koeberg Nature Reserve. The Sout River (and its tributary, the Donkergat River) and Diep River drain the broader area. These rivers all flow in a south-westerly direction towards the coast, but are generally ephemeral in nature. The mouth of the Sout River is at Melkbosstrand, approximately 3.8 km south of the Koeberg Nature Reserve.

The only area in the vicinity of KNPS where the terrain is sufficiently low-lying to support significant areas of wetland habitat occurs 1.5 km south of the site (SRK, 2014). The slack areas between a series of low lying east-west oriented dunes give rise to a mosaic system of alkaline dune-slack wetlands (Day, 2007a) (Figure 4-3). These dune wetlands are fed primarily by seasonal fluctuations in the water table, forming pools of shallow, brackish water during winter. These wetlands are dry in summer when the water table drops. The wetlands are considered of high local and regional importance, although their similarity to other wetlands north of KNPS has not yet been established (Day, 2007a). A few other seasonal wetlands occur in isolated areas to the north and east of KNPS (Figure 4-3).

In addition to the natural wetlands that occur within the nature reserve, the property also includes a number of artificial wetland areas, which are the product of activities associated with the construction of KNPS e.g. borrow pits (Figure 4-3). A series of coastal infiltration basins, which have been excavated between the dunes 3 km north of the site for disposal of wastewater are highly artificial habitats, comprising deep, permanent, open water bodies, vegetated by species that thrive under conditions of nutrient enrichment (Day, 2007a and Day, 2007b). The coastal infiltration basins are unnatural water features of low quality, but locally rare, permanent freshwater habitat, artificially contributing to plant and animal diversity in the area. They play an important role in terms of providing a hydraulic barrier for the protection of the Atlantis Aquifer from seawater intrusion (Day, 2007a).

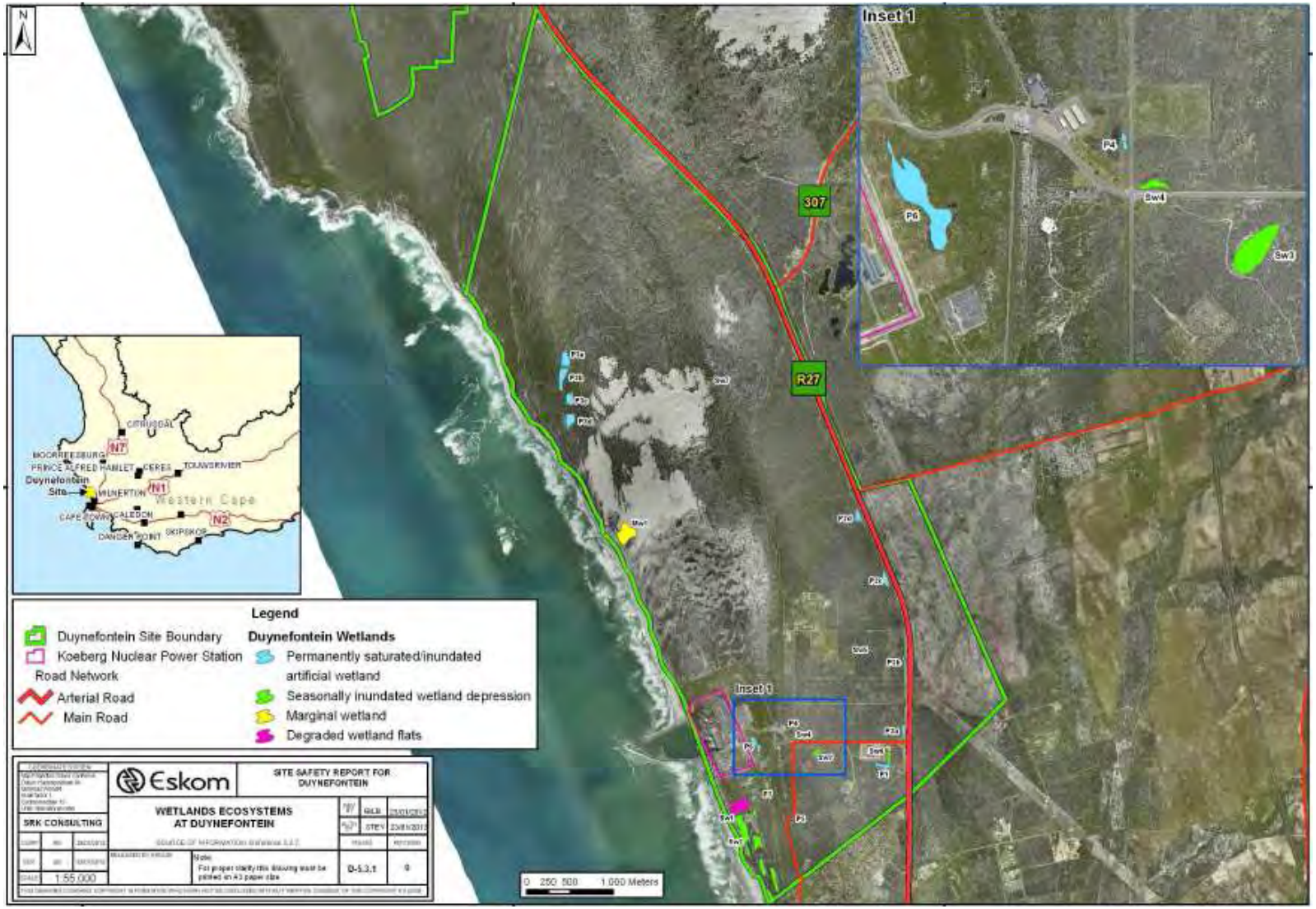


Figure 4-3: Wetlands occurring in the Koeberg Nature Reserve

Source: Koeberg Nature Reserve Management Authority, 2014

4.1.7 Hydrogeology

This section is based on the Geohydrology Assessment by SRK Consulting, 2015 (Appendix G).

KNPS falls within the Duynefontein Groundwater Resource Unit (GRU) which extends from the edge of the Atlantis industrial area southwards to the Sout River near Van Riebeeckstrand. The western and eastern boundaries of the GRU are formed by the coastline and outcrops of the Tygerberg Formation rocks, respectively. The GRU is predominantly covered by geologically younger sediments of the Witzand and Springfontyn formations.

4.1.7.1 Aquifer Types

Groundwater in and around KNPS occurs in two aquifers (Figure 4-4), namely:

- An upper unconfined primary (intergranular) aquifer locally known as the Atlantis Aquifer; which forms part of the more extensive Sandveld Aquifer, and
- A deeper semi-confined secondary fractured bedrock aquifer known as the Malmesbury Group Aquifer.

The Atlantis Aquifer is an important and significant primary aquifer with two wellfields (Witzand and Silwerstroom) situated >5 km north of KNPS supplying water to the surrounding towns (predominantly to Atlantis). Numerous boreholes exist around KNPS (Figure 4-4).

Only the upper Sandveld Aquifer is discussed in the subsections below as the deeper Malmesbury Group Aquifer will not be impacted by the project for the following reasons:

- The Malmesbury Aquifer is separated from the Sandveld Aquifer by a c.5 m thick clay layer. This clay layer forms a low permeable confining barrier to downward migration of any potential contaminants.
- The Malmesbury Aquifer is a confined aquifer with an upward flow gradient which prevents downward movement of potential contaminants from the upper unconfined Sandveld Aquifer into the Malmesbury Aquifer.

4.1.7.2 Depth to Groundwater

Seasonal rainfall variation does not significantly affect groundwater flow direction or groundwater levels at the site. The influence of tides may impact on temporal variations in groundwater levels. Based on previous observations, groundwater levels west of KNPS fluctuated by some 0.55 m during construction of the power units and by 0.70 m within the foundation area of the units (Dames and Moore, 1975a and Dames and Moore, 1975b).

Monitoring data for boreholes in close proximity to KNPS since 1985 show no indication of significantly declining water levels. It is, therefore, apparent that groundwater levels have not been negatively impacted by abstraction from the Witzand or Aquarius wellfields (SRK, 2014). Seasonal trends are evident, as is the temporary influence of pumping.

The water table ranges between 2 and 5 mbgl. The depth to groundwater inversely mimics surface topography i.e. the higher the topography, the deeper the water table. Seasonal and tidal impacts are the dominant factors influencing local groundwater level fluctuations.

The depth to water table at Alternative 1, based on previous measurements in the area, is expected to be between 3 and 4 mbgl. Water depths measured at boreholes close to Alternative 2 indicate the water depth varied between 2.28 and 3.31 mbgl (SRK, 2010).

It is predicted that global warming will cause a future increase in sea levels worldwide (SRK, 2014). Modelling of potential sea level rise at KNPS indicates a possible rise in sea level of about 1.2 m over the next 50 years (Bates *et al*, 2008). Groundwater levels at Alternative 1 could rise between 0.9 and 0.8 m and at Alternative 2 between 0.7 and 0.6 m, with effects (0.1 m) being propagated up to about 1 000 m inland (SRK, 2014).

4.1.7.3 Groundwater Flow

Using the available water level elevation data from the numerous boreholes around KNPS, a detailed site groundwater level contour map was compiled (Figure 4-5). These contours indicate the direction of groundwater flow to be from the interior, across KNPS in a south-westerly direction towards the coast, with discharge into the ocean. Groundwater flows under a relatively low gradient at a calculated flow rate of 2.6 m per day, which indicates a relatively quick migration across KNPS, towards the coastline.

4.1.7.4 Aquifer Recharge

Estimates of recharge (as a percentage of rainfall) in the vicinity of KNPS have previously been made by Bredenkamp and Vandoolaeghe (1982), Vandoolaeghe and Bertram (1982), Bertram et al., (1984), Fleisher (1990) and Fleisher and Eskes (1992). Average recharge was estimated to be between 10 and 30 % of mean annual precipitation (MAP). The recharge in the Duynefontein GRU was estimated to be 15 % of MAP (Woodford, 2007). Following a review of all available recharge estimates for this assessment, a site recharge figure of 15 % is considered to be representative.

Due to the unconfined nature of the upper sediments, recharge takes place over the entire area (Figure 4-6).

4.1.7.5 Borehole Yields and Groundwater Use

The Atlantis Aquifer is a highly productive aquifer with borehole yields of >10 L/s being obtained from production boreholes in the Witzand and Silwerstroom Wellfields, which are located >5 km north of KNPS (Figure 4-7). Borehole yields in the range of 0.5 to 5 L/s are common in the sands underlying KNPS (SRK, 2014).

The town of Atlantis has been largely dependent on groundwater for its water supply since 1976. Groundwater is abstracted from the aquifer at 40 boreholes in the Witzand and Silwerstroom Wellfields (Figure 4-7), softened at a water treatment plant and then distributed for domestic and industrial use (Flanagan and Parsons, 2005). Two basins situated in the dunes to the south-west of Atlantis, which serve as final retention ponds for intermediate quality stormwater and treated domestic wastewater, provide for the artificial recharge of the aquifer some 500 m up-gradient of the Witzand Wellfield (Wright and Parsons, 1994).

Based on data received from the CoCT, 2.6 Mm^3/a of groundwater was abstracted from the two wellfields in 2007, significantly less than what was estimated during previous years (SRK, 2014). The reduced yields and the reduced abstraction productivity of the two wellfields are a result of iron-related clogging. The CoCT is planning to rehabilitate and clean the boreholes to return borehole yields back to their initially determined sustainable yields (SRK, 2014). There are no visible signs of any negative impacts caused by groundwater abstraction from the Atlantis Aquifer, and the Silwerstroom spring is still flowing in spite of continued groundwater abstraction from the Silwerstroom Wellfield (Parsons, 1999). The discharge rate of the Silwerstroom spring was estimated to be 0.5 Mm^3/a during 1992 (Fleisher and Eskes, 1992). The Atlantis Aquifer is fully allocated and no further development or increased abstraction (other than rehabilitating the existing boreholes) will be allowed (Van der Berg et al., 2007).

Groundwater is used in the vicinity of KNPS as a source of water for smallholdings, brickmaking and sand mining (SRK, 2014). Groundwater is predominantly used for small-scale vegetable farming, water for horses and irrigation of commercial lawn. There are approximately 1 000 erven in Duynefontein, of which about 75 % have wellpoints installed for garden irrigation (SRK, 2014). An average of some 230 m^3 per annum of groundwater per erf is abstracted via wellpoints from the primary aquifer, assuming gardens are irrigated each day. This equates to 173 000 m^3 per annum of groundwater being abstracted from the area south of KNPS.

Some 30 000 m^3 per annum of groundwater is abstracted from four boreholes along the Aquarius Wellfield. The groundwater from these boreholes is currently used for stock watering and irrigation purposes, as well as to supply the dam at the conservation offices at KNPS. These boreholes were initially drilled to supply water to KNPS. However, as the groundwater is relatively saline, the use of these boreholes was temporarily abandoned as desalination by reverse osmosis was not cost-effective (Eskom, 2006a). It was previously estimated that 0.5 Mm^3/a of groundwater was abstracted from the Aquarius Wellfield (Parsons, 1999). The four boreholes were re-commissioned at the beginning of 2007.

Seventeen monitoring boreholes are situated around the reactors at KNPS. These boreholes are solely used for groundwater monitoring purposes, as are three piezometers installed in some of the wetlands on site.

4.1.7.6 Aquifer Classification and Vulnerability

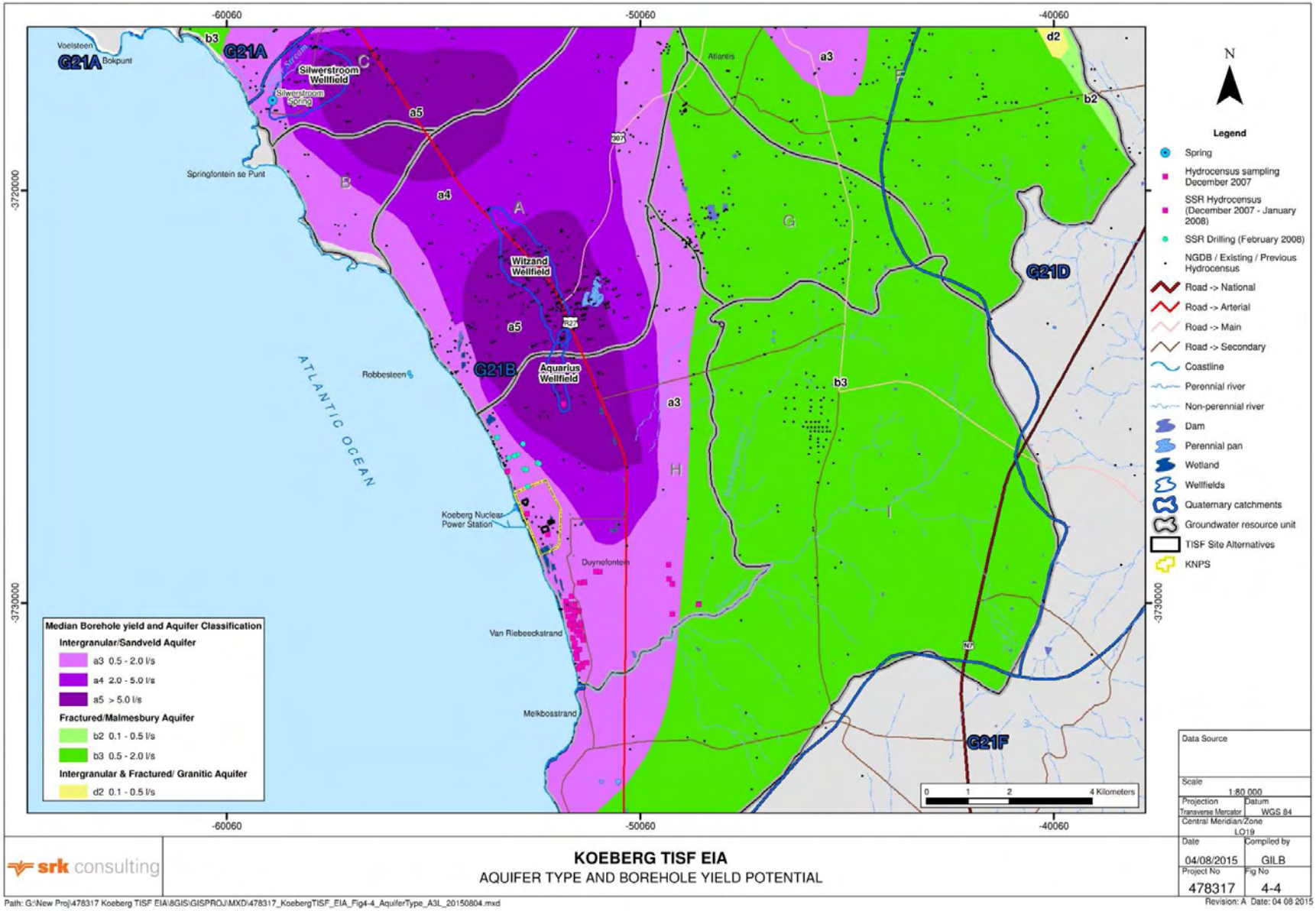
The Atlantis portion of the Sandveld Aquifer is classified as a Sole Source aquifer system (Parsons 1995 and Parsons and Conrad, 1998). Although smallholdings in the vicinity of the site are dependent on groundwater, a reticulated pipeline was installed in 2002. The primary aquifer system towards the east of the site is therefore classified as a Major Aquifer system with high vulnerability to anthropogenic impacts (Parsons and Flanagan, 2006). Its vulnerability is mainly due to its shallow unconfined water table and high permeability. The Sandveld Aquifer beneath KNPS similarly has a high vulnerability due to its shallow water table and high permeability.

4.1.7.7 Groundwater Quality

The groundwater of the Sandveld Aquifer was classified as Class A type (Electrical Conductivity [EC] <70 mS/m) (Vandoolaeghe and Bertram, 1982). The groundwater is generally of a sodium (Na) - chloride (Cl) type, but younger groundwater in the vicinity of the site shows a calcium (Ca) - bicarbonate (HCO_3) character (Parsons, 1999). Interpretation of groundwater quality data collected in the area confirms that groundwater quality in the vicinity of KNPS has a Na-Cl character, as is typical of groundwater in coastal environments. Based on monitoring data and previous investigations, groundwater in close proximity to KNPS also shows a magnesium (Mg) - sulfate (SO_4) and Mg-Cl character.

Groundwater salinity (indicated as EC in mS/m) across the study area is indicated in Figure 4-8. Based on field measurements, EC at KNPS ranges between 85 and 215 mS/m, while at the Aquarius Wellfield, it ranges from 135 to 200 mS/m (Jolly and Hartley, 1996). Groundwater quality monitoring data available for the Witzand Wellfield indicates that EC levels vary between 50 and 250 mS/m in the vicinity of KNPS (Figure 4-8).

The quality of the groundwater is a direct result of the closeness of these aquifers to the ocean, i.e. at the end of the flow path and influence of frontal rainfall recharge and sea-spray / aerosols.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Bokpunt
G21A
b3
G21A
Silwerstroom Wellfield
Silwerstroom Spring
Springfontein se Punt
a5
a4
B
C
A
Witzand Wellfield
R27
a5
G21B
Aquarius Wellfield
Robbesteen
ATLANTIC OCEAN
a3
H
Koeberg Nuclear Power Station
Duynefontein
Van Riebeeckstrand
Melkbosstrand
Atlantis
a3
d2
b2
G
G21D
b3
I
N7
G21F
N
Legend
Spring
Hydrocensus sampling December 2007
SSR Hydrocensus (December 2007 - January 2008)
SSR Drilling (February 2008)
NGDB / Existing / Previous Hydrocensus
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Road -> Arterial
Road -> Main
Road -> Secondary
Coastline
Perennial river
Non-perennial river
Dam
Perennial pan
Wetland
Wellfields
Quaternary catchments
Groundwater resource unit
TISF Site Alternatives
KNPS
Median Borehole yield and Aquifer Classification
Intergranular/Sandveld Aquifer
a3 0.5 - 2.0 l/s
a4 2.0 - 5.0 l/s
a5 > 5.0 l/s
Fractured/Malmesbury Aquifer
b2 0.1 - 0.5 l/s
b3 0.5 - 2.0 l/s
Intergranular & Fractured/ Granitic Aquifer
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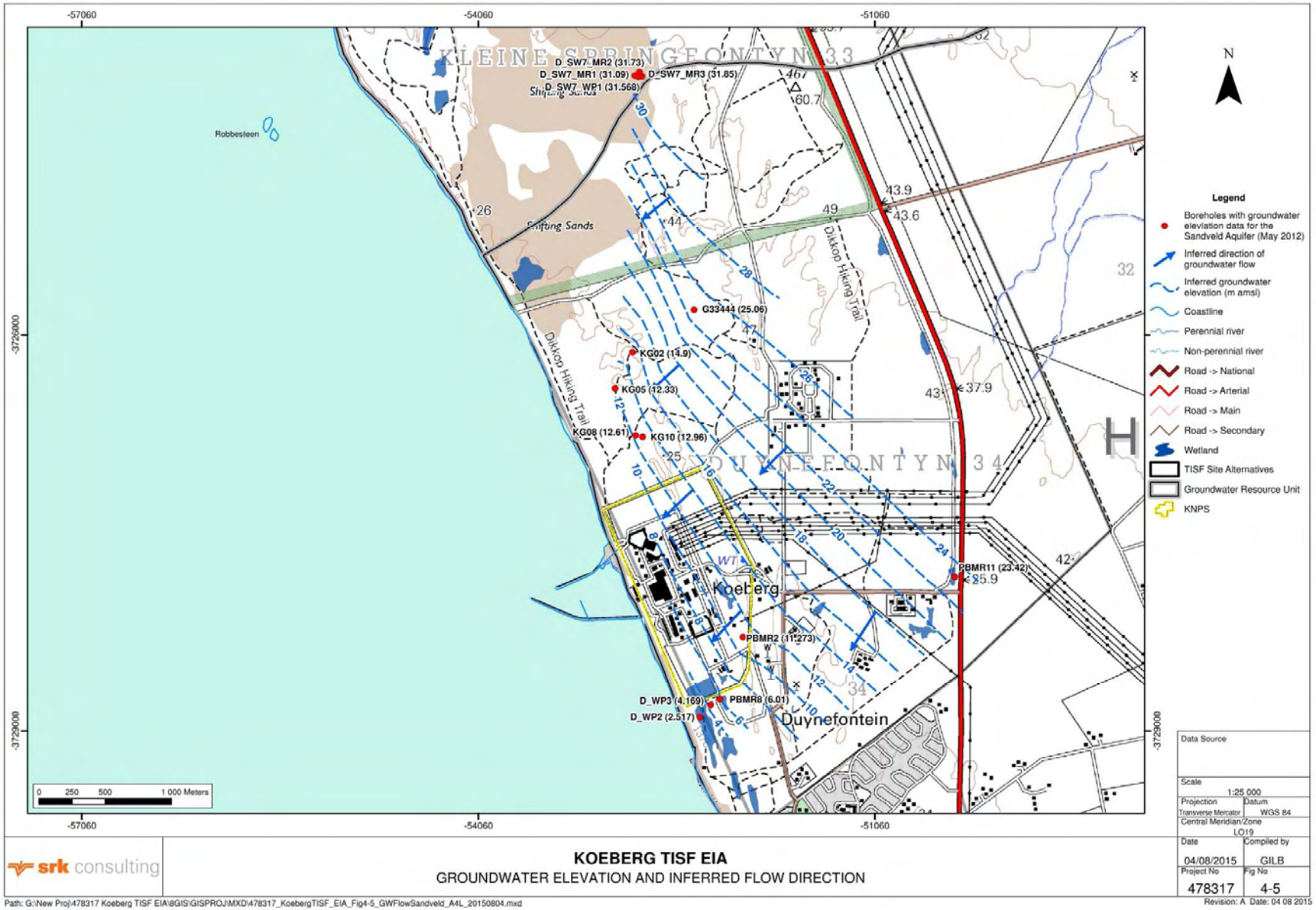
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Shifting Sands
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KG02 (14.9)
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KG08 (12.61)
KG10 (12.96)
PBMR11 (23.42)
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D_WP3 (4.169)
PBMR8 (6.01)
D_WP2 (2.517)
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Duynefontein
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Boreholes with groundwater elevation data for the Sandveld Aquifer (May 2012)
Inferred direction of groundwater flow
Inferred groundwater elevation (m amsl)
Coastline
Perennial river
Non-perennial river
Road -> National
Road -> Arterial
Road -> Main
Road -> Secondary
Wetland
TISF Site Alternatives
Groundwater Resource Unit
KNPS
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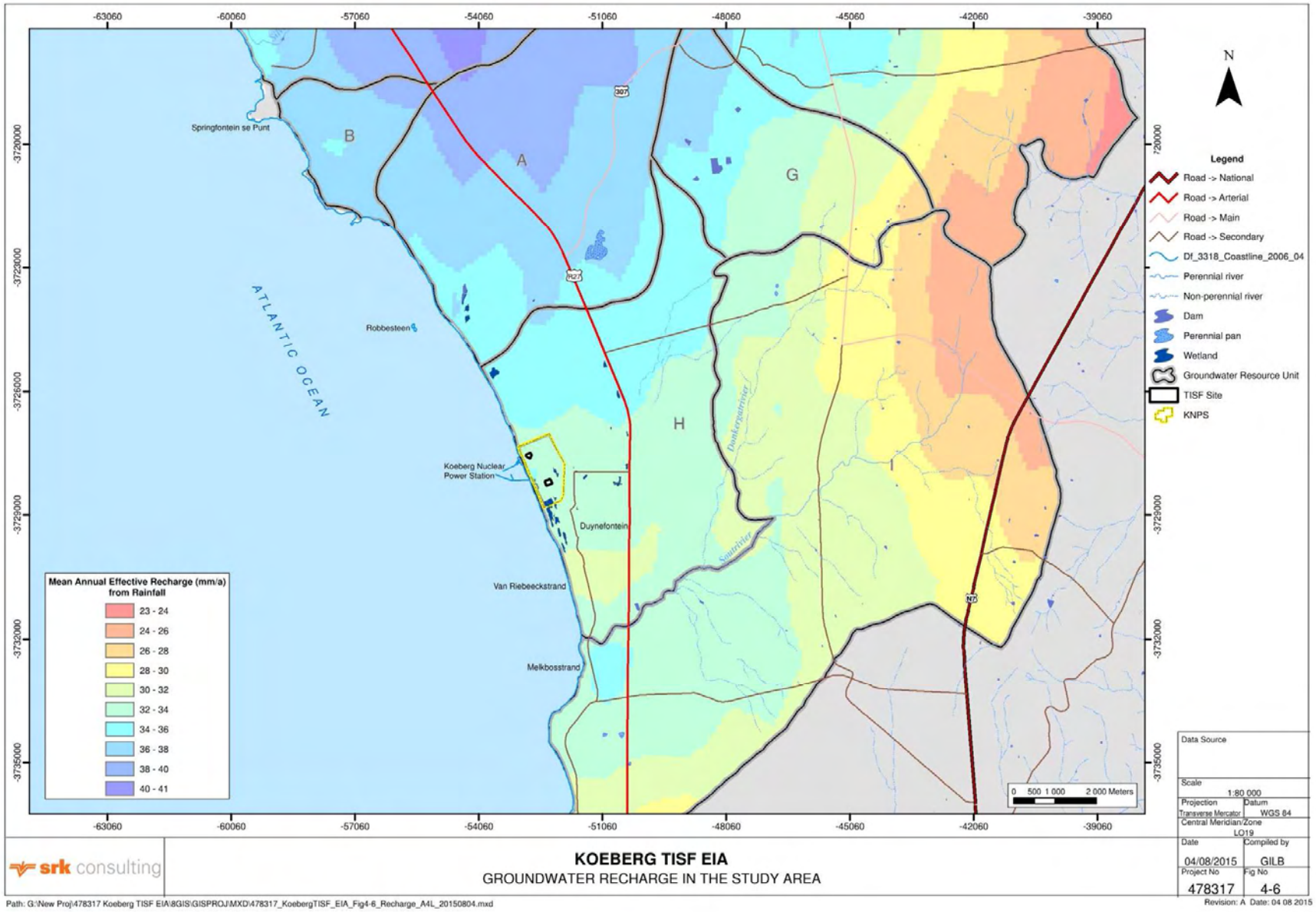
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ATLANTIC OCEAN
Robbesteen
Koeberg Nuclear Power Station
Duynefontein
Van Riebeeckstrand
Melkbosstrand
Donkergatrivier
Sout River
Legend
Road -> National
Road -> Arterial
Road -> Main
Road -> Secondary
Df_3318_Coastline_2006_04
Perennial river
Non-perennial river
Dam
Perennial pan
Wetland
Groundwater Resource Unit
TISF Site
KNPS
Mean Annual Effective Recharge (mm/a) from Rainfall
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26 - 28
28 - 30
30 - 32
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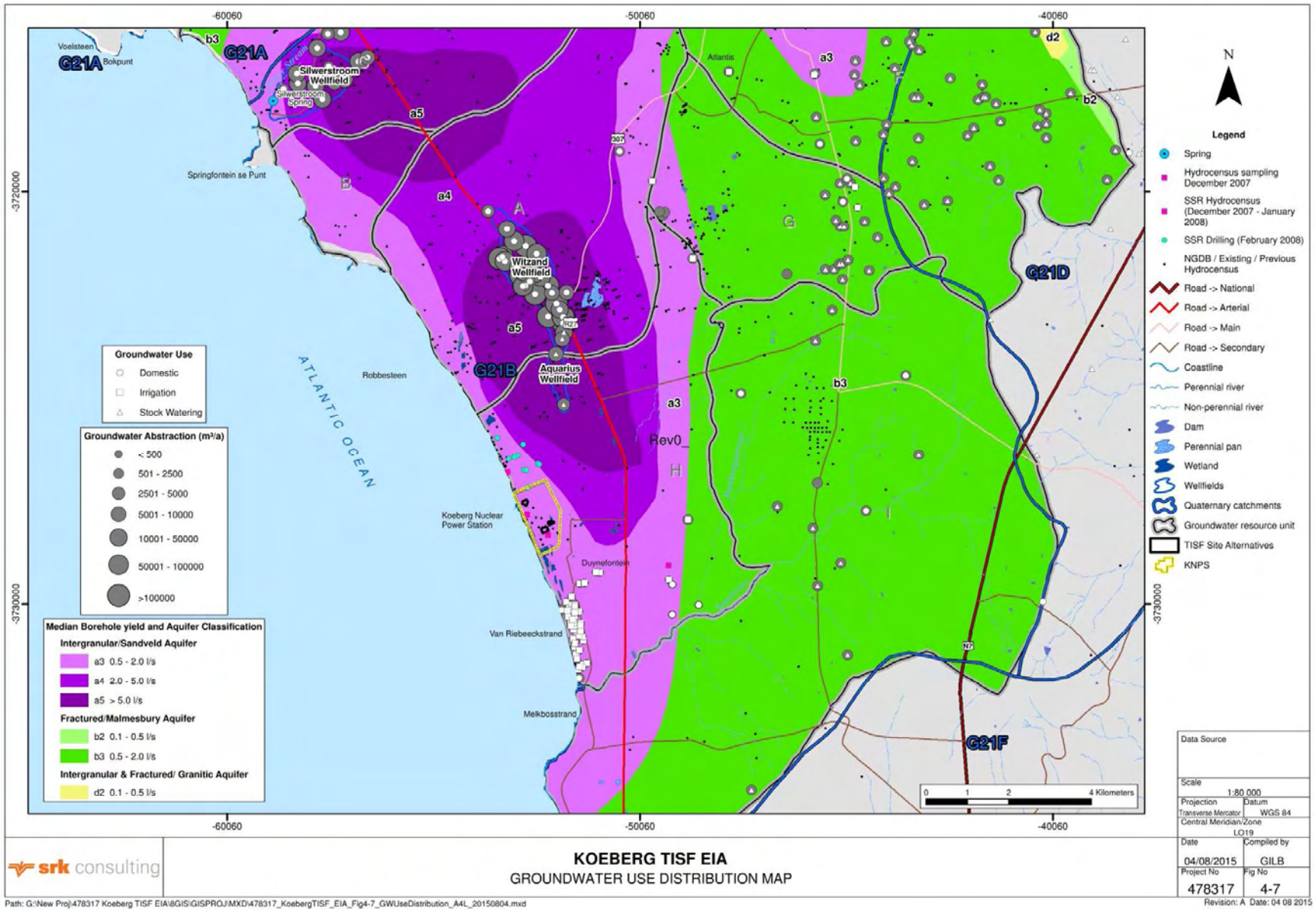
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G21F
Groundwater Use
Domestic
Irrigation
Stock Watering
Groundwater Abstraction (m³/a)
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501 - 2500
2501 - 5000
5001 - 10000
10001 - 50000
50001 - 100000
>100000
Median Borehole yield and Aquifer Classification
Intergranular/Sandveld Aquifer
a3 0.5 - 2.0 l/s
a4 2.0 - 5.0 l/s
a5 > 5.0 l/s
Fractured/Malmesbury Aquifer
b2 0.1 - 0.5 l/s
b3 0.5 - 2.0 l/s
Intergranular & Fractured/ Granitic Aquifer
d2 0.1 - 0.5 l/s
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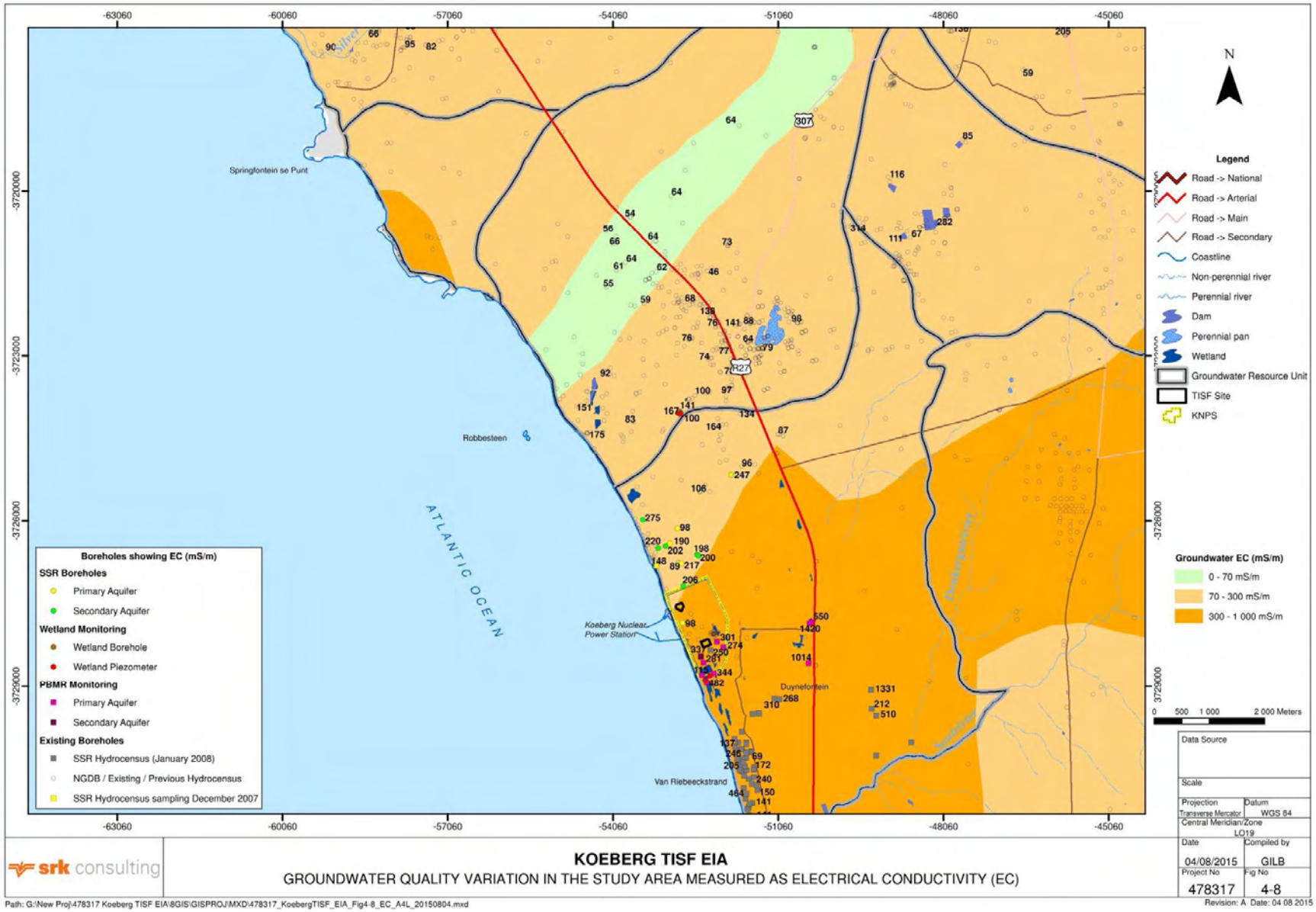
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Perennial river
Dam
Perennial pan
Wetland
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TISF Site
KNPS
Groundwater EC (mS/m)
0 - 70 mS/m
70 - 300 mS/m
300 - 1 000 mS/m
0 500 1 000 2 000 Meters
Boreholes showing EC (mS/m)
SSR Boreholes
Primary Aquifer
Secondary Aquifer
Wetland Monitoring
Wetland Borehole
Wetland Piezometer
PBMR Monitoring
Primary Aquifer
Secondary Aquifer
Existing Boreholes
SSR Hydrocensus (January 2008)
NGDB / Existing / Previous Hydrocensus
SSR Hydrocensus sampling December 2007
Data Source
Scale
Projection
Transverse Mercator
Datum
WGS 84
Central Meridian/Zone
LO19
Date
04/08/2015
Compiled by
GILB
Project No
478317
Fig No
4-8
srk consulting
KOEBERG TISF EIA
GROUNDWATER QUALITY VARIATION IN THE STUDY AREA MEASURED AS ELECTRICAL CONDUCTIVITY (EC)
Path: G:\New Proj\478317 Koeberg TISF EIA\8GIS\GISPROJ\MXD\478317_KoebergTISF_EIA_Fig4-8_EC_A4L_20150804.mxd
Revision: A Date: 04 08 2015

4.1.7.8 Conceptual Geohydrological Model

A conceptual geohydrological model is a descriptive representation of a groundwater system that incorporates an interpretation of the geological and hydrological conditions. It consolidates the current understanding of the key processes of the groundwater system, including the influence of stresses, and assists in the understanding of possible future changes. Figure 4-9 presents a schematic representation of the geohydrological profile at KNPS. The main concepts of the model, as discussed above, are summarised below:

- There is no downstream use of groundwater;
- Groundwater at KNPS is near/at the end of its flow path;
- Depth to the groundwater table at KNPS ranges between 3 and 4 mbgl;
- The receiving environment/downstream receptor of any contamination will be the shore zone/sea;
- There is a two aquifer system present, with an upper intergranular aquifer (Sandveld Aquifer) and a lower fractured rock aquifer (Malmesbury Aquifer). For this assessment, only the upper Sandveld Aquifer may potentially be impacted by the project;
- Local direct recharge only affects the Sandveld Aquifer - the Malmesbury Aquifer is recharged inland, far from KNPS. There may be upward leakage of groundwater from the Malmesbury Aquifer into the Sandveld Aquifer (and vice versa) depending on relative groundwater heads in each aquifer;
- Groundwater flow is from the interior, across KNPS, in a south-westerly direction towards the coast, with discharge into the ocean;
- Hydraulic conductivity values of the Sandveld Aquifer at and around KNPS range from 0.9 to 5.6 m/d.
- Groundwater flows under a relatively low gradient at a calculated flow rate of c.2.6 m/d, which indicates a relatively quick migration across KNPS, towards the coastline;
- There is an inferred interface between ‘fresh’ groundwater from inland and saline groundwater in the shore-zone. This interface may be shifted by groundwater control measures and sea level rise. However, down-hole salinity probing did not detect this zone and so it is unlikely to be a significant boundary at KNPS; and
- Natural groundwater quality is marginally saline and of a mixed NaCl and $CaHCO_3$ character.

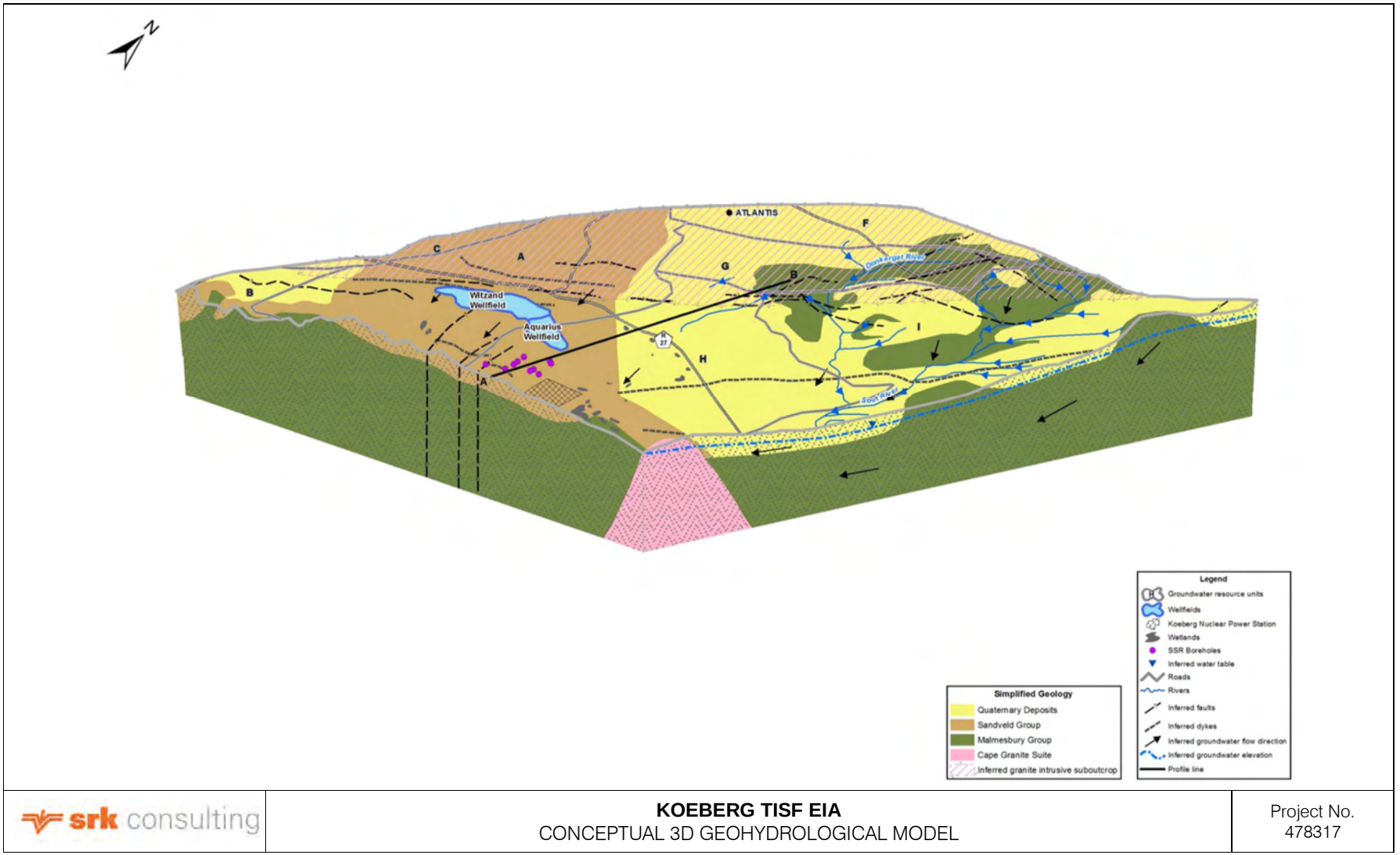

Figure 4-9: Conceptual 3D geohydrological model

Source: SRK, 2015a

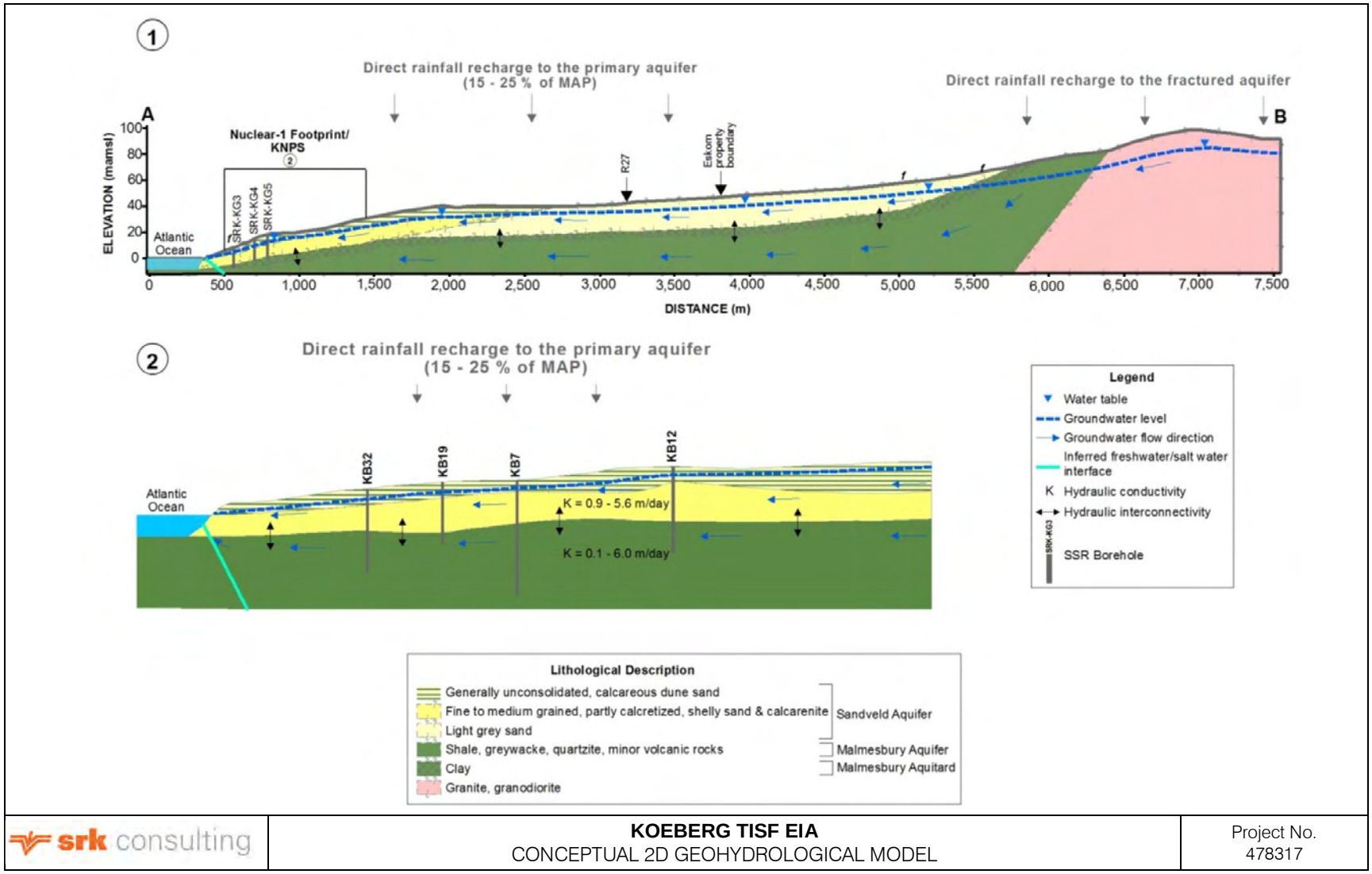

Figure 4-10: Conceptual 2D geohydrological model

Source: SRK, 2015a

4.1.8 Terrestrial Vegetation and Habitats

This section is based on the Terrestrial Ecology Assessment by Scientific Aquatic Services, 2015 (Appendix H).

KNPS is located within the Fynbos biome and the Western Strandveld bioregion. The vegetation type indicated by Mucina and Rutherford (2009) is Cape Flats Dune Strandveld (Figure 4-11) which is considered to be *Endangered* within the region (National list of threatened ecosystems for South Africa, 2011). The Cape Flats Dune Strandveld vegetation type can be subdivided into two forms, the False Bay form and the West Coast form. The False Bay form occurs on the False Bay shoreline from Muizenberg to Gordons Bay (south and east of the city bowl), and the West Coast form occurs on the western shoreline from Cape Town to Bokbaai (north of the City bowl) (City of Cape Town Biodiversity Fact Sheet 5: Cape Flats Dune Strandveld, 2011). Cape Flats Dune Strandveld occurs as four discontinuous regions. The largest patch spans the south coast of False Bay and penetrates deep into the Cape Flats as a broad wedge as far north as Bellville (False Bay form). The other patch spans Silverstroomstrand and Table Bay and includes the Atlantis dune plume. The third region is a series of small patches covering coastal dune pockets on the Cape Peninsula, while the last patch is situated on Robben Island (Mucina and Rutherford, 2006).

Cape Flats Dune Strandveld is characterised by high levels of transformation as a result of urban sprawl, road building, sand mining and cultivation. Approximately 56% of the vegetation type as a whole has been transformed and only 7% is statutorily conserved. Approximately 7% of the False Bay and 7% of the West Coast forms are in proclaimed reserves, with the West Coast form also having 16% in the private Koeberg Nature Reserve (City of Cape Town Biodiversity Fact Sheet 5: Cape Flats Dune Strandveld, 2011). The conservation target for the Cape Flats Dune Strandveld (24%) has not yet been reached and any unnecessary loss of this vegetation type should be avoided, where possible.

Alternative 1 is located within the Cape Flats Dune Strandveld vegetation type. This vegetation type is characterised by a flat to slightly undulating (dunefields) landscape, covered by tall, evergreen, hard leaved shrubland with abundant grasses and annual herbs in gaps (Mucina and Rutherford, 2006). The vegetation associated with Alternative 1 (Figure 4-12) has been disturbed by historical construction related activities associated with the development of KNPS and by gravel road development through the area, which has resulted in the loss of naturally occurring Cape Flats Dune Strandveld vegetation from the site. However, vegetation has subsequently begun to re-establish within the area. The vegetation currently present on site is characterised by the presence of clumps of shrubby vegetation with an open, shorter shrub and grassy layer. Annuals and bulbous species are also likely to appear in these gaps during spring after sufficient rainfall. The vegetation is dominated by the pioneer shrub *Chrysanthemoides incana* which is indicative of past disturbance on the site. However, additional indigenous floral species including *Otholobium bracteolatum, Helichrysum niveum, Searsia glauca, Morella cordifolia, Thesium* cf *spicatum*, *Trachyandra divaricata*, *Solanum africanum, Thesidium fragile, Cladoraphis cyperoides, Metalasia muricata, Cynodon dactylon, Ficinia lateralis, Atriplex nummularia, Limonium peregrinum, Searsia laevigata, Carpobrotus acinaciformis, Chironia baccifera, Pelargonium capitatum* and *Lessertia* sp. were also encountered scattered within the area.


18°24'40"E
18°25'8"E
18°25'36"E
18°26'4"E
18°26'32"E
18°27'0"E
33°39'56"S
33°40'24"S
33°40'52"S
33°41'20"S
N
Legend
Road -> Other
TISF Selected Location Alternatives
Security Protected Area
VEGETATION SENSITIVITY
Atlantis Sand Fynbos (Critically Endangered)
Cape Flats Dune Strandveld (Endangered)
Cape Seashore Vegetation (Least Concern)
Alternative 1 (CSB)
Alternative 2 (Ekhaya)
0 100 200 400 m
Data Source:
1/50,000 Topographic Map Sheet 3318
ESRI Bing Maps
Scale:
1:18 000 @ A4
Projection:
TM
Datum:
HH94
Central Meridian/Zone:
Lo19
Date:
06/11/2015
Compiled by:
GILB/FUBM
Project No:
478317
Fig No:
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srk consulting
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VEGETATION TYPES
Path: G:\New Proj\478317 Koeberg TISF EIA\8GIS\GISPROJ\MXD\478317_Fig4-11_KoebergTISF EIA_Vegetation_A4L_20151106.mxd
Revision: A Date: 16 02 2016

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Figure 4-12: Vegetation associated with Alternative 1

Alternative 2 is also located within the Cape Flats Dune Strandveld vegetation type. Vegetation associated with Alternative 2 was historically disturbed by activities associated with construction of KNPS and by the development of a laydown area. However, over the years, dune movement has resulted in the movement of sand over the disturbed area and Cape Flats Dune Strandveld vegetation has re-established in the area. Vegetation associated with Alternative 2 (Figure 4-13) is characterised by the presence of dense stands of shrubby, hard leaved vegetation up to approximately 1.5 m tall. Species diversity within the area proposed for Alternative 2 is considered to be higher than that associated with Alternative 1 with a higher floral species richness and evenness encountered. However, species diversity is not likely to be as high as in surrounding, undisturbed Cape Flats Dune Strandveld. Indigenous floral species encountered which are considered to be representative of the natural vegetation type included *Otholobium bracteolatum, Helichrysum niveum, Asparagus asparagoides, Seriphium plumosum, Searsia glauca, Searsia lucida, Thesidium fragile, Solanum africanum, Galium tomentosum, Helichrysum crispum, Morella cordifolia, Thesium* cf *spicatum, Helichrysum* sp*., Trachyandra divaricata, Cladoraphis cyperoides, Metalasia muricata, Cynodon dactylon, Ficinia lateralis, Phylica ericoides, Searsia laevigata, Carpobrotus acinaciformis, Chironia baccifera, Pelargonium capitatum, Lessertia* sp*, Psoralea sp. Senecio* sp*.* and *Drosanthemum sp.*

During the field assessment, special emphasis was placed on the identification of floral Species of Conservation Concern (SCC) as listed by previous ecological assessments undertaken within and in the vicinity of KNPS (Low, 2008, Todd, 2013 and Koeberg Nature Reserve Management Plan, 2015). A single possible SCC[8], *Lampranthus* cf *explanatus* (*Near Threatened*) was encountered within the construction footprint of Alternative 1. Individuals of this species were mostly encountered within the western portion of the site, to the west of the existing gravel road. Individuals of this species have also been recorded as occurring within the Koeberg Nature Reserve (Low, 2008) and are not restricted to the construction footprint of Alternative 1.

[8] Was not in flower at the time of the assessment which created a limitation to the identification of the species.

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Figure 4-13: Vegetation associated with Alternative 2

No SCC were encountered within Alternative 2 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 (Pers. comm. – Nick Helme). *Lessertia canescens* has yet to be formally Red Listed as *Threatened*, due to recent taxonomic changes, but is likely to be listed as *Vulnerable*, and is restricted to coastal areas from Cape Town to Mossel Bay (Pers. comm. Nick Helme). *Lessertia canescence* is also likely to occur in other areas within the Koeberg Nature Reserve.

In a previous study, Low (2008) listed 22 SCC for Koeberg (based on a composite species list generated in SaSFlora 1998-2007). Additional floral SCC, as listed by Low (2008), which have a possibility of occurring within the site alternatives include annuals and bulbs such as *Cotula duckittiae* (*Vulnerable*), *Capnophyllum africanum* (*Near Threatened*), *Steirodiscus* cf *tagetes* (*Vulnerable*) and *Satyrium* cf *carneum* (*Near Threatened*). Although the site alternatives have been historically disturbed, there is still a small possibility that these species may occur.

Three floral species which are protected under the Western Cape Nature Conservation Laws Amendment Act 3 of 2000 (WCNCLAA) were also noted within the site alternatives at the time of the assessment. These include *Carpobrotus acinaciformis* (occurring on both sites), *Drosanthemum* sp. (encountered within Alternative 2) and *Lampranthus* cf *explanatus* (occurring at Alternative 1) (all members of the Mesembryanthemaceae family).

Alien vegetation was very limited within both site alternatives. A few *Acacia longifolia* saplings were encountered interspersed with the vegetation of both sites. Additional alien and invasive species were largely limited to the outer boundary of the areas where disturbance has occurred as a result of previous road development.

4.1.9 Fauna

This section is based on the Terrestrial Ecology Assessment by Scientific Aquatic Services, 2015 (Appendix H).

4.1.9.1 Mammals

The location of the site alternatives within KNPS largely precludes the existence of medium to large mammal species because of the proximity of the sites to existing infrastructure and human activity. Also, both the site alternatives are located within the high security area, and as such are surrounded by a high security fence, which inhibits the movement of mammal species between the site alternatives and the surrounding natural habitat. However, smaller mammal species will be able to move through the fence structure and may inhabit the site alternatives either temporarily or permanently. Such mammals will likely comprise of the smaller Rodentia species, as noted through the observation of *Rhabdomys pumilio* (Four striped grass mouse) on site.

It is highly unlikely that the site alternatives will provide usable and viable habitat to medium and large mammal species. It is likely that a significantly higher number of mammal species will be located outside of KNPS, within the Koeberg Nature Reserve. Koeberg Nature Reserve has significantly lower levels of transformation in comparison to the site alternatives and is home to a number of introduced antelope species and indigenous small mammal species.

4.1.9.2 Avifauna

Data obtained from the South African Bird Atlas Project (SABAP2), habitat observations on site and previous studies of the area surrounding both the site alternatives, indicates that the sites are likely to be inhabited and utilised by a number of common bird species of the region. Close proximity to human and noise disturbances within the complex combined with a lower habitat suitability of the site alternatives will most likely preclude avifaunal SCC from occurring on site. Any avifaunal species that may currently occuron either Alternative 1 or 2, are likely to utilise the surrounding area, and will not be solely restricted to either of the site alternatives. Furthermore, the absence of any wetlands or permanent water sources within both site alternatives will further result in decreased overall bird diversity. No priority avifaunal species as per the Western Cape State of Biodiversity Report (2012) are expected to occur within either of the site alternatives.

4.1.9.3 Invertebrates

Habitat observations on site and data obtained from previous studies along with invertebrate distribution data was assessed to determine the probability of invertebrate species occurrence within the site alternatives. Historically the surrounding habitat of both Alternative 1 and Alternative 2 hosted the butterfly SCC *Chrysoritis dicksoni* (Dickson's Strandveld Copper), which is listed as *Critically Endangered*. However, all known populations from the area are now considered to be "extinct", with the remaining populations only known to occur near Witsand (East of De Hoop Nature Reserve) (Henning et al, 2009).

4.1.9.4 Amphibians

No wetlands or preferred amphibian habitat units occur within either of the site alternatives. The surrounding areas contain seasonal wetland habitats, and as such it is likely that amphibians within the area will congregate within these areas and largely avoid the site alternatives. The only amphibian SCC listed for the area is *Cacosternum capense* (Cape Caco), however the specific habitat requirements for this species are likely to exclude it from either Alternative 1 or 2. It is possible that this species will occur within the surrounding areas.

4.1.9.5 Reptiles

The location of both Alternative 1 and 2 within the high security fence line, as well as associated anthropogenic activities and disturbances, will likely preclude any reptile SCC from inhabiting the sites on a permanent basis. Although no reptile SCC are expected within the site alternatives, it is

likely that other common reptile species will occur within both Alternative 1 and 2. It is unlikely that these reptiles rely solely on the sites for survival and will relocate to surrounding natural habitat should construction commence. *Scelotes montispectus* (Bloubergstrand Dwarf Burrowing Skink) has been confirmed to occur within the area surrounding the sites. As yet this species has not been identified as a SCC; however, due to its perceived limited distribution range and the lack of data for this species, the precautionary principle may well be applicable here. As such consideration needs to be given to the possibility that *S. montispectus* may occasionally traverse through either of the site alternatives.

4.1.9.6 Arachnids

Spider and scorpion species distribution has not been well documented and verified historically in the Western Cape. However, the data available from previous studies in the area indicates that no arachnid SCC are known to occur within either Alternative 1 or 2. No arachnid species are listed as protected according to the Western Cape Province State of Biodiversity Report 2012 or in the WCNCLAA. *Harpactira atra* (Common Baboon Spider) has been observed within the Koeberg Nature Reserve. As such it is possible that there may be *H. atra* individuals occurring within both Alternative 1 and 2, although this species is not protected and is common throughout the Western Cape.

4.1.10 Conservation Areas

The Koeberg Nature Reserve was proclaimed as a private nature reserve in 1991 and was established by Eskom to conserve the natural habitat as far as possible whilst providing a buffer area surrounding KNPS and maintaining land for future development (Eskom, 2014).

The Koeberg Nature Reserve covers an area of approximately 3 000 ha on Eskom property around KNPS (Figure 3-1) and incorporates a number of environments - small wetlands, coastal dunefields, strandveld dune vegetation and sand plain fynbos. The reserve is home to a number of animal species. Grysbok, Steenbok and Duiker occur naturally in the area and Bontebok and Springbok have been introduced to the Reserve. The reserve's largest predator is the Caracal (Rooikat) and the African wild cat, Grey mongoose and Genet can also be seen. The most common reptiles are the Cape cobra, Mole snake, Boomslang, Skaapsteker and the Angulated tortoise. The reserve has an abundant birdlife with 153 species recorded to date - including the Ostrich, African fish eagle and Cape penduline tit.

Koeberg Nature Reserve is a private reserve but access is provided to the public with a number of hiking and mountain bike trail options.

4.2 Socio-economic Environment

4.2.1 National Socio-economic Environment

South Africa is a middle-income developing country with an abundance of natural resources. It is the most industrialised country in Africa, leading the continent in industrial output and mineral production, with well-developed financial, legal, communication, energy and transport sectors. South Africa also has a smaller, but well developed, informal economy which interacts with the formal economy.

Not only is South Africa itself an important emerging economy, it also provides trade linkages to other African markets. The country plays a significant role in supplying relief aid, transport, communications and investment on the continent (SAinfo, 2009). South Africa's well-developed road and rail links provide the platform and infrastructure for land-based trade throughout Southern Africa.

Two of the biggest challenges facing the South African economy are poverty and unemployment. Current estimates place unemployment figures in South Africa at ~25%.

4.2.1.1 Performance and Structure of the Economy

Between 1999 and 2008 South Africa experienced sustained economic growth with Gross Domestic Product (GDP) growing at an average of 5.4%. The global financial crisis reduced local and international demand for domestic goods and services. South African GDP growth slowed to 3.2% in 2008 and contracted by 1.5% in 2009 (SARB, 2014), broadly mirroring developments in global economic activity.

During the recession and subsequent recovery, economic activity in developing markets was more robust than developed markets, with China and India specifically maintaining strong economic momentum (SARB, 2010). This provided strong support for commodity and resource exporting nations such as South Africa; and consequently GDP growth recovered in the third quarter of 2009. Growth was then strong in the first quarter of 2010 before cooling off to a certain degree thereafter (SARB, 2010).

In 2012 and 2013 global economic growth remained sluggish on the back of low economic output, and downward pressure on developing countries has intensified (PERO, 2014). In South Africa economic growth contracted during this period from both supply-side and demand side constraints, such as labour unrest (particularly in the mining and manufacturing sectors), a persistent current account deficit, interruptions in electricity supply, reduction in domestic demand, decrease in global commodity prices and reduced investor confidence (SARB, 2014 and PERO, 2015).

The tertiary sector in South Africa contributes the largest portion to GDP (62% in 2013); while the primary and secondary sectors contribute approximately 10% and 18% to GDP respectively. The relative decline in the contribution of the primary and secondary sectors to South Africa's economy since 2009 is evidence of the impact of labour disputes, constrained electricity supply and a reduction in both domestic and international demand. Constrained growth is expected to continue in the short term as a result of the persistence of these factors.

4.2.1.2 Employment

After rising to above 25% following the 2009 recession (Trading Economics, 2015), the South African unemployment rate[9] remained relatively stable until the first quarter of 2015, when it jumped to 26.4%, the highest unemployment rate in South Africa for 12 years (Fin24, 2015).

The failure of the South African labour market to stimulate employment growth post-2009 can be attributed to a number of factors, including a decline in labour relations, fall in commodity prices post-2012, slowdown in South African output growth, decline in investor confidence, electricity supply constraints and a renewed sluggishness in the global economic recovery, particularly in Europe, which is one of South Africa's major trading partners (SARB, 2014 and UNDP, 2015). The most recent spike in the unemployment rate is likely to be partially a consequence of electricity rationing, as energy supply is increasingly constrained in the face of rising energy demand (SARB, 2015). Electricity rationing is set to continue in South Africa until at least 2017 (Business Day, 2015).

The percentage of total jobs in each sector broadly mirrors the sectors' percentage contribution to GDP (StatsSA, 2015 and StatsSA, 2014). The majority of employment in South Africa is in the social services and commercial industries, followed by manufacturing and finance. While the utilities sector (including electricity) contributes ~3% to annual GDP it only employs ~1% of the employed workforce in South Africa. Employment levels in the electricity-generation sector contracted marginally in 2009

[9] The number of people actively looking for a job as a percentage of the labour force.

and 2010. However, the sector's workforce expanded by 4% and 3.7% in 2011 and 2012 respectively, when Eskom expanded with a view to increase capacity (SARB, 2014).

4.2.1.3 Electricity Demand and Supply

Almost 90% of South Africa's electricity is generated in coal-fired power stations. KNPS provides about 5% of national electricity capacity. A further 5% is provided by hydroelectric and pumped storage schemes (DOE, No date).

Eskom, the national wholly state-owned utility that also owns and operates the national electricity grid, supplies about 95% of South Africa's electricity. While Eskom does not have exclusive generation rights, it has a practical monopoly on bulk electricity. It also operates the integrated national high-voltage transmission system and supplies electricity directly to large consumers such as mines, mineral beneficiators and other large industries, municipalities, commercial farmers and residential consumers (DOE, No date).

In January 2008, Eskom curtailed power exports and introduced load shedding in South Africa to ration electricity, as demand outstripped supply capacity (WNA, 2015). The demand: supply ratio improved by 2009, partly due to the economic slowdown and hence lower electricity demand (WNA, 2015).

National electricity production has been declining since peaking in 2011, when 262 538 GWh were generated. In 2014, less electricity was produced in South Africa than in 2013 (StatsSA, 2014a), intensifying the country's continued challenge with a decreasing supply margin. In the face of declining production, Eskom again introduced load shedding in late 2014. It has been estimated that load shedding will continue until 2017, when additional generating facilities are scheduled to come online. Load shedding will place an ongoing strain on growth in South Africa for the short term.

4.2.2 Provincial and Metropolitan Socio-economic Environment

The physical characteristics of the Western Cape support a diverse provincial economy. The shoreline provides an important fishing industry. Varying geographic and climatic zones, ranging from winter rainfall areas suitable for intensive farming (such as for citrus and viticulture) to the arid condition of the Karoo and Namaqualand only suitable for extensive livestock farming (PERO, 2010), allow for agricultural diversity. These characteristics also contribute to a sizable and developed tourism sector that attracts national and international visitors.

Although the Western Cape is not recognised as an industrial hub, a number of industries make significant contributions to the economy. These include a developed processing industry which supports the agricultural sector, heavy industries such as metal and chemical and, to a lesser and declining extent, the clothing and textiles industries. The economy of the Western Cape has seen significant growth in the large service sector.

Cape Town is one of Africa's most dynamic and developed metropolitan areas. It benefits from its strategic and spectacular location on the tip of Africa and at the foot of Table Mountain, recently voted as one of the world's new seven wonders of nature. One of the Province's two deep sea ports as well the international airport are located in the Cape Town, facilitating both domestic and international trade and travel to and through the City.

4.2.2.1 Performance and Structure of the Economy

The economy of the Western Cape has outperformed the national economy since 2010 (StatsSA, 2014) and contributed more than 13% to national GDP since 2004, exceeding its share of national population and land mass (both ~11%). The historically better performance by the Western Cape economy stems from both the structure and source of its economic activity (PERO, 2014): the

tertiary sector makes up a greater proportion of the Western Cape economy and has outperformed primary and secondary sector industries.

Regional GDP (GDPR) for the Western Cape economy grew at an annual average of 5.3% over the period 2006 – 2008 (compared to a national average of 4.7%). The Western Cape GDPR contracted in 2009, mirroring a similar development in the national GDP (StatsSA, 2014). After accelerating to an annual rate of 3.9% in 2011, economic growth in the Western Cape slowed to 2.9% in 2012 and has largely mirrored national growth since then (PERO, 2014).

The performance of the CoCT metropolitan area largely mirrors that of the Province, as it generates more than 70% of the Western Cape's GDPR (CoCT, 2013) with 64% of the Province's population. It is the second-largest metropolitan economy in South Africa, after the City of Johannesburg. On average, in the last 15 years, the variation of the City's GDP growth rate from the provincial rate was ~ 0.5 percentage points (CoCT, 2013).

The Western Cape economy has developed from its agricultural beginnings and now has a strong complement of food and beverage producers, higher value-added manufacturing activity and a range of services activities (including tourism). The regional economy is, however, still characterised by a strong agro-processing sector. The tertiary sector (67% of GDPR in 2013) plays a slightly more dominant role in the Western Cape economy than in the national economy (StatsSA, 2014), while the relative contribution of the primary sector is less than half that of the contribution to the national economy (4% of GDPR in 2013). The secondary sector contributed 18% of GDPR in 2013.

The most important industries to the Western Cape Economy in terms of contribution to GDPR are finance, real estate and business services (~30% of total value added); wholesale, retail and trade, catering and accommodation (~16% of total value added); and manufacturing (~16% of total value added) (StatsSA, 2014). Although it contributes a relatively small portion of GDPR, a wide diversity of products makes the agriculture, forestry and fishing industries important to the Western Cape economy.

The CoCT contributes 80% of the Western Cape's finance and business services, more than 70% of wholesale and retail trade and about 70% of manufacturing (CoCT, 2013).

Income, household consumption and growth in real consumer spending is expected to remain under pressure nationally in the short to medium term as rising inflation, higher interest rates, subdued employment and credit growth weigh on household income (PERO, 2014). This poses a particular challenge to the tertiary sector dominating the Western Cape economy, as a slowdown in consumer spending will reduce demand for services (PERO, 2014). However, the Western Cape is less exposed to the mining sector than the national economy, and the challenges related to an anticipated prolonged drop in commodity prices.

4.2.2.2 Population

The Western Cape has a population of ~6.1 million people, about 11% of the national population (StatsSA, 2014c). Almost 3.9 million people live in the Cape Town Metropolitan area, i.e. 63% of the provincial population (CoCT, 2014). The population structure of both the Western Cape and the CoCT broadly mirrors the national population structure: ~25% are younger than 15 years, ~70% of the population is of working age (15 – 64 years old) and ~6% are over the age of 64 years (StatsSA, 2014b and CoCT, 2014b). The CoCT and the Western Cape Province have a slightly higher proportion of working-age population than South Africa as a whole.

The provincial and metropolitan populations grew on average by 2.3% per annum between 2001 and 2014 (CoCT, 2014), compared to a 1.6% average annual growth rate in the national population (Census, 2001 and Census, 2011). The faster population growth in the Western Cape and the CoCT can (at least partly) be ascribed to inter-provincial migration, where people are drawn to the

Western Cape with the hope of finding employment and better opportunities (CoCT, 2014 and PERO, 2014). The Western Cape had a net in-migration of just over 150 000 people between 2006 and 2011 (StatsSA, 2014c). This trend is projected to continue.

4.2.2.3 Employment

Of the ~6.1 million people in the Western Cape, ~4.2 million people are of working age (15 – 64 years) (PERO, 2014). Of these, 64% (or ~2.9 million people) are in the labour force (employed or actively seeking employment), while ~8% (340 000 people) are discouraged work seekers[10]. Approximately 23% (675 000 people) of the provincial labour force was unemployed in 2014 (PERO, 2014).

Of the ~3.7 million people living in the City in 2011, ~2.6 million people were of working age. Of these, 65% (or ~1.7 million people) were in the labour force, while 3% were discouraged work seekers. Approximately 24% of Cape Town's labour force was unemployed in 2011 (Census 2011), closely mirroring provincial labour statistics.

Following the recession and global financial crisis, the unemployment rate increased in South Africa. The provincial unemployment rate grew by an average of 5.6% annually between 2009 and 2014 (higher than the national average of 3.5% - partly as a result of in-migration of unemployed people seeking work in the Western Cape). However, in the Western Cape, the number of employed people has increased at a faster rate than the national average (PERO, 2015) indicating that although unemployment is rising, additional jobs are being created in the Province.

The sector with the highest share of employment in the Western Cape in 2014 was wholesale and retail trade (21.5%), followed by general government services (21.4%), finance, real estate and business services (16.7%) and manufacturing (13.2%) (StatsSA, 2014b and StatsSA, 2010).

Employment structure in the CoCT is expected to largely mirror provincial employment statistics, with slightly lower numbers of the metropolitan population employed in the primary sector than in rural areas.

4.2.2.4 Income

Table 4-4 shows the distribution of annual household income in South Africa, the Western Cape and the CoCT. Both the Western Cape and the City have a smaller proportion of households earning very low income and a larger proportion of households earning higher incomes than at national level. Nevertheless, more than half of the households the Western Cape (65%) and the City (61%) have a monthly income of less than ~R6 366 (or R76 400 per annum).

The GDPR per capita in the Western Cape was estimated at R43 557 in 2011 (2005 prices) compared to R49 647 for Cape Town (CoCT, 2014). This placed the CoCT in third place, after Tshwane and Johannesburg, in terms of per capita GDPR amongst the country's six metros. The poverty rate[11] has decreased in the Western Cape Province and the CoCT by 4.6% and 4.2% respectively between 2001 and 2010 (CoCT, 2014) to ~160 000 people.

[10] The Western Cape differs substantially from most other provinces in that the non-searching unemployed (also referred to as discouraged work seekers) account for ~8% of the working-age population, compared to nearly 32% nationally (PERO, 2014). A number of factors explain this difference, including the Province's relatively high level of urbanisation, the City of Cape Town's dominance within the provincial labour market and different patterns of educational attainment (PERO, 2014).

[11] The poverty income is defined as the minimum monthly income needed to sustain a household and varies according to household size; the larger the household the larger the income required to keep its members out of poverty. The monthly income needed to keep a one person household out of poverty was estimated in 2010 to be R1 315, while for a two person household it was R1 626; a four person household required an estimated income of R2 544 to stay out of poverty while a household with eight or more person required an estimated R4 729.

Table 4-4: Annual household income in 2011

Annual income	% of the households in:		
	South Africa	Western Cape	CoCT
No income	15%	13%	14%
R1 – R38 200	48%	36%	33%
R38 201 – R76 400	13%	16%	14%
R76 401 – R307 600	16%	24%	25%
R307 601 – R614 400	5%	7%	9%
R614 401+	3%	4%	5%

Source: Census 2011

4.2.3 Local Socio-Economic Environment

The CoCT is divided into eight planning districts and 24 subcouncils. Subcouncils are divided into a total of 111 smaller administrative wards, which may contain several suburbs.

KNPS is situated in the Blaauwberg Planning District (Planning District B) and Subcouncil 1 of the CoCT. The geographical boundaries of Subcouncil 1 and the Blaauwberg Planning District are almost identical. Subcouncil 1 is divided into Wards 4, 23, 29, 32, 104 and 107[12] (see Figure 4-14). KNPS is located in Ward 32.

Subcouncil 1 is located on the western coastline of the City and stretches 30 km from Milnerton in the south to Atlantis in the north. The subcouncil includes a great diversity of areas, ranging from some of the poorest and most underprivileged suburbs in Cape Town such as Atlantis, Dunoon, Joe Slovo Park and Doornbach, to some of the more affluent, including Table View, Flamingo Vlei, Sunningdale, Big Bay, Blouberg and Melkbos.

A 5 km Precautionary Action Planning Zone (PAZ) and 16 km Urgent Protective Action Planning Zone (UPZ) have been delineated around KNPS, where development is restricted. The population density around KNPS is thus low. The study area has thus been taken as those areas within a 20 km radius of KNPS, where socio-economic impacts may occur (for example, from construction activities) (see Figure 4-15).

Key residential areas (suburbs) that fall within the study area include (see Figure 4-15)[13]:

- Within 5 km of KNPS: Melkbosstrand, Kleine Zout River Small Holdings and portions of the Atlantis and Milnerton non-urban areas;
- Within 5 – 10 km of KNPS: Portions of the Atlantis and Milnerton non-urban areas;
- Within 10 – 15 km of KNPS: Morning Star Small Holdings, Sunningdale, Atlantis and Philadelphia; and
- Within 15 – 20 km of KNPS: Parklands, Vissershok, Bloubergstrand, Table View, Doornbach, Du Noon, Mamre and Milnerton.

[12] Prior to the 2011 Census Subcouncil 1 was divided into Wards 4, 23, 55, 56 and 104.

[13] Note that the "suburb" of Killarney Gardens is a wholly industrial area with no residential population and therefore is not included in the analysis.

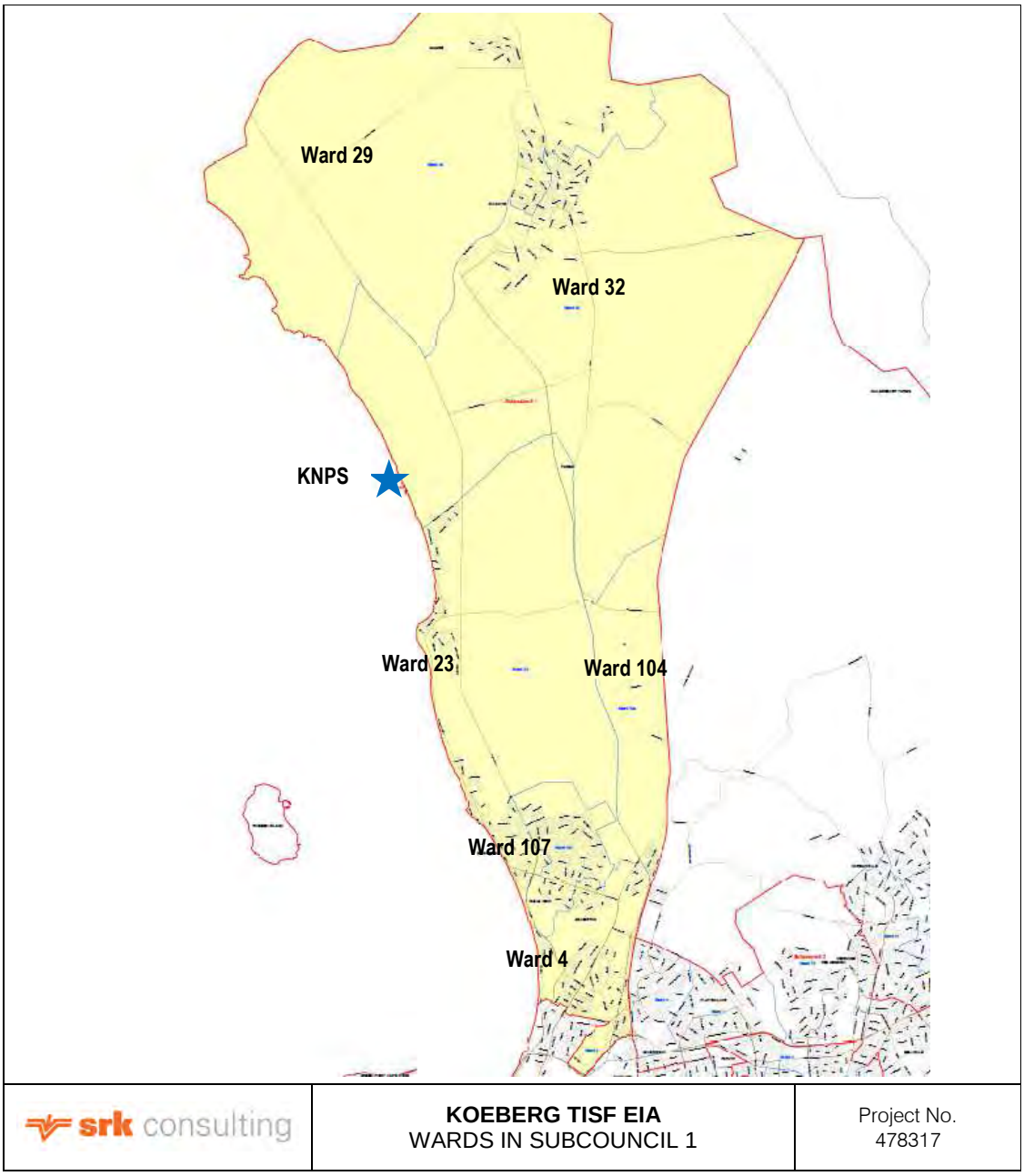

Figure 4-14: Wards in subcouncil 1

Source: CoCT, 2012

A number of socio-economic indicators are discussed below, mainly derived from Census 2011 data. Where Census 2011 data is not available, Census 2001 data is used.

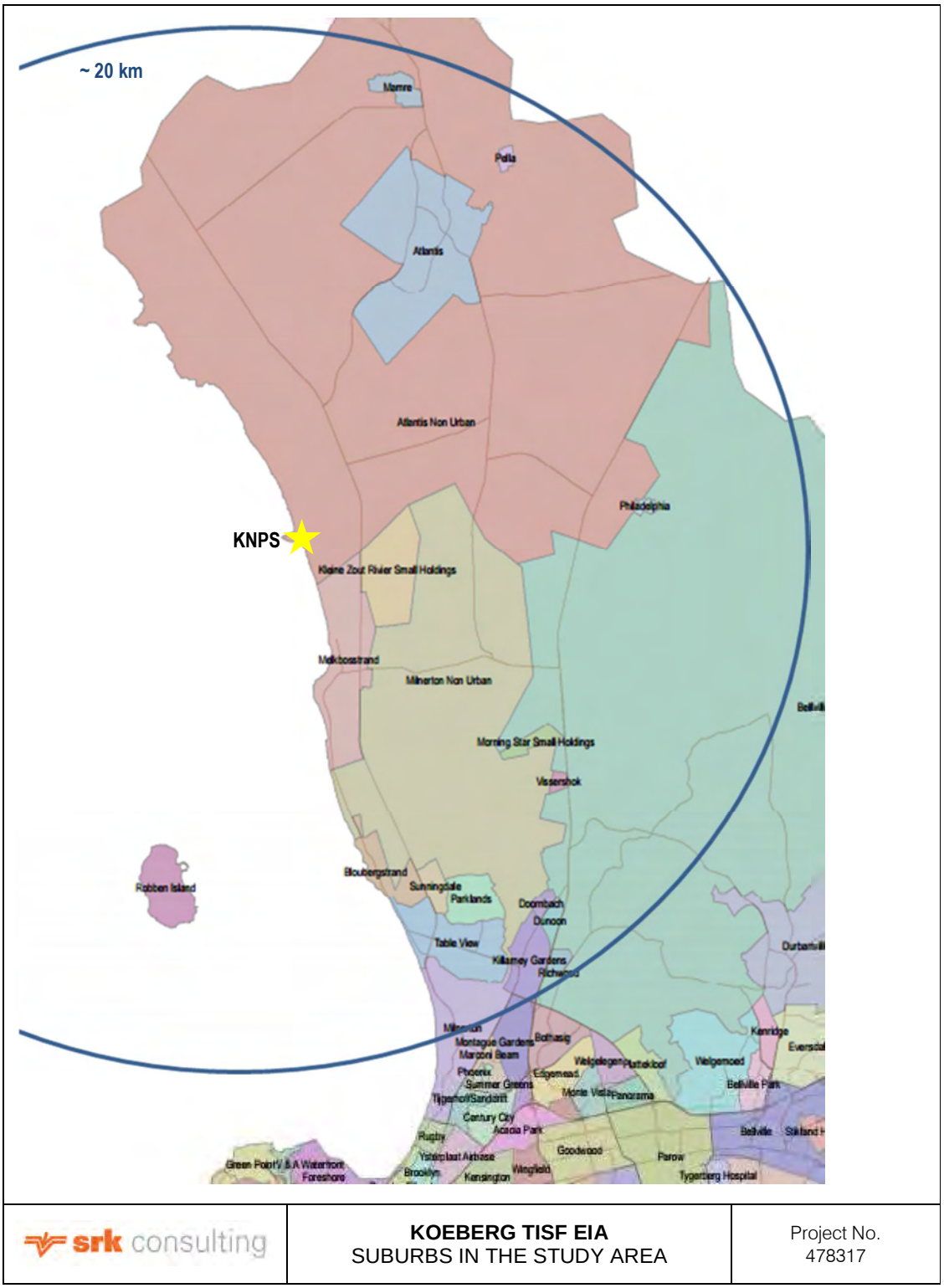

Figure 4-15: Suburbs in study area (within 20 km arc)

Source: CoCT, 2013a

4.2.3.1 Population

The geography of Cape Town makes the study area an attractive region for urban expansion. This is evidenced by the rapid residential expansion into new suburbs such as Sunningdale and Parklands. The population of the study area increased at an average of 7.3% per annum between 2001 and 2011 (see Table 4-5, Census 2011). This exceeds the average growth rate of the City (2.3%) by a considerable margin.

In 2001 the population of the study area was estimated to be 122 762. Census 2011 estimated the population of the study area to be 212 813, almost doubling in the 10 year period. Extrapolating the past population growth rate of the study area into the future, the population of this area could grow to more than 430 000 people by 2021. If the population of the study area grows at the current City-wide average growth rate, the population would be approximately 270 000 in 2021. In reality, population growth rates in the study area are likely to exceed the City average, but be below historic growth rates.

The most populous suburbs in the study area include Atlantis, Du Noon, Table View and Parklands: are all located more than 14 km from KNPS. The largest suburb near KNPS is Melkbosstrand with a population of more than 11 000 people, located > 2 km south of KNPS.

The highest population growth in urban suburbs took place in areas furthest away from KNPS, including Du Noon, Milnerton and Bloubergstrand. Apart from Du Noon, suburbs in the south west of the study area at or adjacent to more affluent communities have seen the most rapid urban growth between 2001 and 2011 (see Table 4-4). The population growth in the Milnerton non-urban area also indicates expansion of Sunningdale and Parklands beyond their registered suburban boundaries. The population of Du Noon had tripled between 2001 and 2011. Opportunities for employment at the industrial area of Killarney Gardens serve as a significant pull factor for people entering this area. Nevertheless, Melkbosstrand is also an attractive area and has shown considerable growth.

The gender profile of the study area is relatively evenly distributed with females having a slightly higher count (52%) against males (48%) (Eskom, 2015b). This gender distribution is the same as the South African average.

Population density is highest in the urban areas to the south and north east of KNPS (see Figure 4-16). Based on 2001 Census data, Eskom (Eskom, 2015b) estimated that the average population density of the area within 16 km of KNPS was 155 people per km^2. Based on the estimated population increase between 2001 and 2011, population density in the study area may have increased to at least 270 people per km^2 on average in 2011. However, population density is highly variable within the study area, with large areas nearly unpopulated.

Table 4-5: Population data for the study area

Suburb	2001 Population	2011 Population	Average Annual Population Growth Rate	Projected Population in 2021 at CoCT Growth Rate (2.3%)	Projected Population in 2021 at Study Area Historic Growth Rate
Melkbosstrand	6 462	11 302	7.5%	14 188	22 864
Kleine Zout River Small Holdings	No data	283	N/A	355	573
Atlantis non-urban	4032	2 479	-3.9%	3 112	5 015
Milnerton non-urban	205	3 293	150.6%	4 134	6 662
Morning Star Small Holdings	No data	485	N/A	609	981
Sunningdale	No data	5 299	N/A	6 652	10 720
Atlantis	54 904	67 490	2.3%	84 722	136 533
Philadelphia	No data	570	N/A	716	1 153
Parklands	No data	24 614	N/A	30 899	49 794
Vissershok	332	323	-0.3%	405	653
Bloubergstrand	5 844	11 179	9.1%	14 033	22 615
Table View	23 445	25 977	1.1%	32 610	52 552
Doornbach	4 082	5 033	2.3%	6 318	10 182
Du Noon	9 036	31 133	24.5%	39 082	62 982
Mamre	7 267	9 047	2.5%	11 357	18 302
Milnerton	7 153	14 306	10.0%	17 959	28 941
Total / Average	122 762	212 813	7.3%	267 149	430 522

Source: Census, 2011

Note:

- Dark grey shading indicates suburbs located within 5 km (PAZ) of KNPS;
- Lighter shading indicates suburbs located within 10-15 km (UPZ) of KNPS; and
- No shading indicates suburbs located within 15-20 km of KNPS.

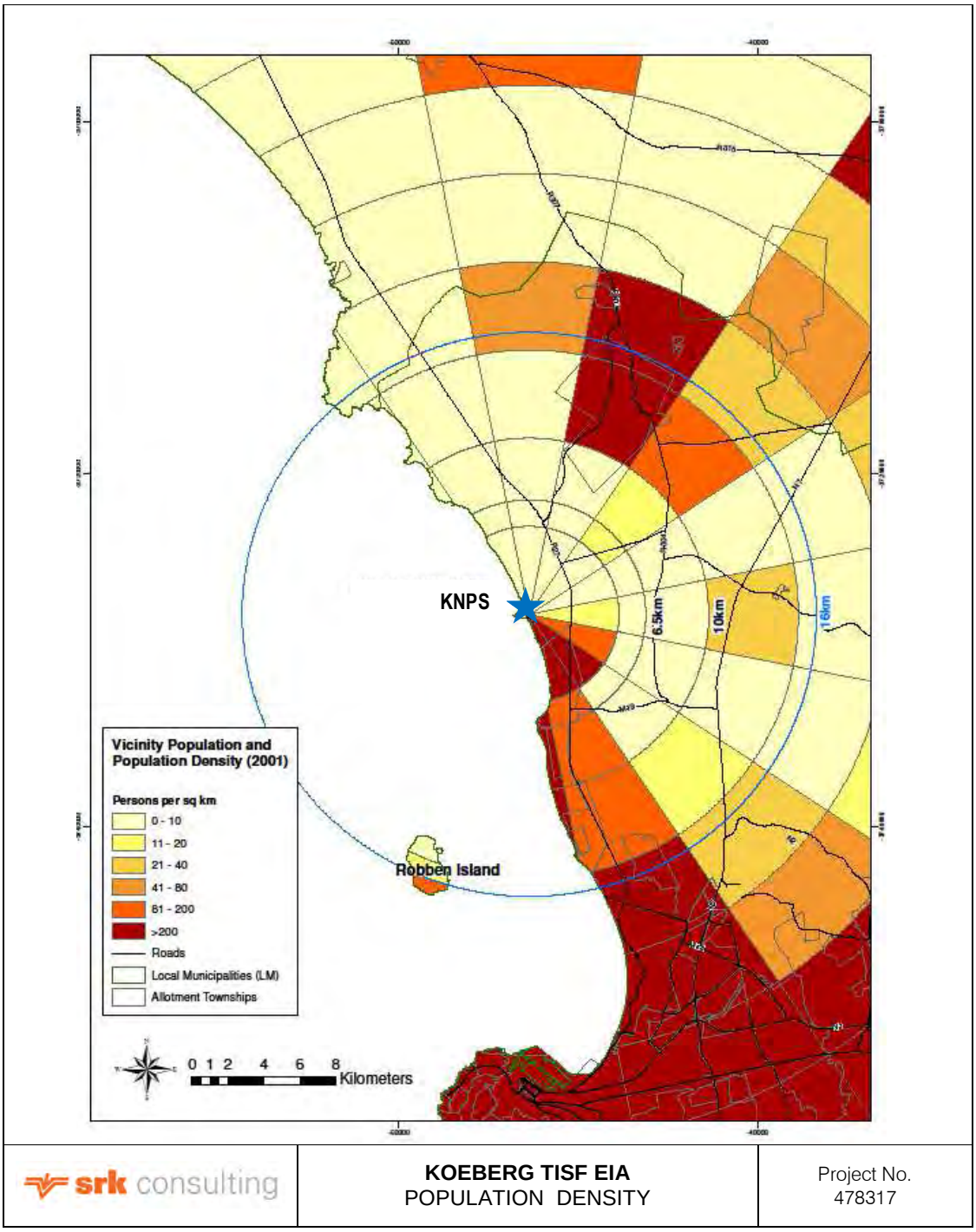

Figure 4-16: Population density

Source: Eskom, 2015b

4.2.3.2 Socio-economic Status Index

The Socio-economic Status Index (SES) is an indicator of relative socio-economic status of communities, calculated by the CoCT based on Census 2001 data (CoCT, 2007). The SES considers four indicators:

- % of households earning less than R19 200 per annum;
- % of adults (20+) with highest educational level less than matric;

- % of the economically active population that was unemployed; and
- % of the labour force employed in elementary/unskilled occupations.

A higher SES score indicates relatively better socio-economic conditions. The SES of the Blaauwberg Planning District (Planning District B) is 30.22, below the City average of 37.97.

The socio-economic status of communities and wards within Planning District B varies significantly. Generally, areas north of KNPS are more deprived than areas to the south (see Figure 4-17), although both include some communities that are considered "*worst off*"[14] by the CoCT, including Vissershok, Du Noon and areas of Atlantis.

Ward 104 was the worst off ward in the District in 2001 from a socio-economic perspective, indicating that people in this area are more likely to be unskilled and / or unemployed and have a lower income. This ward included the communities of Doornbach, Du Noon, Killarney, Killarney Gardens, Milnerton, Parklands, Sunridge, Table View and West Riding. Ward 23 was the best off ward in the district in 2011, indicating that people living in this ward are more likely to be skilled and / or employed and have a higher income. This ward included the communities of Atlantic Beach Estate, Blouberg, Bloubergrant, Bloubergstrand, Duynefontein, Melkbosstrand, Morningstar, Philadelphia, Sunningdale, Table View, Van Riebeeckstrand, Vissershok and West Beach.

The socio-economic status of communities in these wards also varies significantly. For example West Beach and Vissershok are classified as "best off" and "worst off" respectively in terms of their socio-economic status, and are both located within the same ward (see Figure 4-17).

Using Census 2011 data and, like the CoCT, considering income, education and employment, and including the status of dwellings in these suburbs (i.e. % of households that are informal) (see Table 4-6); SES Indices were calculated by SRK for this assessment to compare the current socio-economic status of suburbs in study area (see Table 4-6). Suburbs with a less favourable socio-economic status are located inland to the north, east and south east of KNPS, while more affluent suburbs are located on the coastline to the south and south west. A brief description of the socio-economic characteristics of each of these suburbs is presented in Section 4.2.3.3.

[14] The City of Cape Town classifies suburbs with a SES score of 54.92 – 79.07 as being in the bottom 20th percentile of all suburbs in the City, while those suburbs with a SES score of less than 13.06 are classified as being in the top 20th percentile of all suburbs in the City.

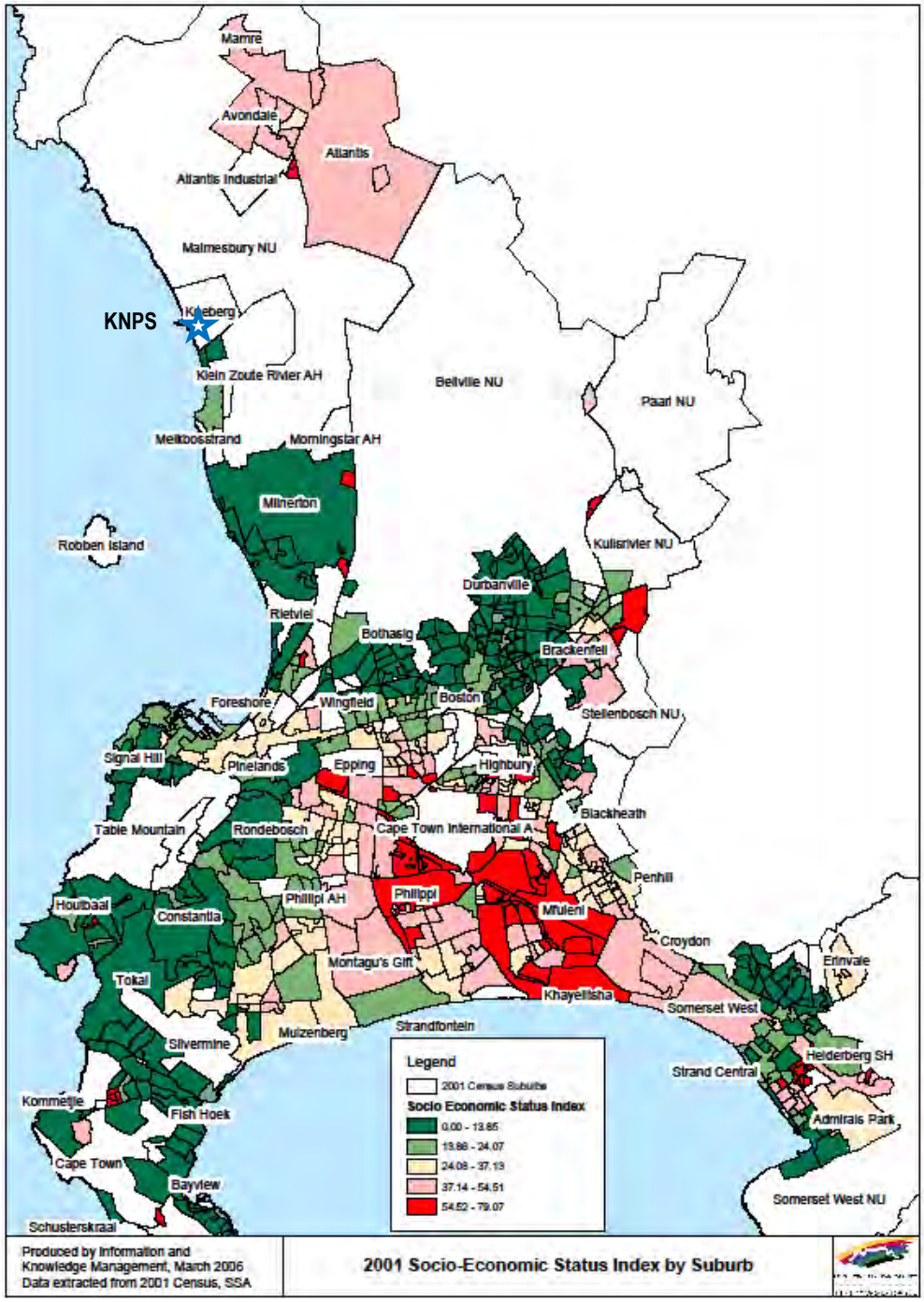

Figure 4-17: Socio-economic status index

Source: CoCT, 2007b

Table 4-6: SES indices for suburbs in study area (Census 2011)

Suburbs	Distance to KNPS	SES Score
Melkbosstrand	up to 5 km	34,71
Kleine Zout River Small Holdings		52,13
Atlantis non-urban		54,35
Milnerton non-urban		36,77
Morning Star Small Holdings	10 – 15 km	36,37

Sunningdale		33,35
Atlantis		57,27
Philadelphia		50,14
Parklands	15 – 20 km	33,61
Vissershok		64,17
Bloubergstrand		33,53
Table View		34,31
Doornbach		59,43
Du Noon		56,21
Mamre		60,13
Milnerton		32,61
Average		**45,57**

Source: Census, 2011

Note: Grey shaded communities indicate above study area average SES Index scores

4.2.3.3 Socio-economic Analysis

The following section briefly describes the socio-economic status of the study area and of the suburbs in the study area. Table 4-6 presents selected socio-economic indicators for the suburbs in the study area.

Based on the SES indices derived for this assessment, the socio-economic status of the population of the study area is marginally better than the City average (see Table 4-6). On average, the population of the study area is slightly more educated and more likely to be employed than other people living in Cape Town. Households in the study area are less likely to have a very low monthly income (i.e. less than R3 200 / month). It is noteworthy that, on average, nearly one in four dwellings in each suburb is informal, about 2% higher than the City wide average.

The socio-economic status of people living in each of the suburbs in the study area varies significantly (see Table 4-7). A brief description of the socio-economic status of each suburb, or where appropriate, cluster of suburbs, follows.

Table 4-7: Socio-economic indicators for the study area

Suburb	% Working Age	% Adults with Grade 12 or Higher	Unemployment Rate	% hh Monthly Income < R3 200	% Informal Dwelling	SES*
Melkbosstrand	68.6	82.0	5.7	17.1	2.0	34.71
Kleine Zout River Small Holdings	71.3	34.4	20.0	76.9	54.0	52.13
Atlantis non-urban	73.0	38.7	18.3	49.8	12.0	54.35
Milnerton non-urban	69.9	73.3	5.6	21.9	7.1	36.77
Morning Star Small Holdings	75.4	66.1	9.4	12.7	10.5	36.37
Sunningdale	65.1	83.2	3.1	14.5	1.0	33.35
Atlantis	68.4	32.4	26.6	50.4	15.5	57.27
Philadelphia	65.6	35.6	12.5	32.7	9.0	50.14
Parklands	72.6	84.7	6.6	13.2	0.6	33.61
Vissershok	70.5	2.8	63.2	93.2	96.9	64.17
Bloubergstrand	75.2	87.3	5.5	16.4	0.5	33.53
Table View	73.8	83.1	6.0	14.8	0.5	34.31
Doornbach	73.7	13.1	56.3	93.6	99.1	59.43
Du Noon	71.9	29.6	36.7	76.8	59.1	56.21
Mamre	67.9	32.0	27.2	48.7	3.4	60.13
Milnerton	72.9	85.7	4.6	12.4	0.9	32.61
City of Cape Town	*69.7*	*46.9*	*23.9*	*47.0*	*21.6*	*50.60*
Total / Average	**71.0**	**54.0**	**19.2**	**40.3**	**23.3**	**45.57**

Source: Census, 2011

Note: Grey shaded communities indicate above study area average SES Index scores

* - SES Indices have been derived by SRK for this study, considering income, education, employment status of dwellings in these suburbs (i.e. % of households that are informal) to compare the socioeconomic status of suburbs in study area.

hh - household

Milnerton

The suburb of Milnerton is located in the south of the study area and includes the communities of Milnerton, Sunset Beach and Milnerton Ridge. The suburb is the best off suburb in the study area in terms of its socioeconomic status, with relatively low levels of unemployment and excellent service delivery. Dwellings are almost all formal (more than 99%), and residents of this suburb generally enjoy a more affluent lifestyle than the majority of the population of the study area.

The population of the suburb doubled between 2001 and 2011 to more than 14 000 people.

The suburb hosts a number of facilities such as the Milnerton Medi-Clinic, Paddocks Shopping Centre, Milnerton Golf Course, Killarney Race Track and Theo Marais Sports Park (Eskom, 2015b). Sunset Beach and Woodbridge Island are both popular beaches located in the suburb. The Rietvlei Nature Area is also situated in this suburb.

The R27 and M5 roads provide access to the Cape Town Central Business District (CBD) to the south and to other areas in the City. These transportation routes are congested during high use periods (i.e. rush hour). The City railway network passes to the east of the suburb and also provides good access to the City. The recently (2013) launched MyCiti Bus Service also provides access to and from this area.

Sunningdale, Parklands, Bloubergstrand and Table View

These four contiguous suburbs are located to the north of Milnerton (Figure 4-15) and include the communities of Table View, Flamingo Vlei, Sunridge, Rosendal, West Riding, Bloubergrant, Blouberg Rise, Sunningdale, Parklands, Bloubergstrand, Blouberg Sands, West Beach and Big Bay. These suburbs also display a better than average socioeconomic status with relatively low levels of unemployment and better than average levels of service delivery. Dwellings are almost all formal (~ 99%), and residents of these suburbs generally enjoy a more affluent lifestyle relative to the population of the study area.

These four suburbs, particularly the communities of Big Bay, Sunningdale, Parklands and Blouberg Sands, have expanded significantly. A large amount of residential densification has also taken place, in particular along the coastal strip (Eskom, 2015b). Sunningdale and Parklands are two of the fastest growing urban areas in Cape Town and further expansion is proposed (Eskom, 2015b). The population of these four suburbs increased by nearly 130% to more than 67 000 people between 2001 and 2011 placing strain on services in the area (Eskom, 2015b).

While this area is predominantly residential, the West Coast Village (Shopping Centre) and Big Bay are both important retail nodes, and the Blaauwberg Netcare (hospital) is located in Sunningdale. Many local residents and people from outside of the study area surf and kite surf at Bloubergstrand and Big Bay (Eskom, 2015b).

The R27 and M5 roads provide access to the Cape Town CBD to the south and to other areas in the City. These transportation routes are congested during high use periods (i.e. rush hour). The MyCiti Bus Service also provides access to and from this area.

Parklands Main Road is proposed to develop as a mixed use activity street northward along the railway line.

Milnerton Non-urban

The Milnerton non-urban area is a largely unpopulated area located north of Sunningdale and Parklands stretching north towards KNPS. The suburbs of Parklands and Sunningdale have expanded into this area and therefore the socioeconomic status largely reflects the socioeconomic

status of these neighbouring suburbs (see Table 4-6). This also accounts for the rapid population expansion between 2001 and 2011 (see Table 4-4).

The Blaauwberg Conservation Area is located in this non-urban area, a unique nature area of approximately 2 000 ha comprising natural, cultural and historical elements which is regarded as a global biodiversity hotspot. The R304 and the M19 (Melkbosstrand Road) are important regional access routes and traverse the area.

Melkbosstrand

Melkbosstrand is the closest populated area to KNPS and is located to the south of the facility on the coastline. The suburb includes the communities of Duynefontein, Van Riebeeckstad and Melkbosstrand. This suburb also displays a better than average socioeconomic status with relatively low levels of unemployment and better than average levels of service delivery. Dwellings are almost all formal (~ 99%), and residents of these suburbs generally enjoy a more affluent lifestyle relative to the population of the study area. Due to its location along the coastline and the adjacent Blaauwberg Conservation Area the suburb is a sought after residential area.

The most significant development in the suburb in the last 15 years is the Atlantic Beach golf estate to the south. The development of the Melkbosstrand CBD has also proceeded with the construction of a supermarket and residential component. The demarcation of the urban edge will limit the extent of outward expansion of the town over the development projection period. However, due to its proximity to the City and being a desirable residential area, a certain amount of infill and redevelopment may be expected (Eskom, 2015b).

The beach is popular with surfers and is one of the landing points for the South Africa-Far East and South Atlantic/West Africa submarine cable systems.

The R27, which runs to the west of the suburb, provides access to and from other areas in Cape Town. The MyCiti Bus Service also provides access to and from this area.

Philadelphia

The rural village of Philadelphia is a small isolated community situated in the east of the study area with a population of only 570 people in 2011. The village has a slightly worse than average socioeconomic status, and the population has generally low levels of education (see Table 4-6). More than 90% of dwellings in the suburb are formal, and more than 65% of households earn more than R3 200 / month.

The community was established as a religious community and is dominated by a large church. The historic town is a fairly popular destination for local tourists and hosts a primary school and a police station.

The R304, which runs through the suburb, provides access to and from other areas in Cape Town.

Morning Star Small Holdings

Morning Star Small Holdings is a small rural community of only about 500 people located about 12 km to the south east of KNPS. This community is relatively affluent, with fairly low levels of unemployment. Dwellings are mostly formal (89.5%), and residents of this suburb generally enjoy a more affluent lifestyle than the majority of the population of the study area.

The N7, an important regional access route, passes to the east of Morning Star, and a railway line passes to the west providing access to and from Cape Town for this community.

Kleine Zout River Small Holdings

Kleine Zout River Small Holdings is a largely unpopulated rural area located to the west of Melkbosstrand (see Figure 4-15). More than half of the dwellings in the area are informal, and most of the population of 283 people have a low monthly income.

The area hosts an airstrip and an off-road vehicle track. The R27 forms the western boundary of the area.

Du Noon and Doornbach

The suburbs of Du Noon and Doornbach are two contiguous communities located to the west of Parklands (see Figure 4-15). Doornbach and large parts of Du Noon are informal settlements, and housing is typically of poor quality with little space, and residents are exposed to high levels of environmental risk. Correspondingly, service delivery is poor. These communities are characterised by low levels of education, high levels of unemployment and low income and are known for high levels of crime.

These suburbs reflect high levels of social and environmental vulnerability associated with living in low income settlements in urban areas in South Africa. The majority of people living in such areas can be considered socially, economically and environmentally vulnerable (Oelofse, 1999, in Lewis et al, 2007).

The population of Du Noon tripled between 2001 and 2011. Opportunities for employment at the adjacent industrial area of Killarney Gardens serve as a significant pull factor for people entering this area. A growth corridor is proposed between Big Bay and Doornbach (Eskom, 2015b) which will further expand the population of this area.

The N7 runs to the west of this area, and the railway network provides access to the west. The MyCiti Bus Service also provides access to and from this area.

Atlantis and Mamre

Atlantis and Mamre are two large urban communities located in the north east of the study area. Atlantis was established in the 1970s by the apartheid era government as an industrial and residential community. The suburbs include the communities of Wesfleur, Saxonsea, Sherwood, Beaconhill, Robinvale, Avondale, Protea Park, Witsand and Mamre. While most households are formal, there are some informal settlements in Atlantis. The population has a below average level of education, and has a slightly higher unemployment rate than the City average. In addition to unemployment, crime is also a major challenge to these communities (IOL, 2013).

A large and important industrial sector is present in Atlantis. The establishment of a Hisense (electronics) factory in 2013 has created much needed employment opportunities and skills development in the area (BusinessDay, 2013).

While population growth rates have been low compared to the average rates in the study area and Atlantis has experienced a period of relative stagnation, further residential and industrial development is proposed in the Atlantis Growth Corridor. The town has also been identified at ministerial level for upgrading in order to facilitate the economic upliftment of the community (Eskom, 2015b). Since heavy industrial uses are permitted in Atlantis, it could be expected that further heavy industrial uses may develop here (SSR, 2012).

The 41 bed Wesfleur Hospital is located in the suburb of Atlantis and is the closest hospital to KNPS.

The railway network, the R27, the R304 and the MyCiti Bus service provide access to and from these suburbs.

Atlantis Non-Urban

The Atlantis non-urban area is a largely unpopulated rural area in the north of the district which surrounds Atlantis and Mamre. The population of this area experiences a similar socioeconomic status to Atlantis and Mamre.

This area includes KNPS and surrounding nature reserve, the Atlantis dune field and aquifer and the Silwerstroomstrand recreational area on the coast. Silwerstroomstrand was expected to develop as a resort because of the beauty of the coastline, the growing popularity of the West Coast as a recreational area, and its proximity to the City. However, this has not yet materialised.

The R27 and the N7 are important regional access routes connecting Cape Town to areas to the north.

Vissershok

The community of Vissershok is a small informal community of about 300 people located near the Vissershok hazardous waste disposal site. This community is characterised by extremely low education and income levels. It is assumed that the majority of employed persons in this community work at the waste disposal site. The N7 runs to the west of Vissershok.

4.2.3.4 Health

This section is based on the Human Health Impact Assessment by Infotox, 2016 (Appendix I).

Since the main health effect of concern with respect to the proposed project is cancer, this section largely focussed on the sensitivity of the surrounding City of Cape Town and Western Cape population to cancer.

Based on data obtained from the South African Children's Tumour Registry, the age-standardised average annual incidence rates (ASR) of cancer in the age range 0 to 14 years (expressed as an average annual number of cases per million person years) are highest in the Western Cape (88.4 annual cases per million person years) and in Gauteng (81.0 annual cases per million person years). Stefan et al. (2015) suggest that the lower incidence rates in other provinces were likely due to under-diagnosing, misdiagnosing and under-reporting, amongst other reasons. Other possible explanations offered were lower registration rates in black African children, who present a smaller proportion of the Western Cape population compared to other provinces, and higher incidence rates among white children, who are proportionally more represented in the Western Cape. Consequently, it would not be correct to conclude from the higher ASR that the Western Cape is more vulnerable to childhood cancer than other regions in South Africa.

When compared to other districts in the Western Cape, the West Coast District in which KNPS is located does not differ significantly either in terms of years of life lost due to cancer (Gray and Vawda 2016) or mortality rate (Groenewald et al. 2011). Baseline health data do thus not indicate reasons to believe that the population surrounding KNPS is more vulnerable to cancer than the other Western Cape districts and would thus not be more sensitive to the health effects of low levels of ionising radiation potentially emitted from the TISF.

The 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.