

Review of Environmental Impact Report and Specialist Studies: Nuclear-1 Project, Duynefontein, Western Cape

Review Report

Report Prepared for

Eskom Holdings SOC Ltd



Report Number 594280/02

DFFE Reference Number: 12/12/20/944

Report Prepared by



October 2023

Review of Environmental Impact Report and Specialist Studies: Nuclear-1 Project, Duynefontein, Western Cape

Review Report

Eskom Holdings SOC Ltd

DFFE Reference Number: 12/12/20/944

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Note:

In response to stakeholder comments, the Draft Review Report was updated at the end of the comment period to produce this Final Review Report for submission to the Minister of Environment, Forestry and Fisheries.

All changes in the Final Review Report and Executive Summary vis-a-vis the previously released Review Report are italicised and underlined for easier reference. Italicised (only) text is retained from the Draft Review Report.

*An **Issues and Responses Summary**, reflecting stakeholder comments received during the stakeholder engagement process and responses by SRK or Eskom, is included in Appendix J.*

Profile and Expertise of EAPs

SRK Consulting (South Africa) Pty Ltd (SRK) has been appointed by Eskom Holdings SOC Ltd (Eskom) to commission a Climate Change Impact Assessment (CCIA) and undertake the Independent Review of the Environmental Impact Assessment (EIA) Report and Specialist Studies undertaken in terms of the National Environmental Management Act 107 of 1998 (NEMA) for the proposed Nuclear-1 Project.

SRK Consulting was established in 1974 and comprises over 1 600 professional staff worldwide, offering wide-ranging expertise in the natural resources and environmental sectors. SRK's Cape Town Environmental, Social and Governance (ESG) department has a proven track record of managing large, complex environmental and engineering projects in the Western Cape, Africa and internationally. SRK has rigorous quality assurance standards and is ISO 9001 certified.

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

Project Director and Reviewer: Christopher Dalglish, BBusSc (Hons); MPhil (Env. Sci)

Registered EAP (no. 2019/413)

Chris Dalglish is a Partner and Principal Environmental Consultant with over 36 years' experience, primarily in Southern Africa, West Africa, South America, the Middle East and Asia. Chris has worked on a wide range of projects, notably in the natural resources, Oil & Gas, waste, infrastructure and industrial sectors. He has directed and managed numerous Environmental and Social Impact Assessments (ESIAs), in accordance with international standards (e.g. IFC). He regularly provides high level review of ESIAs, frequently directs Environmental and Social Due Diligence studies, and leads E&S reviews on behalf of financial institutions. He also has a depth of experience in Strategic Environmental Assessment (SEA) and Resource Economics.

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

Registered EAP (no. 2020/427)

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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.

Nuclear-1 EIA Review Report: EAP Affirmation


Section 16 (1) (b) (iv), Appendix 1 Section 3 (1) (r), Appendix 2 Sections 2 (i) and (j) 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 (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.
- If applicable, 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.

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Chris Dalgiesh

12/10/2023

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Acronyms and Abbreviations

AIDS	Acquired Immunodeficiency Syndrome
AIS	Alien Invasive Species
CARA	Conservation of Agricultural Resources Act 43 of 1982
CBA	Critical Biodiversity Area
CCIA	Climate Change Impact Assessment
CCIAR	Climate Change Impact Assessment Report
CCT	City of Cape Town
CFR	Cape Floristic Region
DEA	(Former) National Department of Environmental Affairs
DEA&DP	Western Cape Department of Environmental Affairs and Development Planning
DFFE	National Department of Forestry, Fisheries and the Environment (formerly DEA)
DWS	Department of Water and Sanitation
DMS	Development Management Scheme
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECA	Ecological Support Area
Ecia	Economic Impact Assessment
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
EMS	Environmental Management System
EPZ	Emergency Planning Zones
Eskom	Eskom Holdings (SOC) Limited
FEIR	Final Environmental Impact Report
GDP	Gross Domestic Product
GDPR	Regional Gross Domestic Product
GIA	Geohydrological Impact Assessment
GHG	Greenhouse Gas
GN	Government Notice
HIA	Heritage Impact Assessment
HIV	Human Immunodeficiency Syndrome
HLW	High Level Waste
HV	High Voltage
IAPs	Interested and Affected Parties
IBA	Important Bird Area
IDP	Integrated Development Plan
IRP	Integrated Resources Plan 2010-2030
ISO	International Organisation for Standardisation
IAIA	International Association for Impact Assessment
IUCN	International Union for Conservation of Nature
IRP	Integrated Resource Plan
KPNR	Koeberg Private Nature Reserve

KNPS	Koeberg Nuclear Power Station
<u>KNR</u>	<u>Koeberg Nature Reserve</u>
LILW	Low and Intermediate Level (Radioactive) Waste
MMP	Maintenance Management Plan
MPBL	Municipal Planning By-law
NAAQS	National Ambient Air Quality Standards
NCMSBP	National Coastal and Marine Spatial Biodiversity Plan
NEMA	National Environmental Management Act 107 of 1998
NEM:BA	National Environmental Management: Biodiversity Act 10 of 2004
NEM:ICMA	National Environmental Management: Integrated Coastal Management Act 24 of 2008
NERSA	National Energy Regulator of South Africa
NFEPA	National Freshwater Ecosystem Priority Area
NGO	Non-Governmental Organisation
NHRA	National Heritage Resources Act 25 of 1999
NIA	Noise Impact Assessment
NISP	Nuclear Site Investigation Programme
NMT	Non-Motorised Traffic
NNR	National Nuclear Regulator
NNRA	National Nuclear Regulator Act 47 of 1999
NPS	Nuclear Power Station
NORM	Naturally Occurring Radioactive Material
NWA	National Water Act 36 of 1998
OEHHA	Office of Environmental Health Hazard Assessment
ORV	Off-Road Vehicles
POPIA	Protection of Personal Information Act 4 of 2013
PRDW	Prestedge Retief Dresner Wijnberg
PSDF	Provincial Spatial Development Framework
PWR	Pressurised Water Reactor
RDL	Red Data List
RO	Reverse Osmosis
SAM	Social Accounting Matrices
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SAR	Safety Analysis Report
SAWS	South African Weather Service
SCC	Species of Conservation Concern
Screening Tool	National Web Based Environmental Screening Tool
SDF	Spatial Development Framework
SDG	Sustainable Development Goal
SEMA	Specific Environmental Management Acts
SIA	Social Impact Assessment
SoW	Scope of Work
SPLUMA	Spatial Planning and Land Use Management Act 16 of 2013
SRK	SRK Consulting (South Africa) (Pty) Ltd

SSR	Site Safety Report
StatsSA	Statistics South Africa
TDP	Transmission Development Plan
TIA	Tourism Impact Assessment
TLD	Thermoluminescent dosimeter
TOPS	Threatened or Protected Species
TrIA	Transport Impact Assessment
UPZ	Urgent Protective Zone
VIA	Visual Impact Assessment
VU	Vulnerable

Units

ha	Hectare
km	Kilometre
kV	kilovolt
m	Metre
MW	Megawatt

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.
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
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.
Critical Biodiversity Area	Areas of the landscape that must be conserved in a natural or near-natural state in order for the continued existence and functioning of species and ecosystems and the delivery of ecosystem services.
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.
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.
Endemic / Endemism	Species unique (native or restricted) to a defined geographic location, i.e. ecological state of a species being unique to a defined geographic location.
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 Authorisation	Permission granted by the competent authority for the applicant to undertake listed activities in terms of the NEMA EIA Regulations, 2014.
Environmental Impact Assessment	A process of evaluating the environmental and socio-economic consequences of a proposed course of action or project.
Environmental Impact 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	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.
Flora	The collective plants of a particular region, habitat or geological period.
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.
Herpetofauna	Amphibians and reptiles of a particular region, habitat or geological period.
Hydrology	The scientific study of the movement, distribution, and quality of water on Earth, including the water cycle, water resources and environmental watershed sustainability.
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.
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.
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.
Screening Tool	The National Web Based Environmental Screening Tool used to identify environmental sensitivity ratings to a specific identified site for a number of environmental themes.
Sense of Place	The identity of a place related to uniqueness and/or distinctiveness. Sometimes referred to as genius loci meaning 'spirit of the place'.
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.
Watercourse	A natural or artificial freshwater drainage feature.

1 Introduction

1.1 Background

Eskom Holdings SOC Ltd (Eskom) appointed ARCUS GIBB (Pty) Ltd (now GIBB) to undertake an Environmental Impact Assessment (EIA) for the proposed construction, operation and decommissioning of a new nuclear power station and associated infrastructure at one of three alternative sites, viz. Thyspunt in the Eastern Cape and Duynefontein and Bantamsklip in the Western Cape. On 11 October 2017, the Department of Forestry, Fisheries and the Environment (DFFE) granted Environmental Authorisation (EA) for a new nuclear plant at Duynefontein (hereafter Nuclear-1, interchangeably Nuclear Power Station). The decision was appealed and on 8 August 2022, DFFE's Minister, the Honourable Ms. B Creecy adjourned the appeal process to afford Eskom an opportunity to appoint an independent specialist to commission a Climate Change Impact Assessment (CCIA) study and review specialist studies, the Final Environmental Impact Report (FEIR) and the Environmental Management Programme (EMPr, interchangeably EMP) relating specifically to the Duynefontein site (Figure 1-1) to identify any data gaps and determine risks of not updating reports. This will inform the Minister's final decision on the appeal process.

SRK Consulting (South Africa) (Pty) Ltd (SRK) has been appointed by Eskom to review the FEIR, EMPr and specialist studies. Also, SRK, on behalf of Eskom, appointed The Promethium Group (Promethium) to undertake the required CCIA study, presented as a **separate CCIA Report**.

1.2 Scope of Work

In broad terms, the Scope of Work (SoW) to inform the Minister's decision on the appeal process, is to:

- Review specialist studies, the FEIR and the EMPr to determine risks of not updating reports, and determine if the risks (if any) need to be mitigated;
- Compile a report (hereafter Review Report – this report) documenting the findings of the review and - if necessary - recommend methods to address any gaps, e.g. by updating specialist studies and/or a revision (and approval) of the EMPr;
- Undertake a CCIA; and
- Conduct a public participation (stakeholder engagement) process, facilitating review and comment by all registered Interested and Affected Parties (IAPs), including appellants, the competent authority, and all relevant organs of state for a period of at least 30 days as prescribed by the EIA Regulations (2014) as amended.

As confirmed by DFFE, the reviews and CCIA are required for the Duynefontein Nuclear-1 site only.

The Review Report compiled by SRK and the CCIA compiled by Promethium were subject to a single (combined) stakeholder engagement process described in Section 6.

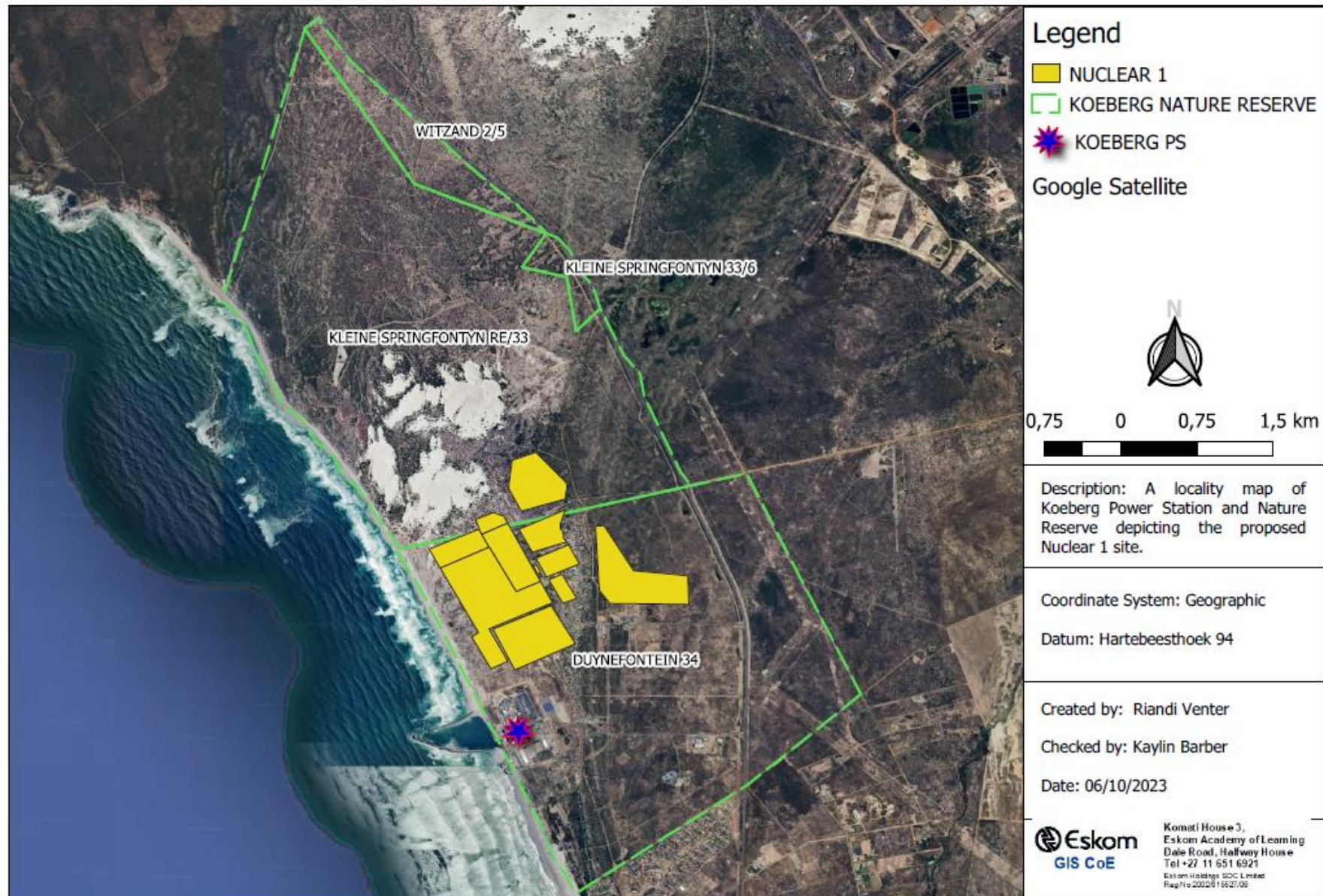


Figure 1-1: Locality Plan

1.3 Review Approach and Methodology

1.3.1 Regulatory Context

The EIA Regulations, 2006 (GN R385 of 2006), promulgated in terms of NEMA, governed the process, methodologies and requirements for the Nuclear-1 EIA undertaken by GIBB.

The EIA Regulations, 2006 and associated Listing Notices were replaced by the EIA Regulations, 2014 (Government Notice (GN) R982) and associated Listing Notices 1-3, which came into effect on 4 December 2014 and were further amended on 7 April 2017, prior to conclusion of the EIA process. The EIA for Nuclear-1 commenced prior to the promulgation of the EIA Regulations, 2014, and was concluded under the provisions of the EIA Regulations, 2006.

In the interim a number of new regulatory requirements, specialist study regulations, specialist reporting protocols published under the NEMA 2014 EIA (as amended) (GN 320, 2022), and standards have been effected. The protocols themselves do not make a statement regarding transitional arrangements, for example, explicitly excluding application of the protocols to EIAs that have been completed but for which no decision has yet been made.

However, the NEMA 2014 EIA regulations do include transitional arrangements and explicitly state that *"53 (4) An appeal lodged in terms of the previous NEMA regulations, and which is pending when these Regulations take effect must despite the repeal of those previous NEMA regulations be dispensed with in terms thereof as if those previous NEMA regulations were not repealed"*¹. Therefore, it can be inferred that the protocols and other instruments that have subsequently been published in terms of the NEMA 2014 EIA regulations are not applicable to pending applications.

Clearly the Nuclear-1 EIA could not and - in law - does not need to comply with instruments which came into effect after the Nuclear-1 EIA commenced (i.e. after the application was lodged). In other words the Nuclear-1 EIA cannot be expected to comply with "the letter of new law".

1.3.2 Approach to the Review

The review does not assess the correctness or accuracy of information and data presented in the EIA Report or specialist reports as these were very thoroughly reviewed (through peer review and stakeholder review) for factual correctness during the EIA process, and EA was granted for Nuclear-1 at Duynefontein. The review assumes that the EIA process, stakeholder engagement, FEIR and specialist studies were comprehensive, legally compliant and fit-for-purpose when EA was granted in October 2017. The review is thus not a technical review, but a process review assessing whether EIAs and associated studies undertaken over 10 years ago are fit-for-purpose in 2023.

To that end, the review is guided by the following factors (high level criteria) and focuses on:

- The extent to which the EIA of Nuclear-1, undertaken in terms of the 2006 EIA Regulations, is aligned with the intent and "spirit" of the EIA Regulations, 2014. This entailed a detailed review of transitional provisions and the FEIR against a number of aspects, including stakeholder engagement, listed in Section 3 of this report;
- Alignment with and applicability of "the spirit" and intent of (new) specialist study regulations and reporting protocols, reported in more detail in Section 4 and Section 5;

¹ *This correlates with the transitional provisions contained in the National Appeal Regulations, 2014 (GN R.993 of 8 December 2014 (as amended), regulation 10(2)(b), which provide (among other things) that: "An appeal lodged after 8 December 2014 against a decision taken in terms of the Environmental Impact Assessment Regulations, 2006 must despite the repeal of the regulations... be dispensed with in terms of the Environmental Impact Assessment Regulations, 2010 as if those regulations have not been repealed".*

- Whether old information is still suitable, i.e. is baseline information and data in the Nuclear EIA adequate for the purposes of EA or have conditions changed so considerably that the information may compromise the original EA;
- The materiality of the information, i.e. does the status of the information in the FEIR or a particular study affect potential impacts of the project, increasing the risk that the project will not withstand further appeals in future; and
- Whether data deficiencies and risks can be addressed:
 - Through new conditions attached to the EA and/or appeal decision, including conditions which may pertain to more technical matters, e.g. seismic risk;
 - By a new application for EA (i.e. a new EIA process);
 - By updating the EMP; or
 - Through a Specialist Study Addendum;
 - By implementing and disclosing a Grievance Redress Mechanism (GRM) and reacting to valid grievances as they arise;
 - Through another legislative process (e.g. land use application); or
 - Some other process.

This review only considers the Duynefontein site. Bantamsklip and Thyspunt are excluded from the review (although they are assessed in the original studies).

1.3.3 Project Team

The review of the FEIR and EMP, as well as the coordination and review of the specialist study reviews and CCIA and the stakeholder engagement process was undertaken by a core team of consultants in SRK's Cape Town office, as listed in Table 5-1.

Table 1-1: Review management team

Position	Name	Assigned Reviewer
Project Director	Chris Dalgliesh	Principal Environmental Consultant and Partner
Project Manager	Sharon Jones	Principal Environmental Consultant and Partner
Project Consultant	Kate Steyn	Principal Environmental Consultant
Stakeholder Engagement Assistant	Asheerah Meyer	Intern

In addition, SRK assigned a team of experienced principal consultants to review certain specialist studies. Review of ten other studies was outsourced. The credentials of the reviewers are presented in Table 1-2. Details of which specialist undertook which review are presented in Sections 4 and 5. CVs of specialist reviewers are included in Appendix B.

Table 1-2: Designation and professional registration(s) of review team

Name	Designation	Organisation	Professional Registration(s)
<i>EIA and EMP Reviewers</i>			
Chris Dalgliesh	Principal Environmental Consultant	SRK	Registered EAP (2019/413) Member International Association of Impact Assessment (IAIAsa)
Sharon Jones	Principal Environmental Consultant	SRK	Pr Sci Nat (400122/05) Registered EAP (2020/247) Member IAIAsa

Name	Designation	Organisation	Professional Registration(s)
Kate Steyn	Principal Environmental Consultant	SRK	Member IAIAAsa
Jennifer Barnard	Principal Environmental Consultant	SRK	Pr.Sci.Nat. (400197/09) Registered EAP (2020/2492) Member IAIAAsa
<i>Specialist and Technical Reviewers²</i>			
Rob Gardiner	Principal Environmental Scientist	SRK	Pr Sci Nat (400079/03) Registered EAP (2020/1390) Member IAIAAsa
Nicola Rump	Principal Environmental Scientist	SRK	Registered EAP (2019/611) Member IAIAAsa
Hasheel Tularam	Principal Environmental Scientist	SRK	Pr.Sci.Nat (117336) Chairman for National Association for Clean Air (NACA) Kwa-Zulu Natal South Africa Society for Atmospheric Science
Bruce Engelsman	Principal Engineer	SRK	Pr Eng (980152) SACPCMP (D/893/2005) Fellow of the South African Institute of Civil Engineers (SAICE) (201900328)
Kelly Armstrong	Environmental Consultant	SRK	Registered EAP (2019/1167)
Dr. Dawid de Villiers	Specialist Scientist	SciRAD Consulting (Pty) Ltd	International Health Physics Society, International Radiation Physics Society SACNASP (400143/10) South African Institute of Physics (2015002) Southern African Radiation Protection Association
Chanel Barnard	Tourism Research and Planning Specialist	Urban-Econ Development Economists (Pty) Ltd	South African Property Owners Association Membership Urban-Econ Development Economists (Pty) Ltd
Johan Christoff Krogscheepers	Professional Engineer	Innovative Transport Solutions	Fellow of SAICE (090491) Registered Engineer, Engineering Council of South Africa (920021) Member of the Institute of Transportation Engineers (32767)
Tim Florence	Associate Town and Regional Planner	Planning Partners	SACPLAN (Pr. Pln A/1877/2014) Royal Town Planning Institute Licentiate member (106982)
Dr. Willie van Niekerk	Qualified Environmental Professional (USA) (Environmental Toxicologist)	Infotox (Pty) Ltd	Qualified Environmental Professional (USA) Environmental Toxicologist (Institute of Professional Environmental Practice, USA) Pri Sci Nat (South Africa) Member of NACA Member of the Toxicology Society of South Africa

² Not already listed above

1.4 Structure of this Report

This report describes the proposed activity and its context, presents the methodology and findings of the FEIR and specialist study reviews and details the stakeholder engagement process. The report consists of the following sections:

Section 1: Introduction

Provides an introduction and background to the CCIA and FEIR Review and outlines the purpose of this document, outlines the approach to the FEIR and specialist study review process, provides details of the review team and the assumptions and limitation applicable to the study.

Section 2: Nuclear-1 Project Overview

Provides a brief description for the proposed Nuclear-1 Project and (previous) authorisation process.

Section 3: Findings of EIA and EMPr Review

Presents the key findings of the review of the FEIR and EMPr, relating to the Duynefontein site.

Section 4: Findings of Specialist Impact Assessment Reviews

Presents the key findings of the review of each of the specialist impacts assessments which informed the EIA process.

Section 5: Findings of Technical Assessment Reviews

Presents the key findings of the review of each of the technical assessments and studies which informed the EIA process.

Section 6: Review Report and CCIA Stakeholder Engagement

Details the stakeholder engagement activities conducted for the CCIA and Review Report.

Section 7: Conclusions and Recommendations

Summarises the key findings of the review and recommends a way forward.

1.5 Assumptions and Limitations of the Review

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

- The project for which Eskom is seeking authorisation and as described in the FEIR has not changed;
- Assessment and comment on an appropriate energy mix (e.g. coal, gas, nuclear, renewables) are excluded from the scope of this review;
- The purpose of stakeholder engagement coordinated by SRK is to solicit comment **only on the reviews** of specialist studies, the FEIR and EMPr as documented in this Review Report, as well as the CCIA. The purpose is expressly **not** to reopen comment on the issues raised during the EIA process undertaken by GIBB;
- Once the appeal process is finalised, Eskom will need to acquire a number of other (environmental) permits and licences and it is assumed that Eskom will apply for these in terms of the legislation applicable at the time. This review excludes a detailed review of recent updates to legislation governing such licensing requirements;
- In this document references to the DFFE may be used interchangeably with former Departments responsible for authorisations in terms of NEMA (e.g. DEAT, DEA and DEFF);

- SRK is permitted to utilise the stakeholder database provided by Eskom without contravening the Protection of Personal Information Act 4 of 2013 (POPIA); and
- The executive summaries of the Review Report and CCIA have been translated from English into isiXhosa and Afrikaans. In the event of any inconsistencies in meaning between the versions, the English version must be considered as definitive.

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

2 Nuclear-1 Project Overview

2.1 Nuclear-1 Project

Eskom proposes to construct, operate and decommission a conventional nuclear power station in South Africa in order to meet the total demand for electricity. In many countries, including South Africa, economic growth and social needs are resulting in substantially greater energy demands, in spite of continued and accelerated energy efficiency advancements. As a result, new generating capacity must be installed to cater for the growth in energy demand or to replace aging plants. (GIBB (Pty) Ltd, 2016).

Pressurised Water Reactor (PWR) technology, which uses water as a coolant and moderator, was chosen by Eskom for Nuclear-1. A simplified diagram of a PWR unit is provided in Figure 2-1.³

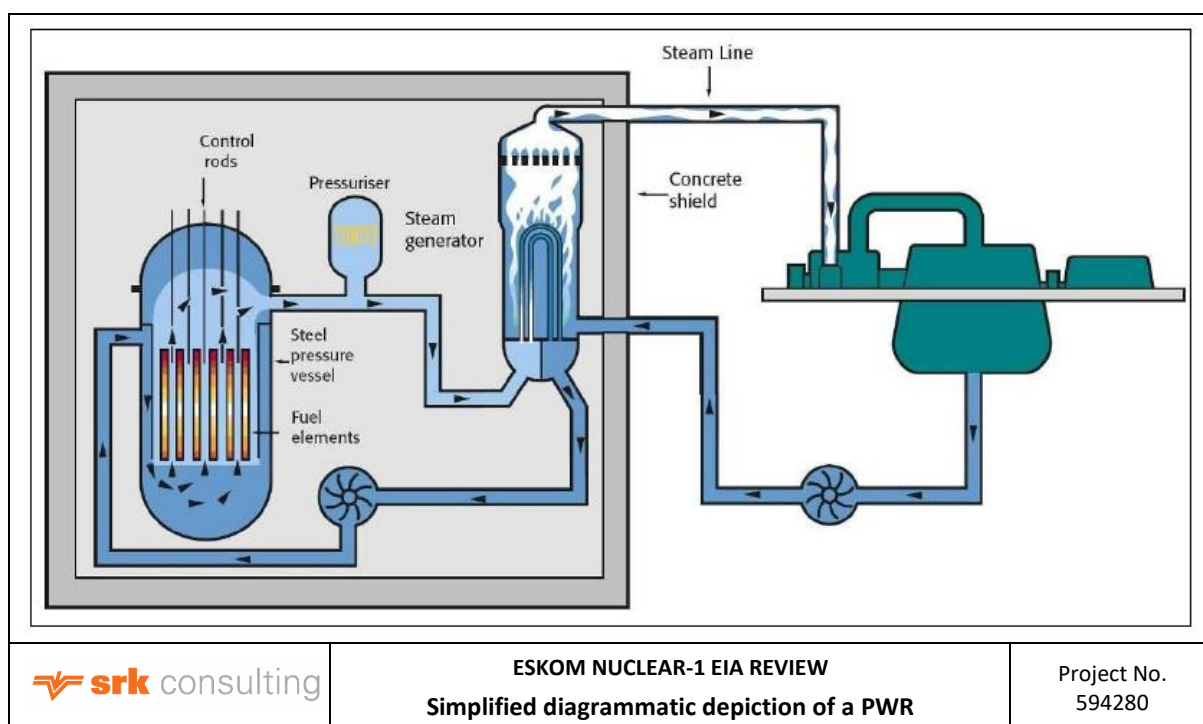


Figure 2-1: Simplified diagrammatic depiction of a Pressurised Water Reactor (Ragheb, 2008)

PWRs are the most commonly used nuclear reactors internationally. Eskom is familiar with this technology from a Health and Safety, as well as an operational perspective, having used it for the past 30 years at the Koeberg Nuclear Power Station (KNPS). A nuclear power station of standard Generation III design is favoured by Eskom due to the operational simplicity and rugged design, availability, reduced possibility of core melt accidents, minimal effect on the environment, optimal fuel use and minimal waste output (GIBB (Pty) Ltd, 2016).

Detailed descriptions of the proposed nuclear plant are not available, as a preferred supplier has not been selected. The approach used in the EIA process was thus to specify enveloping environmental and other relevant requirements, to which the power station design and placement on site must comply. The enveloping criteria have been developed to ensure that they represent the most conservative parameters associated with the various plant alternatives within the PWR technologies.

The total footprint required for the (4 000 MW) Nuclear-1 at Duvnefontein is ~265 ha; however the area assessed in the EIA made allowance for a potential future expansion of Nuclear-1 up to 10 000 MW

³ Although the nuclear power station in this figure does not obtain its cooling water from the sea, the principle of its operation remains the same.

(excluded from the authorisation process). The actual Nuclear-1 building (reactor units and turbines) will occupy one third of the footprint, with the remainder of the area affected by earthworks, topsoil stockpiles, contractors' yards and laydown areas. In addition to the footprint of Nuclear-1 power station, two categories of exclusion zone for emergency planning purposes are implemented around the Nuclear-1 complex. Internationally accepted exclusion zones are being considered for Nuclear-1. The size of the emergency planning zones will be determined by the National Nuclear Regulator (NNR), as per the National Nuclear Regulator Act 47 of 1999 (NNRA).

The proposed Nuclear-1 Project will include *inter alia* the nuclear reactor, turbine halls, fuel storage facilities, waste handling facilities, intake and outfall structures required to obtain / release water used to cool the process, a desalinisation plant, power lines within the plant site, roads, the high voltage yard, and any other auxiliary service infrastructure. If authorised, construction of Nuclear-1 is expected to extend over approximately nine years (GIBB (Pty) Ltd, 2016)

Three site alternatives were assessed in the EIA:

- Duynefontein, situated adjacent and to the north of the KNPS on the Cape West Coast, approximately 35 km north of Cape Town. The site falls within the existing Eskom- owned property, which includes a nature reserve;
- Bantamsklip, which is situated on the Southern Cape coast, mid-way between Danger and Quoin Points. The site forms a part of the total Bantamsklip Eskom-owned property, and is primarily utilised for flower harvesting and fishing; and
- Thyspunt, which is situated on the Eastern Cape coast between Oyster Bay and St. Francis Bay. The site for the proposed Nuclear-1 is currently Eskom-owned, but there are a number of houses on the adjacent properties, outside the proposed nuclear power station's EPZs (GIBB (Pty) Ltd, 2016).

The FEIR recommended authorisation of the Nuclear-1 development at the Thyspunt site, but DFFE authorised the development in the Duynefontein site. However, it has always been Eskom's intention to prepare for more than one Nuclear Power Station. It was thus stated from the onset of the EIA process that all original sites identified during the Nuclear Site Investigation Programme (NISP) will be considered for the development of power stations, as far as they are deemed acceptable by the EIA process (GIBB (Pty) Ltd, 2016). In other words, Eskom may still undertake processes to authorise development of a Nuclear Power Station at Thyspunt and/or Bantamsklip.

2.2 EIA and Authorisation Process

GIBB was appointed by Eskom as the independent Environmental Assessment Practitioner (EAP), to undertake an EIA process and compile an FEIR and Environmental Management Plan (EMP) for the proposed Nuclear-1) and associated infrastructure. A number of specialists studies were commissioned to inform the EIA.

The EIA process for Nuclear-1, undertaken in terms of the EIA Regulations 2006, comprised two phases, the Scoping Phase and EIA Phase. An application was initially submitted to the (former) DEA in May 2007 and later amended in July 2008 for a single nuclear power station of up to 4 000 MW. The Scoping Report was approved in November 2008, recommending that two of the five alternative sites considered during the Scoping Phase, namely Brazil and Schulpfontein in the Northern Cape, be excluded from further consideration in the EIA, based on limited local demand and the lack of existing electricity transmission corridors. The DEA approved the Final Plan of Study for the EIA in January 2010 (GIBB (Pty) Ltd, 2016).

The EIA assessed the potential environmental impacts of the proposed nuclear power station at three sites, namely Duynefontein and Bantamsklip in the Western Cape and Thyspunt in the Eastern Cape. Draft EIRs were released for public comment in 2011 and - following additional investigations and specialist assessments requested by DEA - again in 2015.

On 11 October 2017, the DFFE granted EA for a new nuclear plant at Duynefontein. The decision was appealed and on 8 August 2022 the appeal process was adjourned to afford Eskom an opportunity to commission additional studies (the CCIA and this Review Report) to inform a final decision on the appeal.

3 Findings of FEIR and EMPr Review

3.1 Introduction

This review is of the FEIR and EMPr for the Eskom Nuclear Power Station and Associated Infrastructure (Nuclear-1) prepared by ARCUS GIBB (Pty) Ltd dated February 2016. Although the key finding and final recommendation of the FEIR was that the (former) DEA consider authorising the Thyspunt site for the Eskom Nuclear-1 Power Station, DEA authorised the Nuclear-1 Project on the Duynefontein site, citing reasons for their decision in the EA (DEA Ref 12/12/20/944) dated 11 October 2017. As such, this review considers only aspects of the FEIR and EMPr applicable to the Duynefontein site.

The review of the FEIR considered a number of key components:

- Project description;
- Need and desirability;
- Legislative requirements;
- EIA methodology, including:
 - Public participation process;
 - Content of the FEIR; and
 - Assumptions and limitations;
- Relevance of baseline data;
- Identification and assessment of impacts;
- Identification and assessment of alternatives;
- Conclusions of the EIA process; and
- Mitigation measures and the EMPr.

A brief overview of each of these aspects as presented in the FEIR is provided in the sections below, along with an evaluation of whether or not this information remains fit-for-purpose and adequate for DFFE (the Minister) to take a final decision on the Project.

3.2 Project Description

The project description as summarised in the executive summary of the FEIR is presented in Section 2.1. The FEIR provides a detailed description of the proposed Nuclear-1 Project including:

- The status and ownership of the Duynefontein site;
- The principles and history of nuclear power plants as well as the proposed nuclear technology for Nuclear-1 with simplified technical diagrams to depict proposed technology;
- A timeframe for construction and power station lifecycle;
- Major associated infrastructure and other activities required during construction including marine works;
- Labour and working conditions, e.g. human resources required, accommodation requirements and staff facilities;
- Water requirements and water sources;
- Construction materials (and volumes), and transportation;

- Operational inputs and outputs;
- Construction and operational waste, effluent and emissions management strategies;
- Nuclear safety considerations;
- Decommissioning requirements and plans; and
- Related projects, subject to separate EA processes but which have been considered in the assessment of cumulative impacts.

Pressurised Water Reactors are still Eskom's preferred technology for the Nuclear-1 Project and Eskom has confirmed that there have been no changes to the project description presented in the FEIR and assessed by the specialists. As discussed in Section 3.5.3 all assumptions in the FEIR relating to the project description remain valid, notably the approach of specifying a conservative envelope of design data and other relevant requirements, with which the detailed Nuclear Power Station design and layout must comply (once a vendor has been appointed).

The project description as presented in the FEIR is therefore considered still valid.

3.3 Need and Desirability

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

In South Africa the need for electricity generation capacity expansion was identified as far back as 1998 when it was reported that Eskom's generation capacity surplus, at that stage, would be fully utilised by approximately 2007. This figure was based on Eskom forecasts for an assumed demand growth of 4.2% and it was recommended that appropriate strategies, including those with long lead times, were implemented in time. By 2007, electricity demand exceeded supply and Eskom was forced to implement load shedding to ensure that the network remained stable. Load shedding was necessary to ensure that the generation and transmission systems did not collapse, by rotating the load in a planned and controlled manner (GIBB (Pty) Ltd, 2016). South Africa will or may continue to experience an electricity base load capacity deficit into the future if it does not construct additional base load generation capacity to cater for future increased demand and replace existing power stations that will be decommissioned in the next few decades.

The Government is mandated to ensure the secure and sustainable provision of energy for socio-economic development. The Integrated Resource Plan (IRP) is viewed as the Government's policy commitment to the mandate and the manner in which it proposes to meet current and projected energy demands. The IRP determines South Africa's long term electricity demand and the type, cost, timing and generating capacity required to meet this demand.

In the FEIR, the *(now superseded)* IRP 2010 underpins the evaluation of the need and desirability of the proposed Nuclear-1 project. In terms of the gazetted IRP 2010, applicable when the EIA process was undertaken, South Africa needed to install an additional 40 000 MW of generation capacity by 2025, of which the IRP 2010 mandated that 9 600 MW must be nuclear and 11 400 MW must be from renewable sources. Eskom thus proposed, as part of a range of initiatives to increase electricity energy generation mandated by the IRP 2010, to construct and operate the proposed Nuclear-1 with a maximum generation capacity of 4 000 MW. This would be the first of a number of proposed new nuclear power stations to meet the IRP's goal of 9 600 MW of nuclear generation (GIBB (Pty) Ltd, 2016).

Along with coal-fired power stations, the IRP 2010 considers nuclear to be the most feasible option available to South Africa to supply base-load generation capacity. Policy however dictates that South Africa must make increasing use of nuclear power generation to reduce Greenhouse Gas (GHG) emissions. Over the full lifecycle GHG emissions from nuclear power generation is a fraction of those generated using coal. The 2010 IRP presents these arguments and accordingly includes 9 600 MW of nuclear in the power generation mix. The continued use and further development of renewable energy technologies is in no way precluded by nuclear. As pointed out in the FEIR, nuclear generation is not seen as an alternative to renewable technologies in the IRP, with the IRP proposing that both technologies need to be developed in parallel (GIBB (Pty) Ltd, 2016).

Although South Africa's electricity supply remains constrained currently, demand for electricity in the five years following the publication of the IRP was less than projected in the IRP 2010. As such stakeholders questioned the need and desirability for nuclear power in general and the proposed Nuclear-1 project specifically since the need and desirability was based principally on the IRP 2010.

The EIA acknowledged the significant reduction in demand for electricity since the publication of the IRP 2010 but noted that the future need for base-load generation remains even if the load growth does not materialise. The authors further noted that an EIA is by definition project specific and that it is beyond the remit of an EIA to second-guess national policy decisions. As such the need and desirability for the Nuclear-1 project was a function of the dictates of the IRP 2010 (GIBB (Pty) Ltd, 2016).

Subsequent to the conclusion of the EIA process, the IRP 2019 was gazetted. The IRP 2019 identifies the preferred generation technologies required to meet projected demand up to 2030, incorporating objectives such as reduced GHG emissions, reduced water consumption, affordable electricity, diversified electricity generation sources and localised and regional development. The envisaged energy mix includes coal, nuclear, natural gas, renewable energy and hydropower sources. Energy (battery) storage is deemed important in the South African context where the power system does not have the requisite storage capacity or flexibility required for the large increase in renewable energy.

While the IRP 2010 mandated that 9 600 MW of the energy mix must be nuclear, the IRP 2019 envisages the total nuclear capacity by 2030 remaining 1 860 MW, based on a proposed extension of the lifespan of the existing 1 860 MW KNPS by 20 years from 2024. The IRP however acknowledged that this extension in lifespan, once all the necessary regulatory approvals have been received, will increase the capacity of the KNPS to its original design capacity of 1 926 MW (DoE, 2019). The IRP 2019 further acknowledges South Africa's decision to expand the nuclear programme into the future noting the >10 year lead time for decision making and implementation (thus extending beyond 2030) noting that the expected decommissioning of 24 100 MW of coal fired power plants post 2030 supports the need for additional capacity from clean energy technologies including nuclear (DoE, 2019).

It is thus SRK's opinion that while the information presented in the FEIR relating to the IRP, current and proposed additional generation capacity may be out of date, this will not affect the motivation that additional power generation capacity is urgently required in South Africa (probably more so than at the time the EIA was completed).

It is not within the remit of this review to decide which forms of energy generation are most appropriate; that decision (and the Minister's final decisions regarding the Nuclear-1 Project) is political in nature and better guided by the IRP 2019 (DoE, 2019) which considers a mix of energy sources.

3.4 Legislative and Policy Requirements

The Planning and Legislative Context chapter of the FEIR aimed is to provide a comprehensive but succinct review of all planning, development, environmental, electricity-generation and distribution legislation, as well as an overview of that legislation, which is of particular relevance to the regulation of the nuclear energy industry (GIBB (Pty) Ltd, 2016).

Compliance with relevant policies and plans largely informed the evaluation of the need and desirability of the project, discussed in Section 3.3. In addition, the relevance (and changes to) policies and legislation applicable to various specialist fields have been considered in the reviews of individual specialist studies (Sections 4 and 5). The review of the legislative requirements detailed in the FEIR thus focussed on those relating to the EIA process and associated permitting processes.

3.4.1 Legislative Requirements

The FEIR notes that the legislative requirements for nuclear facilities in South Africa are extensive. In the case of a Nuclear Power Station, two key authorisations are required:

- Environmental Authorisation (EA) in terms of NEMA and the EIA Regulations from the National DFFE; and
- A Nuclear Installation Licence in terms of Sections 20 and 21 of the NNRA from the NNR.

In terms of NEMA, the DFFE is (currently) responsible for decision-making regarding the potential impacts of Nuclear-1 on the environment, even though these impacts are likely to include those relating to certain aspects of the radiological hazards associated with the facility. The NNR authorisation process applies specifically to issues of nuclear and radiation safety related to the siting, design, construction, operation and decommissioning of nuclear installations. This review focusses on the EA process and does not consider the requirements to the Nuclear Installation Licence (which are addressed in very comprehensive, separate Site Safety Reports [SSR] commissioned by Eskom).

3.4.1.1.1 EIA Regulations

As described in Section 2.2, the EIA process for the Nuclear-1 facility was undertaken in terms of the 2006 EIA Regulations. The EIA Regulations were amended in 2010 and once again in 2014, both prior to the completion of the EIA process.

The transitional provisions of the 2010 EIA Regulations (Regulation 76 of Government Notice (GN) No. R 543 of 2010) as well as the 2014 EIA Regulations (Regulation 53 of GN No. R982 of 2014) specify that an application that has been commenced in terms of the 2006 EIA regulations must continue according to the requirements of the 2006 regulations, as if these regulations had not been repealed, *provided any newly listed activities are assessed in the FEIR*. Thus, the EIA process continued under the provisions of the 2006 EIA regulations.

The DFFE is mandated to authorise listed activities under the 2010 and 2014 EIA regulations in an EIA process commenced under the 2006 EIA regulations, provided that the impacts of the 2010 and 2014 listed activities are assessed in the EIA process (GIBB (Pty) Ltd, 2016).

In terms of the NEMA and associated EIA regulations (Government Notice Numbers R 385, 386 and 387 of 2006 and R 543, 545 and 546 of 2010 and R982, 983, 984, and 985 of 2014⁴ (applicable when the EIA process was completed), the proposed development triggers a number of listed activities, which require EA before they can proceed.

For the proposed Nuclear Power Station the **key** listed activities⁵ in terms of the 2006 EIA Regulations identified in the EIA process, and for which EA was sought were:

- (1a) *The construction of facilities or infrastructure, including associated structures or infrastructure, for the generation of electricity where the energy generation is greater than 20 Megawatts and the facility exceeds an area of one hectare; and*

⁴ Also referred to as Listing Notices

⁵ There are a substantial number of other listed activities requiring authorisation, which were assessed.

- *(1b) The construction of facilities or infrastructure, including associated structures or infrastructure, for nuclear reaction including the production, enrichment, processing, reprocessing storage or disposal of nuclear fuels, radioactive products and waste.*

The FEIR presents a comparative table of listed activities in terms of the 2006 EIA Regulations and equivalent activities in the 2010 (R 543, 545 and 546 of 2010) and 2014 (R982, 983, 984, and 985 of 2014) Regulations, which were considered (and assessed) in the EIA process. The EA authorises the listed activities in terms of the 2006 and 2014 EIA Regulations, as the 2010 Regulation were no longer valid when the EA was issued.

In 2021, subsequent to the conclusion of EIA process and granting of EA, the 2014 EIA Regulations were amended, with new Listing Notices (GN R 517 of 2021) issued. To inform DFFE's decision on the appeal, SRK has considered whether the impacts associated with all **current** listed activities have been assessed. SRK's review of GN R 517 of 2021 confirms that the latest additions to the listed activities relate primarily to mining and oil and gas projects and changes to other listed activities were of a relatively minor nature. No additional listed activities applicable to the Nuclear-1 Project have been added. *SRK therefore believes that the impacts of all current listed activities have been assessed in the FEIR.*

In addition to listing the activities requiring EA, the EIA Regulations specify the authorisation (EIA) process to be followed. The EIA process and methodology is reviewed in Section 3.5.

3.4.1.2 Specific Environmental Management Acts

The FEIR Report lists and summarises the applicability of a number of Specific Environmental Management Acts (SEMAS) and other environmental legislation applicable (or potentially applicable) to the project, including, but not limited to, the:

- National Environmental Management: Air Quality Act 39 of 2004)
- National Water Act, 1998 36 of 1998;
- The National Environmental Management: Biodiversity Act 10 of 2004;
- National Environmental Management: Protected Areas Act 57 of 2003;
- National Environmental Management: Integrated Coastal Management Act 24 of 2008;
- National Environmental Management: Waste Act 59 of 2008) (NEM: WA);
- Conservation of Agricultural Resources Act 43 of 1983); and
- National Heritage Resources Act 25 of 1999.

Although many of these Acts and related Regulations may have changed since the EIA was undertaken, the EIA process was aimed primarily at obtaining EA in terms of NEMA and the EIA Regulations. The FEIR acknowledges that other environmental permits and licences will be required, and it is expected that (once EA has been finalised) Eskom will apply for the remaining licences in terms of the legislation applicable at the time. SRK has this not undertaken a detailed review of recent updates to these Acts.

3.5 EIA Methodology

The EIA Regulations specify the EIA process to be followed. EIA Regulations, 2014 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 IAP; and

- A draft EMPr must be compiled and released for public comment.

GN R982 of 2014 (Appendix 1-5) sets out the procedures to be followed and content of reports compiled during the EIA process.

SRK believes the EIA process undertaken was adequate to meet the current requirements in terms of the EIA Regulations, 2014, but nevertheless evaluates some key components of the EIA process below.

3.5.1 Public Participation Process

The EIA process undertaken by GIBB included a comprehensive public participation process over a period of ~10 years between 2006 and 2016, which is described in detail in the FEIR. One of the objectives of public participation was to ensure that social impacts were addressed appropriately. To this end, the Social Study specialist was kept informed of the outcome of the public interactions throughout the process and participated in some meetings (GIBB (Pty) Ltd, 2016).

The public participation process included:

- Newspaper advertisements:
 - In three languages in 25 newspapers across three provinces announcing the project and availability of a Background Information Document between May and September 2007;
 - In 14 newspapers in two provinces in March 2010 and May 2011 announcing the availability of the Draft FEIR and Revised Draft FEIR (version 1) respectively;
 - In 12 newspapers in two provinces announcing the release of the Revised Draft FEIR (version 2) in September 2015;
- Notification of stakeholders and other potential IAPs via site notices, posters, letters, emails, radio announcements and loud hailing in certain communities;
- Registration of, and consultation with ~ 4 500 stakeholders;
- A total of 50 meetings with stakeholders between June 2007 and March 2008, attended by over 1 700 IAPs (during the Scoping Phase). During the EIA Phase at total of 46 stakeholder and authority meetings were held:
 - 20 between March and May 2010 following release of the Draft FEIR for public comment;
 - 11 between May and July 2011 following release of the Revised Draft FEIR (version 1);
 - 16 between October and December 2015 following the release of the Revised Draft FEIR (version 2).
- Stakeholders were afforded three opportunities to comment on the Draft FEIR (various versions) with comment periods of 116, 90 and 75 calendar days respectively, allowing stakeholders adequate opportunity to review documents and submit comments; and
- Distribution of the Draft FEIR(s) at ~20 locations and on Eskom and the Consultant's websites.

All comments received were recorded and responded to in an Issues and Responses summary with comments grouped thematically and responses provided to the most common and significant issues, given the large volume of comments received. Key issues raised (for the three Nuclear-1 sites) include:

- Concerns about nuclear technology in general and opposition to nuclear energy generation in principle⁶;

⁶ The majority of IAPs who have actively engaged in the EIA process are those who are opposed to nuclear technology in principle or opposed to large a development close to the area where they live (GIBB (Pty) Ltd, 2016).

- Concerns about the nuclear vendor selection process;
- Economic feasibility of a Nuclear Power Station;
- Financial implications of the proposed Nuclear Power Stations (including economic implications to the consumer and impacts on electricity prices);
- Provision for insurance for a nuclear disaster;
- Consideration of alternative electricity generation alternatives, with a specific emphasis on renewable energy (solar and wind power) and the comparative costs of nuclear vs. renewable generation;
- The continued need and desirability of Nuclear-1 and nuclear power in general;
- Risks associated with human health including the potential impacts of a catastrophic incident;
- Concerns around waste disposal (including high-level nuclear waste);
- Change in the social landscape;
- Impacts on off-site infrastructure;
- Institutional capacity;
- Emergency preparedness and evacuation (GIBB (Pty) Ltd, 2016).

The FEIR was also made available for public comment, with comments submitted directly to the DFFE.

GIBB noted that the stakeholders are located mostly in close proximity to the proposed sites but some issues are of national importance and have been raised by stakeholders from further afield.

Individual comments and responses have not been reviewed. Given that there have been no changes to the project description and that the specialist study reviews (Sections 4 and 5) have not identified any material gaps or changes it is reasonable to assume that responses will generally remain valid or, where they may be outdated, relevant information is provided in other sections of this report. For example, responses regarding the need and desirability may be outdated, as discussed in Section 3.3 and/or are considered in Sections 4 and 5 of this Review Report.

The public participation process undertaken by GIBB was comprehensive and far exceeded the requirements of 2006 EIA Regulations as well as current requirements.

It is plausible that there are a number of new stakeholders in the vicinity of the Duynefontein site, since the last formal public participation activities were undertaken in 2016. These individuals or organisations were not consulted during the EIA public participation process but may be affected by the project. Although it is unlikely that any new concerns would be raised, the public participation process proposed through the current review process (see Chapter 6) will afford any new stakeholders an opportunity to raise any such comments and concerns and register on the project database to be kept informed of future developments as well as the final decision taken by DFFE.

SRK believes that the original public participation process provided DFFE with a comprehensive understanding of stakeholder interest and comments (relating specifically to the Duynefontein site) to inform decision making.

3.5.2 Content of FEIR

Contents of the FEIR were informed by (and complied with) the requirements of Regulation 32 of Government Notice No. R. 385 of 2006. The EIA Regulations, 2014 GN R 982, which came into effect on 8 December 2014, prescribe the current required content in an EIA Report, in some cases with very specific requirements.

While the FEIR is not required to comply with GN R 982, a review of the contents of the report confirmed that the FEIR largely complies with these requirements, with a few (non-material) gaps e.g.

- CV of the EAP who prepared the report;
- 21 digit Surveyor General codes of the properties on which the development is proposed; and
- Undertaking under oath or affirmation by the EAP.

These gaps should not in any way affect DFFE's ability to take a final decision on the project or the decision taken.

3.5.3 Assumptions and Limitations

The EIA Report lists a number of assumptions and limitations the majority of which remain valid. Certain **key** assumptions and limitations however warranted further consideration in this review. Each of these is listed (in italics) below, followed by SRK's evaluation of the current validity thereof. Note that this excludes any assumptions and limitations applicable to specific specialist or technical studies or assessments, which have been considered in Sections 4 and 5 of this report.

- *The need and desirability for the Nuclear Power station is adequately defined by the current IRP. If the future IRP does not include the option for nuclear power as a result of a change in demand patterns and supply options then the need and desirability will fall away;*

The need and desirability of the project are discussed in Section 3.3. The IRP 2019 identifies the preferred generation technologies required to meet the expected demand up to 2030, with an envisaged energy mix including coal, nuclear, natural gas, renewable energy and hydropower sources. It is not within the remit of this review to decide which forms of energy generation are most appropriate; that decision (and the Minister's final decision regarding the Nuclear-1 Project) is political in nature and better guided by the IRP 2019 (DoE, 2019) which considers a mix of energy sources.

- *At the time of compiling the FEIR, Eskom and the South African Government had not yet decided on a vendor for the supply of nuclear power station plant type. Thus, an "envelope" of data (consistent dataset [Appendix C of the FEIR]) was used to model the impacts of the proposed power station. This envelope includes the highest (or lowest were applicable) possible values for various aspects for a range of different nuclear technology vendors. It is assumed that the design specifications of the proposed plant by the approved vendor will conform to the "envelope".*

Eskom has confirmed that the consistent dataset used to model the impacts of the proposed power station remain valid, and that since a vendor has not yet been identified, more detailed design information is not available.

- *Authorisations other than the EIA authorisation (e.g. Water Use Licences, authorisations for heritage site excavations as well as additional authorisations in terms of, amongst others, Sections 27, 35, 36 and 38 of the NHRA, borrow pit authorisations, licences for the removal of protected trees and other plans, etc.) falls outside the scope of this application. The Applicant will apply for these authorisations through separate processes.*

These authorisation processes will commence once a positive EA in terms of NEMA is granted. Eskom is aware of the required licences and this assumption remains valid.

- *The EMP is regarded as a dynamic document and will be kept updated by the Applicant as new information becomes available.*

The EMP has not yet been approved and this assumption thus remains valid. An outcome of this review (and the CCIA) may be that additional information is found to be relevant or that additional mitigation measures are identified warranting changes to the EMP.

- *It is assumed, based on information provided by the Eskom engineering team, that the proposal for piped offshore disposal of spoil is technically feasible. Should this not be the case, then a re-assessment of the impacts of spoil disposal proposals would be required.*

Further technical feasibility studies will only be undertaken once the current EA application and associated appeal process has been concluded, and this assumption thus remains valid.

- *It is assumed that the figures provided by Eskom in the Consistent Dataset are accurate. This assumption applies particularly to the volumes of spoil to be disposed at each of the alternative sites and to the cooling water intake and outlet pipes, since these are critical factors that will determine the nature and significance of impacts on oceanographic conditions and marine organisms.*

As indicated above, Eskom has confirmed that the consistent dataset used to model the impacts of the proposed power station remain valid.

- *It is assumed that the NNR will accept Eskom's proposal, adopted from the European Utility Requirements (EUR) for new reactor designs, for Emergency Planning Zones of 800 m and 3 km for the Protective Action Zone and the Urgent Protective Zone, respectively. Should this not be the case, a re-assessment of the impacts in relevant specialist studies and in the FEIR may need to be undertaken.*

This assumption remains valid. Once a vendor has been identified and the power plant design is known, studies will be submitted to the NNR for a decision on zone sizes as proposed by Eskom. No additional information is currently available indicating a potential change in the proposed dimensions of the zones or warranting further assessment at this stage.

SRK has assessed that the assumptions and limitations in the EIA remain valid, and no re-assessment of impacts is required due to changes in assumptions.

3.6 Relevance of Baseline Data

The EIA provides a description of the physical, biophysical and social baseline environment at each of the alternative sites, informed by the specialist assessments.

It is expected that the baseline conditions as described in the FEIR may have changed since the specialist studies were concluded. *The validity of the baseline data presented by specialists was evaluated in the reviews of the specialist studies (see Sections 4 and 5 of this Review Report) which found that no material changes to the baseline have occurred which would invalidate the FEIR.*

3.7 Identification and Assessment of Impacts

Approximately 200 impacts were identified and assessed for the Duynefontein site⁷. Given the multitude of impacts assessed and requests by authorities and stakeholders to simplify impacts without losing the essence of the specialist findings, GIBB summarised the adverse impacts of the proposed development as potential deteriorations/reductions in:

- Public health and safety due to the Nuclear Power Station itself;
- Public health and safety due to activities associated with the Nuclear Power Station;
- Livelihoods;
- Marine water quality;
- Surface (fresh) water quality;

⁷ Some impacts assessed were only applicable to Thyspunt.

- Groundwater quality;
- Availability of water/groundwater;
- Populations of rare/sensitive species;
- Populations of species;
- Heritage resources;
- Wetland numbers; and,
- Wetland functioning (including fragmentation).

Potential benefits were summarised as potential increases/improvements in:

- Electricity supply;
- Conservation of heritage resources;
- Jobs;
- Infrastructure upgrades;
- Conservation of biodiversity; and
- Livelihoods.

Following mitigation, the majority of impacts were rated to be of Medium or lower significance, with only one (heritage - destruction of landscape) impact of High significance. Economic and some social benefits of High significance included (local) construction phase macroeconomic impacts and creation of (construction phase) employment opportunities.

The list of impacts identified is extensive, in many cases addressing concerns raised through the EIA and related public participation process. The assessment of impacts was informed by a range of specialist assessments. Specialists were required to assess and rate potential impacts in terms of a rigorous and standardised assessment methodology, in order to ensure that potential environmental impacts have been adequately investigated and that any relevant shortcomings and / or gaps can be addressed. This includes consideration of uncertainty in predicting impacts and potential cumulative effects. Specialists were also required to consider and recommend appropriate mitigation measures in the light of their likely effectiveness and practicality (GIBB (Pty) Ltd, 2016).

SRK is of the opinion that a robust impact assessment methodology was employed and relevant impacts were assessed. The validity of the impacts assessed by specialists was evaluated in the reviews of the specialist studies (see Sections 4 and 5 of this Review Report) which found that no material omissions in the impact assessments which would invalidate the FEIR.

3.8 Identification and Assessment of Alternatives

The identification, description, evaluation and comparison of alternatives are important for ensuring the objectivity of the assessment process. The aim is to ensure that the selected decision or activity has the lowest negative impacts and the highest positive impacts, while meeting the identified need. The NEMA EIA Regulations of 2006, 2010 and 2014 define alternatives in relation to a proposed activity as “*different means of meeting the general purpose and requirements of the activity*”, which may include alternatives to the –

- (a) property on which or location where it is proposed to undertake the activity;
- (b) type of activity to be undertaken;
- (c) design or layout of the activity;

- (d) *technology to be used in the activity;*
- (e) *operational aspects of the activity;*
- and includes the option of not implementing the activity”.*

Every EIA process must therefore identify and investigate alternatives, with feasible and reasonable alternatives to be comparatively assessed. However, if after having identified and investigated alternatives, no feasible and reasonable alternatives are found, no comparative assessment of alternatives, beyond the comparative assessment of the preferred alternative and the option of not proceeding (the No-Go alternative), is required during the EIA phase (GIBB (Pty) Ltd, 2016).

A wide range of alternatives was considered and assessed during the EIA process. Alternatives considered and the conclusions drawn through the EIA process are as follows. Only the site alternatives were comparatively assessed in the FEIR⁸:

- **Site alternatives:** with comparative assessment of the Thyspunt and Duynefontein sites⁹ concluding that both sites are environmentally suitable for the development of a nuclear power plant. Although the Thyspunt site is environmentally more sensitive, it would provide the greatest immediate return from an electricity supply point of view;
- **Activity alternatives:** considering various *power generation technologies* and concluding that neither coal nor hydropower were suitable alternatives in the Western Cape and that (at the time) renewable energy (wind and solar power) could not provide adequate base load or integrate easily into the existing power network;
- **Technology alternatives:** various *nuclear plant types* were considered by Eskom with PWR selected as it is the most common technology utilised internationally, has been successfully operating at KNPS for over 30 years and Eskom is familiar with the technology;
- **Layout alternatives:** Within the identified development envelope¹⁰ on the Duynefontein site, two layouts were identified - the first extending longitudinally along the coastline, with the second, more compact layout selected to avoid impacts on the active dunes of the Atlantis corridor dunefield;
- **Fresh water supply alternatives:** with desalination proposed as a guaranteed source of fresh water for the lifespan of Nuclear-1 without jeopardising the availability of fresh water to other users and groundwater to be abstracted initially to create a Nuclear Island¹¹;
- **Management of brine:** The disposal of brine into the sea or the co-disposal of brine and cooling water into the sea is environmentally acceptable. Although brine disposal into the surf zone is environmentally acceptable for short periods (during construction) the EAP recommended that the construction phase brine is disposed beyond the surf zone;
- **Intake of sea water:** The installation of undersea pipelines to abstract water from the ocean and feed cooling water into a storage area (intake basin) is the only feasible alternative;
- **Outlet of water and chemical effluent:** Outlet structures for cooling water and chemical effluent must be offshore, with releases at appropriate distances from the shore;

⁸ Noting that Eskom may eventually consider development of nuclear facilities on all of the sites found to be suitable.

⁹ Bantamsklip was excluded from the Final EIR

¹⁰ Avoiding environmentally sensitive features, notably within 200 m of the high water mark of the sea and 100m from any wetland.

¹¹ The “Nuclear Island” is that part of the power station that houses the reactor core, the balance of the nuclear steam supply system and all other systems which support the nuclear processes.

- **Management of spoil material:** as much fine spoil as possible must be disposed of in the marine environment, with strict adherence to recommended pumping rates and distances offshore, with the remainder utilised on site to minimise off-site disposal to landfill;
- **Management of radioactive waste:** The only feasible and reasonable alternative for the disposal of Low and Intermediate Level (Radioactive) Waste (LILW) is disposal at the Vaalputs Nuclear Waste Disposal Site¹². The only alternative currently available in South Africa for High-Level Waste (spent fuel), is long-term storage at the nuclear power station; and
- **The no-development alternative** (i.e. 'No-Go'): The status quo would be retained with the benefits of the development not being realised.

The above alternatives were (in most cases) not comparatively assessed by specialists, although the findings of (particularly technical) specialist studies informed the evaluation of some alternatives.

Key findings regarding the assessment of alternatives are as follows:

- *Many of the above alternatives were considered and eliminated during the Scoping Phase. Only site alternatives were comparatively assessed in detail in the FEIR. Acceptance of the Scoping Report and Plan of Study for EIA by DFFE indicates acceptance of this process;*
- *The reasons for selecting and screening of alternatives considered technical and ecological criteria and are adequately described in the FEIR. Motivations are adequate and largely remain valid; and*
- *There has been a substantial increase in the development of renewable energy projects, in recent years (since the EIA was concluded). The statement in the FEIR that that renewable energy (wind and solar power) could not provide adequate base load or integrate easily into the existing power network may no longer be correct; however the energy mix is informed by the IRPs. It is not within the remit of this review to decide which forms of energy generation are most appropriate; that decision (and the Minister's final decisions regarding the Nuclear-1 Project) is political in nature and better guided by the IRP 2019 (DoE, 2019) which considers a mix of energy sources.*

3.9 Conclusions of the EIA process

Following a detailed comparative assessment of the impacts associated with the development of Nuclear-1 at the Thyspunt and Duynefontein sites, the EAP recommended that the Nuclear-1 development is authorised at the Thyspunt site. Although the site was considered more sensitive, it would provide the greatest immediate return from an electricity supply point of view.

Findings relevant to the Duynefontein site granted EA by DFFE were as follows:

- The establishment of Nuclear-1 at Duynefontein would occur against a backdrop of an existing Nuclear Power Station, large-scale transmission lines and a far more urbanised environment than at Thyspunt; therefore the perception of change will be far smaller at Duynefontein;
- There will be no fundamental change in the sense of place at Duynefontein, the change would be experienced as a more intensive form of the same type of development;
- The 265 ha development at Duynefontein will lead to the loss of conserved land. The conservation area was directly premised on the establishment of the KNPS and has been judicious use of the land that is owned by Eskom and kept free of development for safety reasons. The loss of that conservation area is material and an offset would be required to ensure that there is no net loss of ecological value;

¹² The only authorised facility for this form of waste in South Africa and it has or will have sufficient capacity for the waste that will be generated by Nuclear-1.

- The proposed Nuclear Power Station could be developed without a material reduction in the ecological value of the site, with continued protection afforded to the property through the prevention of other developments;
- The most significant disruption will occur during the Construction Phase, while the Operations Phase would have a much lower level of impact on the natural environment;
- The transmission lines required to evacuate the power pose a number of threats to the environment including direct land transformation, visual impact, and bird mortalities through collision or electrocution;
- Local economic benefits of the project would be less pronounced at Duynefontein given the existing larger regional economy;
- As with all electricity generation, the impacts are felt at the source of generation and along the transmission lines whereas the real benefits manifest at the end of the lines, apart from construction related benefits and those associated with the operation of the power stations. The economic value of the electricity generated is significant but that is a value that will not accrue at a local level (*viz.* in the immediate vicinity of the power station) but rather nationally through use by industrial or other commercial users. The value of electricity is obviously significant too for domestic users;
- Other cumulative effects would typically derive from atmospheric emissions, noise, wastewater discharge and resource consumption. Good ambient air quality and the distance from nearest sensitive receptors make material air quality or noise impacts unlikely;
- The risk of potential adverse health effects of the proposed Nuclear Power Station both at the level of a large scale accidental release with immediate possible fatalities or serious injuries or a long term serious illness is tolerable given the very low likelihood of it occurring due to the defence in depth principles that underpin the design and operation of a modern Nuclear Power Station. The defence in depth principles serve to ensure that radioactivity releases from the power station are kept well below background levels of radioactivity under all circumstances and as such mortality or morbidity as a result of radioactive exposure is highly unlikely;
- Non-radiological exposure risks of mortality and morbidity from the Nuclear Power Station would derive from motor vehicle accidents, potential increases in HIV/AIDS and the presence of a large labour force and increased opportunities for criminal activity. These various effects are inevitably associated with large- scale construction projects and the extent of the effects similarly constrained to the broader project area;
- Impacts on the marine environment are expected due to water abstraction for cooling water and discharge of heated cooling water and brine. Construction activities also pose the risk of contaminated stormwater being discharged from the site into the marine environment and excess spoil is will be disposed in the sea. Very specific operational parameters for the disposal of the spoil at sea, dilution of the brine from the desalination plants using cooling water and the use of a diffuser to limit the impact of heated water pulses into the marine environment will limit the residual risk;
- Many construction activities that could impact surface and ground water quality and groundwater yields. Although there are no perennial watercourses on the site, such spillages could result in contamination of stormwater runoff, which could result in further potential impacts on wetlands, groundwater quality through percolation / recharge or marine discharge;
- The initial use of groundwater before the desalination plant is established will not reduce groundwater yields and the use of hydrological walls to cut off the areas affected by dewatering will limit the extent of the drawdown thereby not impacting in any material way on groundwater flows or quantity; and

- The Duynefontein site is environmentally acceptable for a nuclear power station (GIBB (Pty) Ltd, 2016).

Key recommendations of the FEIR are as follows:

- Should the proposed Nuclear Power Station be authorised then it is proposed that a condition of authorisation should be the development of a Social Impact Management Plan (SIMP) which highlights key social vulnerabilities and gives a detailed review of the social circumstances that unfolded at the applicant's other current mega-projects namely Ingula, Medupi and Kusile. The plan must be managed through the environmental monitoring committee;
- Further agreements with local municipalities regarding infrastructure upgrades and service delivery must be in place prior to construction (post EA);
- The EMP should form part of the contract with the contractors appointed to construct the proposed Nuclear Power Station and ancillary infrastructure. The EMP should be used to ensure compliance with environmental specifications and management measures during all phases of the project;
- The EMP is a dynamic document and as new information becomes available over time, or as lessons are learnt in the implementation of the EMP's recommendations, the EMP must be updated; and
- Should there be any substantive changes to the design of the proposed power station after submission of the FEIR to the DEA for decision-making, a re-assessment of the environmental impacts may be required. Once a Nuclear Power Station vendor has been identified, it must be confirmed that the specifications of the Nuclear Power Station continue to conform to the Consistent Dataset, which was the basis for this EIA process. It is recommended Eskom must provide such confirmation to the DEA well prior to construction of the power station (GIBB (Pty) Ltd, 2016).

A more detailed review of the specialist studies, which impact assessments and recommendations informed the FEIR is presented in Sections 4 and 5.

SRK believes these conclusions and recommendations remain valid and that the FEIR is fit for purpose to inform a decision.

3.10 EMP and Mitigation Measures

The EMP contains mitigation measures that must be implemented in order to ensure that the environmental impacts of the proposed Nuclear Power Station are adequately mitigated. The EIA for the Nuclear-1 Project covers the transmission lines within the power station site and between the Nuclear Power Station and the High Voltage (HV) yard, and therefore does not apply to the transmission lines from the HV yard, which are covered in a separate EA application. The HV yard itself is however covered in this EMP.

As indicated earlier in this report, this review is not a technical review, but a process review assessing whether the EMP undertaken over 10 years ago is fit-for-purpose in 2023.

The EIA Regulations, 2014 (GN R982, which came into effect on 8 December 2014, as amended by GN R326 of 2017 and by GN R517 of 11 June 2021, Appendix 4), prescribe current (2023) content of an EMP. These requirements and the sections of the Nuclear-1 EMP in which they have been addressed, are summarised in Table 3-1 below. The *Review Comments* column gauges compliance with current EMP content requirements.

It is noted that the purpose and essence of an EMP¹³ or EMPr to describe how negative environmental impacts will be managed, rehabilitated and monitored and how positive impacts will be maximised, remains unchanged.

Table 3-1: Content of the EMPr as prescribed by the EIA Regulations, 2014 (as amended)

GN 982 Annexure 4 (1) Ref.:	Item	FEIR Section Reference	Review Comments
(a)	Details of:		
(a) (i)	The Environmental Assessment Practitioner (EAP) who prepared the EMPr	1.3	
(a) (ii)	The expertise of that EAP to prepare an EMPr, including a curriculum vitae	1.3	
(b)	A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	7	
(c)	A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating areas that should be avoided, including buffers;	Figure 2.5	Compliant: Figure 2.5 provides the Duynefontein environmental sensitivity map based on the sensitivities mapped in the FEIR.
(d)	A description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-	7	Compliant: The aspects, mitigation measures, and assigned responsibilities are tabled for the project phases in this section, with monitoring included where applicable.
(d)(i)	Planning and design;	7.1	
(d)(ii)	Pre-construction activities;		
(d)(iii)	Construction activities		
(d)(iv)	Rehabilitation of the environment after construction and in the case of a closure activity, closure; and	7.3	Compliant: The EMP refers to the Decommissioning Phase. Rehabilitation and monitoring is described, and appropriate Method Statements are prescribed. For example, there is a Method Statement for "Site Remediation, Rehabilitation and Re-vegetation (Annexure D: Preliminary List of Method Statements; Section 1.7).
(d)(v)	Where relevant, operation activities;	7.1 and 7.2	Compliant: Operational mitigation measures are included in Section 7.2.
(f)	A description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraphs (d) will be achieved, and must, where applicable, include actions to-	Sections 3 to 6; and Sections 8 to 10 Section 7 Section 9	Compliant: The EMP is intended to avoid, modify, remedy, control or stop adverse impacts, and presents organisational structures and methods to deliver this. Specific and relatively detailed environmental specifications to address specific impacts are provided, i.e. the Library of Environmental Specifications (Section 7), as are additional requirements for Monitoring Programmes (Section 9).
(f)(i)	Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;		
f(ii)	Comply with any prescribed environmental management standards or practices;		
f(iii)	Comply with any applicable provisions of the Act regarding closure, in the case of a closure activity;		
(g)	The method of monitoring the implementation of the impact management actions contemplated in paragraph (f);		
(h)	The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);		

¹³ The EMP was amended from a "plan" to a "programme" in the new EIA Regulations describing an EMPr and fulfils the same function in the environmental impact assessment process.

GN 982 Annexure 4 (1) Ref.:	Item	FEIR Section Reference	Review Comments
(i)	An indication of the persons who will be responsible for the implementation of the impact management actions;		
(j)	The time periods within which the impact management actions contemplated in paragraph (f) must be implemented;		
(k)	The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f)		
(l)	A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;		
(m)	An environmental awareness plan describing the manner in which-	4.3 and 5	Compliant: Section 4.3 describes Eskom's role and responsibilities as the Applicant, including the provision of materials/manuals for environmental awareness (induction) training by the Environmental Manager, and monitoring of the Contractor's environmental awareness training, which is the responsibility of the Contractor's Environmental Officer. Section 5 provides an overview of the environmental training required.
(m)(i)	The applicant intends to inform his or her employees of any environmental risk which may result from their work; and		
(m)(ii)	Risks must be dealt with in order to avoid pollution or the degradation of the environment; and		
(n)	Any specific information that may be required by the competent authority.		
2	Where a government notice gazetted by the Minister provides for a generic EMP, such generic EMP as indicated in such notice will apply.	NA	Not Applicable: This is a site-specific EMP for the Duynfontein Nuclear-1 site.

The EMP includes a number of useful and appropriate annexures, such as Eskom's environmental policy (Annexure B), a preliminary list of method statements (Annexure D), a method statement template (Annexure E) and a penalty schedule (Annexure F). The list of legislation (Annexure C) also contains policies, plans, regulations and treaties that were applicable at the time of the EMP (2016).

The EMP includes Eskom's Environmental Procedure to ensure compliance with Eskom's ISO 14001 Environmental Management System (EMS) Standard requirements. This commitment to continual improvement and ensuring that Eskom puts oversight and control measures in place to achieve its "environmental duty of care" commitments (as contained in Section 2.4.2 of the EMP) is a fundamental principle of NEMA.

The EMP for the Nuclear-1 EMP (2016) is largely fit-for-purpose addressing the aspects, mitigation measures, responsibility, timing of actions required, monitoring, and organisational requirements for the relevant phases of Nuclear-1.

As noted in Section 3.5.3 and Section 3.9 of this Review Report, the EMP is regarded as a dynamic document and will be routinely updated by Eskom as new information becomes available, e.g. once detailed design is finalised. This is standard practice.

In this regard, the legislation annexure of the EMP will also need to be updated to reflect recent policies, plans, regulations, treaties and other legal instruments.

3.11 Key Findings of EIA and EMP Review

The conclusions and key findings of the Review of the FEIR and EMP can be summarised as follows:

- There have been no material changes to the project description presented in the FEIR and assessed by the specialists. In addition, all assumptions in the FEIR relating to the project description remain

valid, notably the approach of specifying a conservative envelope of design data and other relevant requirements, with which the detailed Nuclear Power Station design and layout must comply;

- The *(now superseded)* IRP 2010 underpins the evaluation of the need and desirability of the proposed Nuclear-1 project. While the information presented in the EIA relating to the IRP, current and proposed additional generation capacity may be out of date, this will not affect either the motivation that additional power generation capacity is urgently required in South Africa or the how nuclear energy fits into the proposed energy mix. It was not the purpose of the EIA process to determine this;
- The IRP 2019 envisages nuclear in the energy mix, with an expansion of the current nuclear capacity beyond 2030;
- The EA authorises the listed activities in terms of the 2006 and 2014 (R982, 983, 984, and 985 of 2014) EIA Regulations. In 2021, subsequent to the conclusion of EIA process and granting of EA, the 2014 EIA Regulations were amended, with new Listing Notices (GN R 517 of 2021) issued. No additional listed activities applicable to the project have been added and the impacts of all current listed activities have been assessed in the FEIR;
- Although many of the SEMAs and related Regulations may have been amended since conclusion of the FEIR, the purpose of the FEIR was aimed at obtaining EA in terms of NEMA and the EIA Regulations. Eskom will apply for the remaining licences in terms of the legislation applicable at the time, once the appeal process has been finalised;
- SRK believes the EIA process undertaken was adequate to meet the current requirements in terms of the EIA Regulations, 2014;
- The public participation process undertaken by GIBB was comprehensive and far exceeded the requirements of 2006 EIA Regulations (as well as current requirements). It is plausible that there are a number of new stakeholders in the vicinity of the Duynefontein site, since the last formal public participation activities in 2016. SRK believes that the original public participation process together with the current round of stakeholder engagement will provide DFFE with a comprehensive understanding of stakeholder interest and comments (relating specifically to the Duynefontein site) to inform decision making;
- While the FEIR is not required to comply with GN R 982 prescribing the current required content in an EIA Report, a review of the contents of the report confirmed that the FEIR largely complies with these requirements. Minor gaps should not in any way affect DFFE's ability to take a final decision on the project or the decision taken;
- The FEIR identified a number of assumptions and limitations. SRK has assessed that these assumptions and limitations all remain valid, and no re-assessment of impacts is required due to changes in assumptions;
- The validity of the baseline data presented by specialists was evaluated in the reviews of the specialist studies which found that no material changes to the baseline have occurred which would invalidate the FEIR;
- Approximately 200 impacts were identified and assessed for the Duynefontein site. A robust impact assessment methodology was employed and relevant impacts were assessed. The validity of the impacts assessed by specialists was evaluated in the reviews of the specialist studies, which found that no material omissions in the impact assessments which would invalidate the FEIR;
- A wide range of alternatives was considered and assessed during the EIA process. Only site alternatives were comparatively assessed in detail in the FEIR. The reasons for selecting and screening of alternatives considered technical as well as ecological factors and are adequately motivated and described in the FEIR, and largely remain valid;

- SRK believes these conclusions and recommendations in the FEIR remain valid and that the FEIR is fit-for-purpose to inform a decision; and
- The EMP is regarded as a dynamic document and will be routinely updated by Eskom as new information becomes available, e.g. once detailed design is finalised.

4 Findings of Specialist Environmental Impact Study Reviews

4.1 Introduction

Specialist studies commissioned for the EIA process have been categorised (by SRK) as follows:

- Conventional impact studies assessing the impact of Nuclear-1 on the receiving biophysical and socio-economic environment (reviewed in Section 4); and
- Technical studies, often technical factors and/or risk assessments evaluating risks posed by the environment to Nuclear-1, often best mitigated through adaptive design (reviewed in Section 5). SRK is of the opinion that an EIA is not necessarily the appropriate instrument to address these considerations. Nevertheless, aside from occasional conflation of impacts of- and risks- to Nuclear-1, this is not a deficiency.

As noted in Section 1.3.2, the review of specialist studies does not constitute a technical review, but assesses whether specialist studies undertaken over 10 years ago are fit-for-purpose and decision-making.

To that end, the specialist study review is guided by the following factors (high level criteria) and focuses on:

- Alignment with and applicability of “the spirit” and intent of (new) specialist study regulations and reporting protocols e.g:
 - Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes when Applying for EA (GN R320 and GN R1150 of 2020); or
 - Appendix 6 of the EIA Regulations, 2014;
 - New environmental standards, e.g. National Ambient Air Quality Standards (NAAQS); and
 - New engineering standards, specifications or other pertinent requirements.
- Changes in the (conservation) status of the area, e.g. declaration of Ecological Support Areas (ECAs), Critical Biodiversity Areas (CBAs), Important Bird Areas (IBAs) etc. ;
- Whether old information is still suitable
- The materiality of the information, i.e. does the status of the information in a particular study affect potential impacts of the project
- Whether data deficiencies and risks can be addressed

Specialists defined discipline-specific criteria informing their review in the respective specialist review sections¹⁴.

This chapter presents the findings of the reviews of individual specialist impact assessments undertaken by the reviewers listed in Table 4-1. As indicated in Section 1.3 detailing the approach and methodology, the key purpose of each review was to determine whether the specialist studies are fit-for-purpose in their current form.

¹⁴ Each reviewer carefully considered legislation and policies relevant to their specific review.

Table 4-1: External specialist reviewers

Specialist Study	Assigned Reviewer	Organisation
Dune Geomorphology Assessment	Jennifer Barnard	SRK
Hydrological Assessment	Rob Gardiner	SRK
Geohydrological Assessment	Rob Gardiner	SRK
Oceanographic Assessment	Jennifer Barnard	SRK
Radiological Impact Assessment	Dr. Dawid de Villiers	SciRAD Consulting
Air Quality Assessment	Hasheel Tularam	SRK
Botany and Dune Ecology Assessment	Nicola Rump	SRK
Freshwater Ecology and Wetland Monitoring Report	Kate Steyn	SRK
Vertebrate Fauna Assessment	Kate Steyn	SRK
Invertebrate Fauna Assessment	Kate Steyn	SRK
Marine Ecology Assessment	Jennifer Barnard	SRK
Social Impact Assessment	Rob Gardiner	SRK
Economic Assessment	Chris Dalgliesh	SRK
Visual Impact Assessment	Kelly Armstrong	SRK
Heritage Impact Assessment	Nicola Rump	SRK
Agricultural Impact Assessment	Jennifer Barnard	SRK
Tourism Assessment	Chanel Barnard	Urban-Econ Development Economists (Pty) Ltd
Noise Assessment	Hasheel Tularam	SRK
Transportation Assessment	Dr. Johan Christoff Krogscsheepers	Innovative Transport Solutions
Town Planning Report	Tim Florence	Planning Partners

4.2 Specialist Review: Dune Morphology Assessment

4.2.1 Status of Original Dune Geomorphology Impact Assessment

This review is of the Dune Geomorphology Impact Assessment prepared by Werner Illenberger of Illenberger & Associates (Illenberger, 2010) to assess the impacts related to dune dynamics associated with development of Nuclear-1 at the Duynefontein site. Illenberger's signed Declaration of Independence is dated October 2010.

Key findings of the Dune Geomorphology Impact Assessment (Illenberger, 2010) relating to the Duynefontein site are as follows:

- The dunefield at Duynefontein forms part of the Atlantis corridor dunefield. The dune types found include mobile transverse dunes, transverse dunes artificially stabilised with alien vegetation, and naturally vegetated parabolic dunes (both Mid Holocene and Late Holocene parabolic dune types);
- Active transverse dunes are resilient as wind will re-create their natural shape if they are artificially disturbed, and are considered as having low sensitivity;
- An artificially vegetated transgressive dunefield (defined as a mobile coastal dunefield that moves inland and incorporates mobile unvegetated dunes that transgress landward, where parabolic dunes and transverse dunes are found) has low sensitivity as soil is very poorly developed on these dunefields with very few nutrient-rich fines;
- Mid and Late Holocene parabolic dunes that are naturally vegetated have a low sensitivity as soil is very poorly developed on Holocene dunefields with few nutrient-rich fines;

- Groundwater only “daylights” at Duynefontein in ephemeral interdune hollows and is therefore very unlikely to have significant interaction with wetlands or groundwater; and
- No limitations were identified and the report is considered sufficiently complete (Illenberger, 2010).

The key impacts assessed in the study (Illenberger, 2010) related to dune dynamics were found to be contradictory but not critical, varying from medium to low with mitigation measures indicated, as broadly described below:

- Mobile dunes located upwind of infrastructure will blow over access roads and transmission lines impacting on dune dynamics during the operational phase mitigated through stabilisation techniques (such as placing drift fences, brushwood and/or replanting with indigenous dune vegetation); with no mitigation possible for mobile dunes located downwind of infrastructure;
- The dune stability of the artificially vegetated dunefield and naturally vegetated late Holocene parabolic dunes will be disturbed due to disturbance of the vegetation impacted on by the location of access roads and transmission lines during the operational phase, causing dunes to re-mobilise for both dune types, mitigated through the stabilisation techniques as described above; and
- The location of topsoil and spoils stockpiles located upwind of mobile dunes with the dunes blowing onto the stockpiles from downwind will have operational impacts, mitigated through stabilisation techniques.
- Although not a project impact, the report notes that climate change and higher sea levels may create new sandy beaches further inland, supplying wind-blown sand to dunes, creating mobile dunes and dunefields in areas currently vegetated. A decrease in rainfall and increase in temperature will stress dune vegetation, contributing to blowouts forming more easily. An increase in wind speed is not expected to have any significant impact, although the reviewer notes that any disturbance to mobile dunes will recover quicker due to the increase in wind speed and energy resulting in the ability of the wind to carry sand further.

4.2.2 Dune Geomorphology Impact Assessment Review Evaluation Criteria

This review considers the following aspects/criteria:

- New legislation, policy, protocols or other instruments pertinent to the dune geomorphology impact assessment, notably:
 - “Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed” (GN R320 of 2020); and
 - Maintenance Management Plan: Dunes and Beaches. City of Cape Town (City of Cape Town, 2017).

Also considered are the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:

- e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.2.2.2);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.2.2.3);
 - cB – are there changes to the environment that might affect cumulative impacts (Section 4.2.2.3);

- g –are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 4.2.2.3);

Each of these is discussed below.

4.2.2.1 Changes to Legislation, Policy, Protocols or other Instruments Pertinent to the Agricultural Impact Assessment

The study is generally compliant with the principles of the “Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed” (GN R320 of 2020), which states that the required level of assessment must be based on the findings of the site sensitivity verification and must comply with Appendix 6 of the NEMA 2014 EIA Regulations.

It is recognised, however, that the study does not meet every specific requirement of these regulations, nor was it obliged to, as this was not a requirement at the time.

The City of Cape Town (CCT) has prepared a Maintenance Management Plan (MMP): Dunes and Beaches (City of Cape Town, 2017) that provides a generic MMP to enable the CCT to conduct dune and beach maintenance and rehabilitation on City-owned land more efficiently whilst remaining compliant with the requirements of NEMA. The mitigation measures for dune stabilisation in the MMP (City of Cape Town, 2017) provide a more detailed description of these techniques, should this be required to supplement the proposed mitigation provided in this assessment (Illenberger, 2010). *(The City cannot be held responsible for dune and beach maintenance on Eskom-owned land.)*

4.2.2.2 Appropriateness of methodology used

The Dune Geomorphology Impact Assessment (Illenberger, 2010) investigates the impacts related to dune dynamics and dune morphology relevant to ‘Nuclear-1’, which includes an analysis of available literature, reports prepared for Eskom, consultation with various environmental specialists, and site visits with the wetland and botanical specialists. The Dune Geomorphology study does not however, comment on the relevance of the season of the site investigation to the outcome of the assessment, nor does it describe site-specific cumulative impacts and levels of acceptable change specific to the proposed development. The relevance of the season to the site assessment does not affect the outcome of the assessment, as the inter-relationship between weather conditions and coastal dunes is understood and does not require clarification. The study (Illenberger, 2010) does however, describe generic impacts related to climate change, such as the creation of mobile dunes in areas currently vegetated.

The impact of Off-Road Vehicles (ORV) on the dune systems during the construction and operational phases is not described. It is assumed that impacts associated with ORVs were assessed as impacts related to constructing infrastructure, transmission lines and access roads. It should be noted that the “Control of vehicles in the Coastal Area Regulations (colloquially known as the Off-Road Vehicle Regulations) makes provision for permissible activities and the necessary permits should be obtained prior to construction commencing.

The approach of the impact assessment (Illenberger, 2010) is therefore aligned with the “Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed” (GN R320 of 2020).

4.2.2.3 Changes to Baseline Conditions

The geomorphology of the dunes is characteristic of the interface between the dynamic ocean environment and the land. The study (Illenberger, 2010) classifies the different types of affected dunes in terms of their resilience to change (relevant to mobile dunes) and soil nutrients relevant to dunes that are vegetated, with the dune types at Dwynefontein classified with low sensitivity pre-development.

The potential effects of sea-level rise on dune geomorphology would be difficult to quantify unless monitoring was conducted at the time of the assessment in 2010. Any natural changes to baseline conditions would have occurred within the dynamic coastal interface.

Based on a review of recent (2023) aerial imagery of the site, small changes appear to have taken place within the “currently active transverse dunes”, notably the northwards movement of sand in some places due to the dominant southerly wind, with slight loss of vegetation cover. The study describes the northwards movement of the transverse dunes driven by the dominant southerly wind, and the review of the historical aerial imagery appears to support this.

These changes in dune geomorphology have taken place in the section of the proposed development footprint zoned as the “corridor for nuclear plant and auxiliary buildings” and in the “corridor for HV yard, sub-station and some auxiliary buildings”. The dunes have not migrated into the development footprint – they have shifted position slightly in terms of sand distribution and possibly vegetation cover, within the proposed development footprint.

The essence of the Dune Geomorphology Impact Assessment (Illenberger, 2010) findings and the mitigation measures recommended are regarded as still valid.

4.2.3 Specialist Opinion

The professional opinion of the reviewer is that the following findings of the Dune Geomorphology Impact Assessment review apply:

- The methodology used for the impact assessment does not entirely align with current practice, and in particular the relevant assessment protocols (GN R320 of 2020), which was not a requirement at the time of the impact assessment, but was scientifically sound and is still appropriate;
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time;
- It is unlikely that any further changes to the baseline dune geomorphology would result in significant changes to the impact assessment findings or mitigation recommendations; and
- The mitigation measures provided remain valid.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.3 Specialist Review: Hydrology Environmental Impact Report

4.3.1 Status of the Hydrology Environmental Impact Report

This review is of the Hydrology Environmental Impact Report (‘the study’) prepared by Matt Braune of SRK (SRK, 2015). In this review, only the Duynefontein site is considered. The September 2015 Hydrology Impact Assessment report is an update of an earlier version of the report, submitted with the Nuclear-1 EIA, in response to recommendations of the Peer Review Report (Fundisi, 2015) (Appendix E37 of the Revised Draft FEIR Version 2).

The review identified a number of methodological items in the original (2011) report. How these were addressed in the 2015 report is as follows:

- Rainfall details. The review recommended that a comparison of the South African Weather Services, Water Resources 90 and local rain gauge data should be made. The specialist commented in the review report how this was addressed in an associated report by a meteorological specialist in the revised report;

- The reason why flood lines were determined for only a few sections is not given. The specialist explained that this was provided in the (separate) SRR and that an explanation was included in the 2015 Hydrology Environmental Impact Report ; and
- The modelling program HEC-RAS¹⁵ version 3.2 was used, whereas a version 4.2 was available at the time of the 2015 review. Currently version 6.4 is available. The specialist did not comment on the software versions.

The study considers impact on the environment (e.g. the increase in runoff peaks, runoff volumes, increased erosion potential during construction) and risks to the project due to natural hydrological events (e.g. sea level rise, highest astronomical tide, and frequent high rainfall events). Both are allocated significance ratings using the impact rating method and all identified impacts are rated as being of low-medium significance before mitigation. All impacts, with the following exceptions, are mitigated to a low significance. The identified impacts which remain as low-medium significance are as follows:

- Increased runoff volume;
- Changes in flow paths
- Pollution of surface waters; and
- Sea level rise.

Mitigation measures are proposed and include diversion berms, silt traps, energy dissipation structures, and dirty water containment dams. Other (procedural) measures include developing maintenance programmes for stormwater control measures and operational manuals for control measures.

The study identified no fatal flaws regarding surface water impacts and recommended that existing information should be supplemented on the following aspects:

- Detailed footprint and layout of plant area and ancillary works;
- Locality and extent of possible future residential / commercial developments; and
- Quantification of the rainfall difference due to climate change at each of the sites on base flows. The impact on larger peak flows is, according to the specialist, not expected to be significant.

4.3.2 Hydrology Environmental Impact Assessment Review Evaluation Criteria

This review considers the following aspects/criteria:

- New legislation, policy, protocols or other instruments pertinent to the hydrology study, considering the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.3.2.1);
- Also considered are the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (4.3.2.2);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:

¹⁵ HEC-RAS = Hydrologic Engineering Center – River Analysis System

- cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.3.2.2);
- cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.3.2.3); and
- g – are any buffers proposed still appropriate given legislation/policy changes and changes to the baseline (Section 4.3.2.1).

Each of these is discussed below.

4.3.2.1 Changes to Legislation, Policy, Protocols or other Instruments Pertinent to the Hydrology Environmental Impact Assessment

Appendix 6 of the EIA Regulations, 2014 was in effect at the time of the revision to the hydrology study and the study is broadly compliant with these requirements. The study draws on related environmental legislation and best practice guidelines (e.g., for pollution control dam design) for guidance. These laws remain the most recent.

Legislation governing hydrology studies of this nature is, as a rule, aimed at protecting the development, or surrounding developments, from hydrological impacts of the development. Of importance in this review are those pieces of legislation, policy, protocols, or other instruments that relate to the prediction of the impact of the development on the environment, which due to the nature of stormwater would be downstream developments. As there are no downstream developments or landowners a discussion of changes in legislation relevant to the hydrology study is not pursued.

Similarly, in terms of international standards, the study make reference to a number of nuclear industry safety standards. However, all of these are related to the protection of the facility from flooding or erosion and, for the purposes of environmental impact assessment, changes to these safety standards are not pursued in this review, but are dealt with in separate Site Safety Reports commissioned outside of the EIA process.

4.3.2.2 Appropriateness of methodology used

The methodology for the evaluation of the impacts of hydrology on developments, and/or the downstream impacts of a development due to increased runoff, is well established as evidenced by the fact that the HEC-RAS software was first developed in 1995. The technical review of the study made a number of comments on the method used, as reported in the introduction to this review above.

More recent versions of HEC-RAS software are available. However, these versions are not expected to change either the predictions of the model, nor the significance ratings of the study, and as such would have no impact on a decision.

4.3.2.3 Changes to Baseline Conditions

Baseline conditions that can affect the findings of the hydrology study are topography and surface conditions, rainfall data, and climate change predictions.

In the period between the original EIA specialist studies in 2011, and the revised reports in 2015, the dunes in the study area are reported to have become more stabilised (Low, 2011). Importantly, no watercourses affect the site and surface water runoff would occur between the dunes. While there may have been some changes in the positions of the dunes these would not have changed the fundamental runoff characteristics of the area, nor resulted in a defined watercourse. Moreover, any such changes would be a risk to the facility as opposed to impacts on the environment, and as such are not considered important by this reviewer on the findings of the impact assessment.

In terms of surface conditions, and within the catchment affecting the site, there have been no developments that would have resulted in impermeable surfaces and increased runoff. Stabilisation of the dunes would have occurred due to increased vegetation cover on the dunes. This has the potential to retain water during lower intensity rainfall events and in turn promote infiltration and reduce runoff. However, under the high rainfall predictions that are modelled in the study, i.e. 1:1 000 and 1:10 000 year events, the models would assume no infiltration or impact from this vegetation and therefore would not influence the findings of the study.

The technical reviewer (Fundisi, 2015) commented on the rainfall data as recorded above. Part of the specialist's response was that the predictions are for the 1:10 000 return period and therefore needs to use the longest rainfall records available, i.e. and not consider the four years of on-site records. The rainfall records which were used to 122 years of patched rainfall data. Additional rainfall records would have been captured in the subsequent eight years (to 2023), but it is the reviewer's opinion that this additional eight years of data would have no material effect on the outcomes of the impact assessment. The reasoning for this are as follows:

- The same reasoning that the specialist used in dismissing the consideration of four years of on-site data applies to extrapolating a relatively short dataset to predicting a 1:1 000 storm event with the addition of an additional eight years of monitoring data, i.e. it would be insignificant for the purposes of the EIA process;
- The hydrological impacts on the environment as a result of this development are managed through engineered controls and any change in the hydrological predictions could be accommodated in an engineering design; and
- Risks to the facility as a result of hydrology are managed through engineered controls and these would be detailed in the SSR which would consider any changes in the hydrological predictions.

The specialist recommends that impact on base flows needs to be updated once regional predictions of rainfall due to climate change are available. Such predictions are considered a change in the baseline conditions since they are, or would have been if they were available during the study, inputs into the model. Base flows would not affect the peak flood events and in terms of peak flows the specialist states that the impact of climate change is not expected to be significant. No reasoning for this statement is provided and it seems to contradict the generally accepted understanding of climate change in the region of shorter more intense storms. However, for the same reasons as presented for rainfall data, this review of if the view that the inclusion of such data, while important for the final design, would not change the outcomes of the impact assessment.

4.3.3 Specialist Opinion

The professional opinion of the reviewer is that the following findings of the Hydrology Environmental Impact Assessment apply:

- The methodology used for the study is scientifically sound and rigorous and is consistent with best practice;
- There are no changes in legislation that would invalidate the reporting format or content of the Hydrology Environmental Impact Assessment;
- With the exception of possible new data predicting rainfall in the region as a result of climate change, there are no changes in the baseline conditions that would change the findings of the impact assessment. That is not to say that there might not be changes to the scale and nature of engineered control needed for the site, but that such changes in engineered control would not change the significance rating in the study;

- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time; and
- No changes to the EMPr are required.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.4 Specialist Review: Geohydrological Impact Assessment Report

4.4.1 Status of Geohydrological Impact Assessment Report

This review is of the Geohydrological Environmental Impact (GIA) prepared by Peter Rosewarne of SRK Consulting (South Africa) (Pty) Ltd (SRK, 2015). The September 2015 GIA report is an update of an earlier version of the report, submitted with the Nuclear 1 EIA, in response to recommendations of the Peer Review Report compiled by GCS (Pty) Ltd (Appendix E37 of the Revised Draft FEIR Version 2).

The significance rating of construction and operational phase environmental impacts is summarised as follows:

- Flooding by groundwater: *Medium* without mitigation and Low with mitigation;
- Depletion of local aquifers: *Low-Medium* without mitigation and Low with mitigation;
- Non-radioactive contamination: *Medium* without mitigation and Low with mitigation;
- Degradation of infrastructure: Overall index slight to serious corrosion and minor scaling;
- Contamination with radioactive material under normal reactor operation: *Low-Medium* without mitigation and Low with mitigation; and
- No Go option: *High* without mitigation and *Medium* with mitigation.

The low ratings are largely a function of the site being situated in a coastal zone with groundwater being at/near the end of its flow path, consequently with little or no downgradient groundwater receptors, and confidence in the application of tried and tested mitigation measures.

4.4.2 Geohydrological Impact Assessment Review Evaluation Criteria

This review of the GIA considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments pertinent to the GIA, also considering the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.4.2.1);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.4.2.2);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.4.2.2);
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 4.4.2.1); and

- Time dependency of assumptions and limitation to the study, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environment that impact on these (Section 4.4.2.3).

Each of these is discussed below.

4.4.2.1 Changes to Legislation, Policy, Protocols or other instruments pertinent to the Geohydrological Impact Assessment

No changes in legislation, regulations or policy, relevant to the GIA, are identified. Appendix 6 of the EIA Regulations, 2014 was in effect at the time of the revision to the GIA and the GIA is compliant with these requirements.

In the event that a Water Use Licence is required, e.g. *for disposing of waste in a manner which may detrimentally impact on a water resource (Section 21 (g)), or Disposing of waste in a manner which contains waste from or which has been heated in any industrial or power generation process (Section 21 (h))*, then the GIA would also be expected to meet the requirements of the “Regulations regarding the procedural requirements for water use licence applications and appeals” (GNR 267 of 2017), published under the National Water Act 36 of 1998. The report meets the scientific content requirements of Annexure D of these regulations.

In terms of the methodology adopted to compile the GIA, the following activities were carried out:

1. Survey (hydrocensus) of boreholes/wells/springs within a ~five kilometre radius of the site;
2. Siting of new boreholes for the study;
3. Drilling of new boreholes for the study;
4. Test pumping of boreholes in order to determine transmissivity, specific yield, hydraulic conductivity, sustainable borehole yields, and water quality;
5. Down-hole video camera inspection to improve the accuracy of borehole logs;
6. Packer test programme to determine hydraulic conductivity in the upper 20 m of the secondary aquifer;
7. Monitoring programme to build up a database of groundwater levels and quality so that temporal and seasonal fluctuations could be determined; and
8. Development of a 3D conceptual geohydrological model showing aquifers, groundwater levels, aquifer boundaries, and groundwater flow directions in order to simulate (a) regional, local and site specific response of the groundwater system;(b) wetland-groundwater interactions; and (c) the fate of contaminants introduced into groundwater systems.

Each of the steps outlined above remain necessary for the development of a 3D conceptual model. Of these, only the modelling programme has the potential to become outdated. The GIA uses MODFLOW to model groundwater flow and transport processes. A recent publication (De Paul Adombi, Chesnaux, & Boucher, 2022) on the development of machine learning alternatives to numerical modelling references MODFLOW as the means by which the machine learning alternatives are calibrated, providing an excellent indication of the continued suitability of MODFLOW for the GIA.

It is therefore concluded that the method used for the GIA is consistent with best practice.

4.4.2.2 Changes to Baseline Conditions

The GIA is based on extensive field investigations that were conducted over a period of six years. The majority of the inputs into the groundwater model can be considered constants of over the timescale of the project (e.g. transmissivity, hydraulic conductivity). Changes in the availability (or supply) of groundwater could occur due to changes in weather patterns, abstraction regimes in the vicinity of the site, and sea level rise.

Changes in weather patterns are addressed through the availability of six years of data for the study, which are very unlikely to be materially different at present. An additional 10 years of monitoring data is available and has been used in the updating of the Site Safety Report and did not materially affect the numerical groundwater flow model that was revised (for the SSR) in 2022 (Rosewarne P. , 2023).

The GIA states that *“for the purpose of this assessment, the amount and quality of the data collected is sufficient to carry out the required simulations. However, collection of additional time series monitoring data, e.g. groundwater levels, will enhance the existing data base and allow for updating and refining of the numerical simulations”* (SRK, 2015, p. 8). Such data would change due to natural fluctuations in rainfall or due to anthropogenic changes (e.g. increase abstraction from existing boreholes).

Invariably, rainfall would not have been constant since the completion of the GIA. However, extensive historical data was used in the preparation of the study and natural fluctuations in rainfall over the past eight years are extremely unlikely to affect the model outcomes.

An examination of the National Groundwater Archive (<https://www.dws.gov.za/groundwater/NGA.aspx>) identified 758 boreholes/wells within 15 km of the site, none of which are recorded as having been established after 2010. It is reported (SRK, 2015) that the Atlantis Primary Aquifer System is capable of yielding a minimum of ca 4 million cubic meters per annum groundwater on a sustainable basis. The Witzand and possibly the Silwerstroom groundwater units within the Atlantis Primary Aquifer System are being fully exploited and there may be capacity for the development of additional production holes in the Brakkefontein and Dufnefontein units. It is therefore concluded that a large number of boreholes exist in the area and the GIA has taken these into consideration and, even if some new boreholes have been established and not recorded in the archive, these are extremely unlikely to make a material difference to the significance rating or recommended mitigation measures in the GIA.

4.4.2.3 Time dependency of assumptions and limitation to the study

The GIA recommends that the numerical model be regularly verified and updated using the most recent monitoring data, at a minimum interval of two years post EIA (i.e. with a view to monitoring and not to refining the predicted impacts). The current model requires recalibration with the latest monitoring and climatic data, as well as transient calibration with pumping test data.

The GIA report concludes that it is “not constrained in any way by availability of data, beyond natural constraints in defining and quantifying geohydrological issues/parameters” (SRK, 2015, p. 11).

It is therefore concluded that neither this mitigation measure, nor any of the other recommended mitigation measures, are sensitive to the lapse of time since the publication of the GIA Report.

4.4.3 Specialist Opinion

The professional opinion of the reviewer is that:

- The methodology used for the study is scientifically sound and rigorous and is consistent with best practice;
- There are no changes in legislation that would invalidate the reporting format or content of the GIA;

- In the absence of new fieldwork, it is not possible to definitively comment on the extent to which the baseline environment may have changed. However, the specialist has confirmed that groundwater monitoring has continued and that, for the purposes of the site safety report, the numerical groundwater model has been updated, and that there are no material changes to the numerical model. Consequently it is the opinion of the reviewer that there would be no changes to the associated significance ratings or mitigation recommendations;
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time; and
- No changes to the EMP are required.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.5 Specialist Review: Oceanographic Impact Assessment

4.5.1 Status of Original Oceanographic Impact Assessment

This review is of the Oceanographic Impact Study ('the study') prepared by WSP Environment and Energy (WSP, 2011) and considers the physical marine environment and the impacts associated with the development of Nuclear-1 at the Duynefontein site. The WSP signed Declaration of Independence is dated August 2010.

Key findings of the study relating to the Duynefontein site are as follows:

- This report examines the impacts of the construction and operation of Nuclear-1 on the physical marine environment and finds that Nuclear-1 will have limited impact on the physical marine environment;
- This report also examines the risks to and resilience of Nuclear-1 to storm events, global warming and natural disasters such as tsunamis affecting the operation and safety of Nuclear-1. Appropriate design requirements are required to protect Nuclear-1 against these risks; and
- The study recommends that a comprehensive and site-specific marine environmental mitigation and management strategy is developed for the project site ultimately selected. This should include detailed marine environmental management measures that are based on the specific sensitivities of the site, the final design and the construction plans.

The study describes the potential impacts:

- Construction impacts of Nuclear-1 described as:
 - The cofferdams constructed in the surf zone will disrupt longshore sediment transport (until the coffer dams are removed) considered to be low significance;
 - The discharge of brine from a pipe at the Reverse Osmosis (RO) Plant will result in a localised erosion channel across the beach of short-term duration considered to be low-medium significance; and
 - An increase in suspended sediment concentration related to the spoil disposal in the sea will not affect the existing Koeberg cooling water intake pumps.
- Operational impacts of Nuclear-1 described as:
 - The long-term disruption of longshore sediment transport associated with the discharge point of the outlet pipes forming a localised and minor barrier to sediment movement, considered to be low-medium significance;

- Potential effects of the thermal plume (of heated cooling water), which is highly variable and dependant on the wind, wave conditions and currents, but efficient dispersal of the thermal plume is expected and described as having no impact;
- The brine from the RO plant will be mixed into the cooling water and discharged at the outfall, assessed to have no impact; and
- Any (non-nuclear) accidents and incidents are not expected to affect the oceanography of the surrounding area.
- Risks to Nuclear-1 (i.e. potential changes in the physical marine environment on the proposed development) include:
 - Extreme sea levels associated with flooding from the sea caused by extreme tides, waves or storm surge are considered negligible due to the design and location mitigation proposed;
 - Exposure of or damage to the cooling water intake pipes, blockages of intake pipes (from entrainment of sediment and sea life), elevated seawater temperature and coastal stability, are considered negligible due to the design mitigation proposed; and
 - Seawater could threaten or inundate Nuclear-1 should a tsunami¹⁶ coincide with extreme meteorological conditions (referred to as a meteo-tsunami event), considered to be a risk of medium significance. The occurrence of a local or distant tsunami is described as improbable and considered to have no impact.

4.5.2 Oceanographic Impact Assessment Review Evaluation Criteria

This review considers the following aspects/criteria:

- New legislation, policy, protocols or other instruments pertinent to the oceanographic study, notably:
 - “Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed” (GN R320 of 2020);
 - National Environmental Management: Integrated Coastal Management Act 24 of 2008 (NEM:ICMA), Dumping at Sea Regulations (GN R711 of 2017); and
 - NEM:ICMA, Coastal Waters Discharge Permit Regulations (GN R382 of 2019).
- Also considered are the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.5.2.2);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available or should new data be gathered (Section 4.5.2.3);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.5.2.3); and

¹⁶ A tsunami is a train of water waves generated by impulsive disturbances of the water surface due to non-meteorological but geo-physical phenomena such as submarine earthquakes, volcanic eruptions, submarine slumps and landslides or ice falls into a body of water (WSP, 2011).

- g –are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 4.5.2.1).

Each of these is discussed below.

4.5.2.1 Changes to Legislation, Policy, Protocols or other Instruments Pertinent to the Oceanographic Impact Assessment

One of the significant changes to the NEMA 2014 EIA Regulations, as amended, since the completion of the Nuclear-1 EIA is the requirement to comply the “Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed” (GN R320 of 2020). This Protocol refers to the required level of assessment that must be based on the findings of the site sensitivity verification and must comply with Appendix 6 of the NEMA 2014 EIA Regulations.

It is recognised that the study meets most of the requirement of these regulations. For example, there was extensive research and a data baseline collection programme that extended from January 2008 to August 2010 covering all seasons. However, there is no map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site, with areas to be avoided in the study (WSP, 2011).

Regulations promulgated after the study and which pertain to permitting requirements of Nuclear-1 include the NEM:ICMA, Dumping at Sea Regulations (GN R711 of 2017), and the NEM:ICMA Coastal Waters Discharge Permit Regulations (GN R382 of 2019) are noted by the reviewer as new legislation that do not change the findings of the study (WSP, 2011).

4.5.2.2 Appropriateness of methodology used

The methodology included comprehensive baseline data collection and a desktop analysis of available information. The study (WSP, 2011) incorporated the existing Koeberg intake and outfall in the base case model, allowing for an assessment of the cumulative impacts. The study comprised extensive modelling, including combinations of extreme events, with appropriate mitigation measures recommended for each potentially significant oceanographic impact and/or risk.

The methodology followed for the study (WSP, 2011) is appropriate, and the approach is considered to align with the “Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed” (GN R320 of 2020).

4.5.2.3 Changes to Baseline Conditions

The ocean environment is dynamic, influenced by currents, tides, winds, seasons and climate change, which impacts on sediment transport, variation in sea water temperature and marine life. The study (WSP, 2011) undertook a baseline collection programme and included the review of data on various oceanographic parameters, taking into account the effects of climate change and anticipated sea level rises.

The reviewer notes that the oceanographic risks posed to Nuclear-1 have been studied individually and in combination within the coastal engineering investigations forming part of the SSRs.

Variations in baseline conditions are expected within the dynamic ocean environment. Engineering modelling has been applied to understand and predict future changes in the baseline to anticipate the impacts and risks.

4.5.3 Specialist Opinion

The professional opinion of the reviewer is that the following findings of the oceanographic study review apply:

- The Oceanographic Impact Assessment meets the requirements for a specialist assessment. The study has included coastal engineering investigations as part of the SSRs to understand and predict the environmental impacts and risk. The methodology used for the study is scientifically sound, including engineering investigations that are rigorous. The study aligns with the objectives of the protocol (GN R320 of 2020) adequately addressing the impacts and risks;
- The Specialist Assessment Protocols (GN R320 of 2020) and the NEM:ICMA Regulations are the most significant pieces of additional legislation not in place at the time of the study, however these do not change the findings of the study;
- The ocean environment is dynamic, with the application of engineering investigations to identify environmental impacts and anticipate scenarios that could pose a risk to Nuclear-1;
- It is highly unlikely that any changes to the baseline environment would result in significant changes to the impact and risk assessment findings or mitigation recommendations, and that the impact and risk ratings provided in the study remain valid; and
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.6 Specialist Review: Assessment of the Potential Radiological Impact on the Public and the Environment

4.6.1 Status of Original Public and Environmental Radiological Impact Assessment

This review is of the Public and Environmental Radiological Impact Assessment ("the study"), dated August 2015, prepared by Johan Slabbert of PSI Risk Consultants cc (PSI Risk Consultants, 2015). The document does not contain a version number, but would have been subject to peer review during the submission of the Nuclear-1 EIA.

The study assesses the radiological impacts on the public and the environment from the operation of a representative third generation (GEN III) Nuclear Power Station at the three proposed sites (i.e. Duynefontein, Thyspunt and Bantamklip). The study investigates the following aspects:

- The radiological discharges to the environment during the normal operation of the nuclear power plant, and the dose to the public as a consequence of these releases;
- Nuclear power plant accidents and the associated risk to the public;
- The radiological risk to the fauna and flora that surrounds the sites during the operation of the nuclear power plant; and
- The dose from the background radiation at each of the sites.

The key findings of the study relating to the Duynefontein site are as follows:

- The highest total dose to an infant, child and adult at a distance of 2.5 km from the proposed nuclear power plant is 35.3 $\mu\text{Sv/a}$, 44.0 $\mu\text{Sv/a}$ and 55.6 $\mu\text{Sv/a}$ respectively;

- The highest total dose to an infant, child and adult at a distance of 5.0 km from the proposed nuclear power plant is 18.2 $\mu\text{Sv/a}$, 29.9 $\mu\text{Sv/a}$ and 42.8 $\mu\text{Sv/a}$ respectively;
- Both these instances include the dose contribution from the existing KNPS (assumed to be a maximum of 12.2 $\mu\text{Sv/a}$ as derived from actual measurements). The study therefore demonstrated that the dose constraint of 250 $\mu\text{Sv/a}$ for a member of the public can be met;
- Using the source terms of severe nuclear power plant accidents together with the characteristics of two GEN III design nuclear power plants, the study demonstrated limited off-site radiological impact during an accident. A nuclear power plant based on this GEN III technology should therefore meet the regulatory risk criteria;
- The dose rates to a set of reference animals and plants exposed to the normal operations of a nuclear power plant resulted in values less than the reference value of 10 $\mu\text{Gy/h}$. This reference value is well below any dose rate where measurable radiation related effects in organisms would be detected;
- Based on various research findings, the high dose rates (higher than 100 $\mu\text{Gy/h}$) expected after a nuclear power plant accident are unlikely to result in observable effects on non-human biota populations. If there are any effects, it would be transient in nature; and
- The survey of the background radiation estimated that people living near the site receives a dose of 2 mSv/a. This is lower than the average global dose of 2.4 mSv/a. The estimation was based on measurements of various environmental media (i.e. samples of surface water, groundwater, seawater, soil, sediments, beach sand, marine biota and terrestrial biota) and direct measurements of air quality, radon, and the external ambient gamma radiation.

The key outcome of this study:

The doses to the public and the environment confirms that the environmental impact due to the normal operation of a GEN III nuclear power plant has a low significance and a low cumulative effect. This is due to the doses meeting the regulatory criteria of the NNR.

4.6.2 Radiological Impact Assessment Review Evaluation Criteria

This review considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments pertinent to the study (Section 4.6.2.1),
- The following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.6.2.2),
 - i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environmental impact on these (Section 4.6.2.3).
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.6.2.4),
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.6.2.4),
 - Census data.

Each of these is discussed below.

4.6.2.1 Changes to Legislation, Policy, Protocols or other Instruments pertinent to the Radiological Impact Assessment

There were no relevant changes in current legislation, nor relevant new legislation promulgated since the 2015 publication date of the study. However, in 2016 the NNR issued an Interim Regulatory Guidance document, RG-0011 (NNR, 2016), which provided more detailed information on how to prepare the documents the NNR requires on the topic of siting of a nuclear facility. This document is basically an elaboration on the *Regulations on Licensing of Sites for New Nuclear Installations* (Department of Energy, 2011), which was already considered in the study.

4.6.2.2 Appropriateness of Methodology Used

The study uses the source-pathway-receptor methodology in assessing the prospective radiological impacts to the public. This methodology uses assumptions of the radiation source term and other relevant parameters in conjunction with various relevant exposure pathways and conditions. Combining these in either discrete or probabilistic calculational models, the dose to receptors (i.e. members of the public) at specified locations are then determined. This method is widely used and accepted, also by the NNR. The methodology described in the study is therefore still applicable and is considered adequate to assess doses to the public.

RG-011 (NNR, 2016) requires an additional ingestion exposure pathway (that of the “consumption of free food (e.g. mushrooms, berries and seaweed)”) to be assessed. However, if this pathway is found to be relevant, the impact on the total doses to the public will not be significant. The appropriateness of the methodology is therefore not compromised by the exclusion of this exposure pathway.

The software programme, ERICA, is well researched and used by many European countries. It is considered appropriate and adequate to assess the doses to the non-human biota.

The sampling and data analyses methods for the background radiation studies are based on proven and accredited methods. These are all appropriate for the purpose of assessing the level of background radiation.

4.6.2.3 Time Dependency of Assumptions and Limitation to the Study

The study is subject to a number of assumptions and limitations. The main assumptions, that of the source terms, atmospheric dispersion, dispersion in the sea, and the location of the critical groups are still valid.

Some of the parameters used in the calculational models are best known values, but may change over time. An example is the dose conversion factors. While it is not expected, these factors may change (increase or decrease based on the latest research) in future and subsequently change the calculated doses to the public. The same applies to the parameters used in the ERICA software used for the non-biota assessment. A new version with more suitable parameters or representative animals/plants may change the applicability of the current results. However, it is not expected that these (and any other possible changes in the assumptions) will result in significant changes to the total doses. The findings of the study will therefore remain valid.

It is therefore concluded that there are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time.

4.6.2.4 Changes to Baseline Conditions

Site-specific weather data, collected over a one-year period was used in the study. While the current annual average wind speeds and wind directions may differ from those used in the study, the change will not be significant. The same applies to the census data used. The baseline data is therefore still adequate for use.

Furthermore, there are no changes to the environment or the operations at KNPS (as the Duynefontein site is in close proximity) that might affect the evaluation of cumulative radiological impacts.

4.6.3 Specialist Opinion

The professional opinion of the reviewer is that the following findings of the radiological impact study apply:

- The study was done according to international and national accepted methodology. The data, assumptions and other relevant information are logically presented and well explained. The Radiological Study therefore meets the requirements for a specialist study;
- The approach followed in assessing the doses to the public and the environment was deliberately chosen to be conservative. The dose results are therefore representative of a worst case, which in this instance, are still well below the 250 $\mu\text{Sv/a}$ public dose limit or the 10 $\mu\text{Gy/h}$ environmental reference level. Any changes to baseline conditions or other parameters will not change this outcome; and
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.7 Specialist Review: Air Quality and Climatological Impact Assessment

4.7.1 Status of Original Air Quality and Climatological Impact Assessment

This review is of the Air Quality Impact and Climatology Assessment prepared by Airshed Planning Professionals (Pty) Ltd (Airshed Planning Professionals (Pty) Ltd, 2015) and considers only the Duynefontein site. Along with all specialist studies, the report was subjected to peer review (by Gondwana Environmental Solutions) in 2015, which found the report to be robust and comprehensive and no changes were required prior to its publication in the Draft FEIR version 2 (2015).

Key findings of the Air Quality Impact and Climatology Assessment relating to the Duynefontein site are as follows:

- Due to a lack in industrial and urban development at the Duynefontein site since the baseline assessment was undertaken, it is likely that background sulfur dioxide (SO_2), nitrogen dioxide (NO_2) and particulate matter of less than 10 micrometres (PM_{10}) concentrations are similar to those measured between 2000 to 2007;
- During normal operation of Nuclear-1, trace quantities of radiological materials will be released to the environment. Ignoring the ingestion pathway, the predicted effective dose from these pathways indicates a low significance;
- The Nuclear-1 project will have very low non-radiological air pollution as evaluated against human health risk and vegetation impact criteria; and
- Nuclear-1 could be developed at Duynefontein, without further Air Quality Impact investigations.

The key impacts (those of medium or higher significance) assessed in the study were:

- Fugitive dust emissions from initial general construction activities as well as emissions emanating from vehicles and equipment (a short-term negative impact of *medium* significance that can be reduced to low through mitigation).

4.7.2 Air Quality and Climatological Impact Assessment Review Evaluation Criteria

This review considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments pertinent to the Air Quality Impact and Climatology Assessment, also considering the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.7.2.2);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.7.2.2);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.7.2.3);
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 4.7.2.1).

Each of these is discussed below.

4.7.2.1 Changes to Legislation, Policy, Protocols or Other Instruments Pertinent to the Air Quality and Climatology Assessment

The report references Government Notice 1210 of 2009 (Government Gazette 32816): National Ambient Air Quality Standards (NAAQS, 2009). Amendments were subsequently published in Government Notice 893 of 2013 (Government Gazette 37054) and are also presented in the report. The World Health Organisation Health Risk Guidelines (WHO, 2000) were also provided in the Air Quality and Climatology assessment. A more recent version (WHO, 2021) is now available. As the predicted concentrations are still compliant with the updated NAAQS (2013) and WHO (2021) guidelines, the outcomes of the study (impact significance ratings and mitigation measures) remain valid.

Dust deposition is evaluated according to the South African National Standards (SANS) 1929:2004 in the assessment. These standards require dust fallout rates be evaluated against a four-band scale. The National Dust Control Regulations (Government Gazette No. 36974) published on 1 November 2013 were not referenced or used in the assessment (NEMAQA, 2013). Nonetheless, this shortcoming does not change the scale, intensity, duration, etc. of the impact significance rating related to dust fallout.

The study references the California Office of Environmental Health Hazard Assessment (OEHHA, 1999) acute 1-hour exposure guideline of 94 µg/m³ for formaldehyde. The California OEHHA was updated in 2014 and presents the revised acute 1-hour exposure guideline of 55 µg/m³ for formaldehyde which should have been used in the assessment undertaken in 2015. As the predicted formaldehyde concentrations are below the updated OEHHA guidelines, this will also not affect the outcomes of the study, either in terms of significances.

The study references the National Nuclear Regulations (NNR) dose limits and constraints as per Government Notice No. R.388 of 2006 (DME, 2006). No changes to the NNR dose limits have been effected since promulgation of this standard.

4.7.2.2 Appropriateness of Methodology Used

Meteorological datasets obtained from the five automatic weather stations operated by Eskom at Duynefontein as well as the South African Weather Services (SAWS) meteorological station located at the Cape Town International Airport remain valid and applicable to the assessment.

Radio-nuclide emissions for the preferred alternative reactor designs were obtained from the respective vendors via Eskom. In the absence of any better knowledge, the emission rates were kept constant for this 30-year period. Furthermore, non-radionuclide emissions rates for the auxiliary power generators (Operational Phase) and dust emission rates from the construction phase have not changed since this study was undertaken. The assumptions applied in the dispersion model are therefore still considered applicable in the assessment.

4.7.2.3 Changes to Baseline Conditions

A relatively short baseline air quality monitoring campaign was undertaken at the site over three months (March 2009 to May 2009) for SO₂ and NO₂. Furthermore, air quality datasets were sourced from a monitoring station in Table View for the period January 2000 to January 2007. Due to a lack in industrial and urban development at the Duynefontein site, it is likely that SO₂, NO₂ and PM₁₀ concentrations are likely to have remained consistent with those measured from 2000 to 2007.

The projected on-site radiation doses, due to gaseous and liquid discharges from KNPS during 2007 and 2008 were well within the NNR limit of 250 µSv per annum and the dose target of 10 µSv, which is applicable to an annual period in which there is one refuelling outage. As KNPS is the only nuclear power station at the Duynefontein site, it is likely that baseline projected on-site radiation doses would have remained consistent with those measured from 2007 to 2008.

Results from an environmental surveillance programme undertaken after KNPS was operational showed that no radionuclides were detected in the air particulate samples. Furthermore, findings from direct radiation monitoring (Radiological Environmental Survey, 2008) suggest that the measured ambient radiation doses via a Thermoluminescent dosimeter (TLD) are not due to the operation of the KNPS but are due to the gamma radiation emitted from naturally occurring radioactive material (NORM) in road-construction materials.

As KNPS is the only Nuclear Power Station at the Duynefontein site, it is likely that baseline radionuclide levels in the vicinity are likely to have remained consistent with those measured previously.

4.7.3 Specialist Opinion

The professional opinion of the reviewer is that the following findings of the Air Quality Impact and Climatology Assessment still apply:

- The air quality and climatology assessment fulfils the requirements for a specialist assessment. The study is robust and well conceptualised. The findings are scientifically rigorous, and impacts were adequately assessed;
- While some legislation /guidelines utilised in the study can be considered outdated, this will not affect the outcomes of the study, either in terms of significance ratings or mitigation measures;
- Given that the baseline air quality assessment was undertaken over 10 years ago, without a revised air quality monitoring campaign it is not possible to definitively comment on the extent to which the baseline environment has changed. Based on review of historical aerial imagery of the site however, no obvious dramatic changes are evident. It is unlikely that any changes to the baseline environment would result in significant changes to the impact assessment findings or mitigation recommendations, and that the impact ratings provided in the study remain valid; and

- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the air quality and climatology assessment due to the passage of time.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.8 Specialist Review: Botany and Dune Ecology Impact Assessment

4.8.1 Status of Original Botany and Dune Ecology Impact Assessment

This review is of the Botany and Dune Ecology Impact Assessment prepared by Barrie Low of Coastec Coastal and Environmental Consultants (Low, 2011), and addendum thereof (Low, 2014), to assess the impacts associated with the revised (reduced and repositioned, in response to the recommendations of the original report) footprint for the Duynefontein site. Low's original (2011) report did not support the location of the Duynefontein site due to the positioning of the facility in the endemic, sensitive and mobile transverse dunes, and recommended moving the site some 1.5 km inland to avoid the mobile dunes. The site location was subsequently revised and re-assessed in Low's 2014 addendum report, which found that portions of the transverse dunes had stabilised and revegetated in the interim, and therefore supported the development of the facility on the southern stabilised and revegetated portion of the mobile dune field, as per the revised layout proposed. However, stringent mitigation measures were recommended to ensure appropriate micro-siting of the footprint, preservation of a buffer between the development and mobile dunes, and implementation of an effective management plan during both the construction and operational phases of the project. This management plan must include effective rehabilitation and monitoring, and the enhancement of the Koeberg Nature Reserve. Low also recommended that any losses of the transverse dune should be offset by addition of dune vegetation habitat to the north of the Koeberg Nature Reserve boundary.

The report and addendum were subject to peer review in 2015 as part of the EIA process and were found to be adequately comprehensive, and to meet the review criteria at the time.

Key findings of the study relating to the Duynefontein site are as follows:

- The site falls within the Koeberg Private Nature Reserve, a Protected Area of approximately 3000 ha in extent, which was proclaimed in 1991;
- Two vegetation types (Cape Flats Dune Strandveld and Cape Flats Sand Fynbos) are found on the site, both of which are Endangered;
- The transverse dune system at Duynefontein is endemic, and is poorly represented on the Cape West Coast;
- Sensitivity of the habitat is locally high due to the presence of mobile and potentially mobile dunes, susceptibility to fire is high in the sand plain fynbos, and vegetation resilience is low;
- Negative impacts will mainly relate to the loss of habitat as well as much of a rare mobile transverse dune system. Construction of powerlines over the transverse dunes and the sand plain fynbos could also potentially cause local losses of rare species and fragmentation in habitat;
- Climate change impacts (notable a predicted rise in sea level of some 1.1 m by 2075), could have major impacts on the primary and transverse dunes at the coast, further reducing this habitat type;
- Cumulative impacts would be caused by fragmentation of natural systems, compromising ecosystem functioning, and leading to the permanent loss of rare and quality habitat, particularly the transverse dunes and sand plain fynbos.

The key impacts (those of *medium* significance or *higher* significance) assessed in the 2011 report (no revised impact rating was provided in the 2014 addendum, so it is assumed the specialist considered the impact significance ratings to remain unchanged) were:

- Loss of habitat due to loss of unvegetated and partially vegetated dune areas (a negative impact of *high* significance, not reduced with mitigation, and permanent);
- Loss of ecosystem function due to loss of endemic transverse dune habitat (a negative impact of *high* significance, reduced to *medium* with mitigation, and permanent);
- Loss of locally occurring Red Data List plant species due to vegetation clearing (a negative impact of *high* significance, reduced to *low* with mitigation, including translocation of species);
- Loss of coastal habitat due to sea level rise as a result of climate change (a negative impact of *high* significance, reduced to *low* with mitigation, including implementation of a coastal setback line);
- Cumulative impacts of loss of species, habitat and ecosystem functioning (a negative impact of *high* significance, reduced to *medium* with relocation of the powerplant footprint to outside the transverse dune area); and
- Low notes that relocation of the site as proposed in the 2014 addendum report could potentially result in a positive impact resulting from the continued management of the Koeberg Nature Reserve and expansion thereof into adjacent good quality dune veld.

4.8.2 Botany and Dune Ecology Impact Assessment Review Evaluation Criteria

This review considers the following aspects/criteria:

- New legislation, policy, protocols or other instruments pertinent to the botanical and dune ecology study, notably:
 - Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity (GN R320 of 2020);
 - Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant Species (GN R1150 of 2020);
- Also considered are the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.8.2.1);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.8.2.2);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.8.2.2);
 - g – are any buffers proposed still appropriate given legislation/policy changes and changes to the baseline (Section 4.8.2.2);

Each of these is discussed below.

4.8.2.1 Changes to Legislation, Policy, Protocols or other Instruments Pertinent to the Botany and Dune Ecology Impact Assessment

The study is generally compliant with the principles of the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity (GN R320 of 2020), and the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant Species (GN R1150 of 2020), both of which would have applied to this study if it had been conducted after 2020. It is recognised, however, that the study does not meet every specific requirement of these regulations, nor was it obliged to, as this was not a requirement at the time.

The study has a vegetation / habitat type focus (which the specialist deemed more appropriate) as opposed to a focus on species. The Red Data List that was used to identify and assign the conservation status of indigenous plant species has been updated since the study, meaning that the conservation status of some of the species listed in the report may have changed in the interim. However, a detailed review of such changes is outside the scope of this review.

The report also does not consider or report on Species of Conservation Concern (SCC) as defined by the South African National Biodiversity Institute (SANBI) Regional Red List Assessment (SANBI, 2023), but is limited to *Threatened* species, otherwise known as Red Data List (RDL) species. Species that are protected by South African law, namely the National Environmental Management: Biodiversity Act 10 of 2004 (NEM:BA) Threatened or Protected Species (ToPS) List, the National Forest Act 84 of 1998, Protected Tree List, or the Western Cape Nature Conservation Act 3 of 2000, are not addressed in the level of detail that is currently common practice. This said, the identification of protected species at EIA stage for a project is unlikely to change the impact ratings or mitigation measures. This would however be required for post-authorisation vegetation removal permit applications.

With regard to methodology, Low takes a different approach to what is considered current standard practice for terrestrial biodiversity impact assessment. The integration and groundtruthing of Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), Protected Areas, and other sensitivities identified by a variety of local, regional and national spatial biodiversity and conservation plans, as listed in the terrestrial biodiversity impact assessment protocols, is now the norm. This is mostly to ensure that national and regional conservation targets are met to align with the principles of sustainable development. While no CBAs or ESAs are identified for the Duynefontein site, it does overlap with the Koeberg Nature Reserve¹⁷ (a protected area proclaimed in 1991) and would therefore impact conservation targets, the protected area network, and trigger the requirement for offsets (the subject of a separate specialist report and therefore not part of this review). It is therefore not possible to relate Low's assessment to current standards and conservation targets, particularly as regards specific percentage loss of threatened vegetation types, and how the proposed development within a protected area would impact the local protected area network. However, implicit in Low's study is that such impacts were considered material, hence the requirement for an offset. It is assumed that this is covered in more detail in the report dealing with offsets, and that the information provided in Low's reports is adequate to inform that report. The presence of the KNPS has directly resulted in protection of an area (the Koeberg Nature Reserve - KNR) that may otherwise not have been protected, and it could be argued that similar benefits in terms of biodiversity conservation could potentially result from the Duynefontein power plant if a suitable offset arrangement is reached.

Since the initial specialist review was undertaken, the National Biodiversity Offset Guideline (Department of Forestry, Fisheries and Environment, 2023) has been gazetted, effective 23 June 2023. Although it is a guideline, it is now an official document guiding best practice. As noted above, the original EIA noted

¹⁷ The Koeberg Nature Reserve is managed by Eskom as part of the emergency zone for the Koeberg Nuclear Power Plant.

that the loss of conservation area (at KNR) is material and an offset would be required to ensure that there is no net loss of ecological value. SRK assumes that the Minister was aware of this recommendation, but nevertheless did not make this a condition of EA. The Minister may want to reconsider the merits of an offset in adjudicating the appeal, to take account of the National Biodiversity Offset Guideline.

It is also current practice to include a list of Alien Invasive Species (AIS), as identified in NEM:BA Alien Invasive Species list, in a botanical or ecological report as it is the landowner's responsibility to identify and remove all invasive species. The reviewer is aware that Eskom actively manages AIS on site. This is included as a mitigation measure, but a list would be required to inform a management plan. This is readily addressed post-EIA.

The plant species assessment protocol (GN R1150 of 2020) now requires that SCC are buffered and set aside as no go areas as a mitigation measure. While it is recognised that this would not necessarily be feasible or helpful for the entire study site (given its size, and the number and variety of SCC on the site), this deviation from the protocol is noted. Low included search and rescue as a mitigation measure for loss of threatened / protected species, however the Species Impact Assessment guidelines (2021) strongly discourage this approach, while the offset would also directly address this potential impact.

Despite the above-mentioned and unavoidable departures from current practice and legislated protocols in Low's 2011 and 2014 reports, the essence of the report findings and the mitigation measures recommended would not change substantially.

4.8.2.2 Changes to Baseline Conditions

Given that the latest (Low, 2014) assessment of the site was conducted approximately nine years ago, a revised baseline assessment, including on-site verification, would be required to properly determine whether the baseline conditions as described in Low's report match the current conditions. This is particularly true in dynamic coastal habitats such as Duynfontein, which, despite being part of a protected area, would still be subject to natural dune movement processes. The 2014 Addendum Report indicated that baseline conditions had changed for the site, including stabilisation of parts of the mobile dune areas and, with this, an increase in species number and vegetation cover, moving along a succession from pioneer to mature, climax vegetation. It therefore seems likely that further changes of this nature have continued to take place in the last nine years since Low's Addendum Report, and that if anything, this is likely to have resulted in less areas of sensitive mobile transverse dune being impacted. Given that the impact significance rating was not changed between Low's 2011 and 2014 reports, it seems reasonable to assume that subsequent changes to the baseline environment would not meaningfully change the impact significance rating. Even if this were not the case, the mitigation measures recommended also would not change materially.

No change in the conservation status of the vegetation types identified in the report has been identified. The Duynfontein site is dominated by Cape Flats Dune Strandveld (*Endangered*) and Cape Flats Sandy Fynbos (*Critically Endangered*). Both of these vegetation types have likely experienced transformation, but not to an extent that has resulted in an increased threat status.

4.8.3 Specialist Opinion

4.8.3.1 Overview

The Duynfontein site is sensitive from both a botanical and dune ecology perspective, being located within a transverse dune system and protected area. While the revised site footprint (assessed in the 2014 Addendum report) is supported by Low, the development would still require careful implementation of mitigation measures. Subsequent changes in the baseline environment are likely to have taken place, however, these are not considered to be to the extent that they would result in meaningful changes in the impact assessment provided in Low's 2011 report or the mitigation measures proposed.

The professional opinion of the reviewer is that the following findings of the botanical and dune ecology study review apply:

- The methodology used for the study, while being scientifically sound and rigorous, does not entirely align with current practice, and in particular the relevant assessment protocols (GN R320 and R1150 of 2020), which were not a requirement at the time of the study;
- While the legislation utilised in the study remains applicable and appropriate, some is not mentioned / applied to the extent that is currently expected (for the identification of SCCs, for example). The Assessment Protocols (GN R320 and R1150 of 2020) are the most significant pieces of additional legislation not yet in place at the time of the study, and some gaps in meeting the requirements of these are identified. It is however noted that due to the size and complexity of the site, meeting all of these requirements may not be feasible within the constraints of an EIA process;
- Given that the previous assessment of the site was completed approximately nine years ago, without a revised baseline assessment inclusive of a site visit it is not possible to definitively comment on the extent to which the baseline environment may have changed at a vegetation/ plant species level. Based on review of historical aerial imagery of the site however, no obvious dramatic changes are evident and considering that the impact rating was not changed in response to changes noted in the 2014 addendum report, it is unlikely that any further changes to the baseline environment would result in significant changes to the impact assessment findings or mitigation recommendations; and
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time.

4.8.3.2 Definitive Opinion and Recommendations

Based on the above it is concluded that:

- In general, the Botany and Dune Ecology Impact Assessment report and Addendum meet the requirements for a specialist assessment. They are well-written, scientifically rigorous and have an adequate impact assessment. However, they were written before the gazettement of the assessment protocols, and do not (nor were they obliged to) meet all of the requirements of the protocols. Despite this they are considered to provide adequate information for decision making;
- While uncertainty regarding changes to the baseline environment at a plant species / micro level is noted, the report in its current form does recognise the sensitivity of the receiving environment. Given that the impact significance ratings were not revised in the 2014 addendum, it is reasonable to conclude that any subsequent changes to the baseline would not result in meaningful changes to the impact significance, and that the impact ratings provided in Low's 2011 report remain valid; and
- The mitigation measures provided remain valid.

Since the initial specialist review was undertaken, the National Biodiversity Offset Guideline (Department of Forestry, Fisheries and Environment, 2023) has been gazetted, effective 23 June 2023. The specialist reviewer recommends that the Minister must reconsider the merits of an offset as a condition of authorisation in adjudicating the appeal, to take account of the National Biodiversity Offset Guideline.

4.9 Specialist Review: Wetland Ecosystems Impact Assessment

4.9.1 Status of Original Wetland Ecosystems Impact Assessment

This review is of the Wetland Ecosystems Impact Study ('the study') prepared by Liz Day of the Freshwater Consulting Group (Day, 2011) and considers only the Duynefontein site.

Field assessments were undertaken at the Duynefontein site in July and October 2007, January and August 2008, and April and October 2009. The first draft of the study was prepared in 2010 and subjected

to public review. The study was subsequently revised and updated in 2011, following a year of intensive groundwater and surface water monitoring and analysis (Visser, Dennis, & Day., 2011), the results of which enabled the specialist to assess impacts on wetland systems with a considerably improved level of confidence, but which is not the subject of this review. Version 7 of this study, dated March 2013, was published in the Final Environmental Impact Report (FEIR) in 2015.

The study externally peer reviewed in 2014 and was found to be 'very accurate and the results are reliable. The impact assessment is considered accurate and the mitigation measures proposed are considered relevant and necessary'.

Key findings of the study relating to the Duynefontein site are as follows:

- The site contains wetland systems that are of high ecological importance, relatively unimpacted and considered to be among the last remnants of particular wetland habitats that have been lost from large areas in the region. The conservation status of the site from a wetlands perspective is extremely high and any threats to their integrity are viewed as of high negative significance;
- Development of a single-phase Nuclear Power Station at this site could result in degradation of or disturbance to the artificial wetlands in the north west of the site, the transient duneslack wetlands of the mobile dune and an isolated seasonal wetland potentially in the vicinity of a proposed access road;
- The least sensitive part of the site and thus the recommended development area for the proposed plant lies well away from the most sensitive wetlands on the site – that is, the duneslack depressional wetlands in the south western portion of the site. Groundwater modelling associates a low level of draw-down risk to both these and other wetlands on the site, as a result of dewatering; and
- Avoidance mitigation of impacts to wetlands is considered feasible at this site. Mitigation measures focus on effective management of dust, stormwater and road construction processes, and the location of the Nuclear Power Station and its infrastructure in the least sensitive areas of the development envelope. Retention of the mobile dunes as a viable system is recommended, to ensure maintenance of wetland functions within and to the north of the dunes. Wetlands on the Duynefontein site that lie outside of the 'recommended development area' have, along with their terrestrial margins and interlinking corridors, been identified as 'no development' areas.

Most impacts on wetlands were rated as being of *low* significance by the specialist. Impacts of *medium* or *higher* significance assessed in the study were:

- Loss or degradation of wetlands resulting from dewatering during construction (a medium-term negative impact of *medium* - *low* significance that will be reduced to *low* through mitigation); and
- Loss or degradation of wetlands resulting from seawater contamination, following dewatering during construction (a medium-term negative impact of *medium* - *low* significance that has an extremely low probability of occurring and which will be eliminated with effective mitigation).

4.9.2 Wetland Ecology Impact Assessment Review Evaluation Criteria

This review considers the following aspects/criteria:

- New legislation, policy, protocols or other instruments pertinent to the Wetland Ecosystems study, notably:
 - Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity (GN R320 of 2020);
 - Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species (GN R1150 of 2020);

- Also considered are the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.9.2.2);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.9.2.2);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.9.2.3); and
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 4.9.2.3);

Each of these is discussed below.

4.9.2.1 Changes to Legislation, Policy, Protocols or other Instruments Pertinent to the Wetlands Ecology Impact Assessment

One of the significant changes to the NEMA 2014 EIA Regulations, as amended, since the completion of the Nuclear-1 EIA is the requirement to generate a Screening Report referred to in Regulation 16(1)(v) of the regulations, which identifies related exclusions and/ or specific requirements including specialist studies applicable to the proposed site and/or development, based on the national sector classification and the environmental sensitivity of the site. As part of this review, a Screening Report was generated for the Duiynfontein site. It identifies the Aquatic Biodiversity theme as requiring specialist investigation according to the associated protocols for this theme.

Although not a requirement at the time of the study, interrogation of the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity (GN R320 of 2020) reveals that this comprehensive and robust assessment very adequately fulfils the requirements of the Protocol.

Very little information is currently available regarding the conservation status of freshwater invertebrate biodiversity, apart from dragonflies (Samways, 2006). The report references the IUCN Red List of Threatened Species, but no mention is made of Species of Conservation Concern (SCC) as defined by the South African National Biodiversity Institute (SANBI) Regional Red List Assessment (SANBI, 2023), as that information was simply not available then, or now. The National Water Act 36 of 1998, National Environmental Management: Biodiversity Act 10 of 2004 (NEM:BA), Threatened or Protected Species (ToPS) List, Conservation of Agricultural Resources Act 43 of 1983 (CARA) and the Western Cape Nature Conservation Act 3 of 2000, were not mentioned in the report, and although this legislative context would be useful, it does not materially affect the validity of the findings of the report.

4.9.2.2 Appropriateness of methodology used

The only potentially problematic comment in the external peer review pertains to the peer reviewer's opinion that that 'contextual desktop information from national databases and the application of nationally accepted standard methods of classification and assessment such as the classification method of (Ollis, Snaddon, Job, & Mbona, 2013) and methods such as WET Health and WET Eco Services should be applied in order to improve the scientific validity of the report.' (van de Haar, 2014). The report does in fact give considerable attention to the WET-Health and associated methodologies (this is referenced throughout the report, Appendix C is devoted to an explanation of the methodology and, where

appropriate, Section 5: Recommendations includes the use of these methodologies in proposed monitoring programmes). However, the report makes clear that this methodology was less suited to the wetland types at Duynefontein than those found at the other sites assessed in the EIA and hence other accepted methodologies were also applied and compared where relevant.

The peer reviewer also notes that 'No national or regional desktop information is provided as available on the Biodiversity GIS website. This information is considered important to ensure that the project takes into consideration national and regional ecological conservation targets and concerns for the area. It would also assist the general public with understanding the importance of conservation in a regional context' (van de Haar, 2014). This is a fair observation and given that the National Freshwater Ecosystem Priority Areas (NFEPA) report was published in 2011 (Nel, et al., 2011), it is reasonable to assume that this analysis should have been incorporated into the later versions of the report. However, the specialist report carefully considers the wetland systems of the site in a regional context including consideration of the cumulative effects of loss of similar wetlands in the region. Furthermore, there are no CBAs or ESAs identified for the Duynefontein site¹⁸, so this has little bearing on the outcome of the assessment.

4.9.2.3 Changes to Baseline Conditions

Fieldwork for the study was undertaken from 2007 - 2009 and thus a considerable amount of time has elapsed since the site was surveyed. Given the dynamic nature of the coastal environment, especially the mobile dune field on site, it would be expected that the site has altered to some extent since the original assessment was completed. Given that the bulk of the site is protected and that Eskom has an effective alien vegetation clearing programme in place on the site, it is anticipated that the condition of the environment is likely to have improved over the intervening period, particularly with respect to wetland ecology.

Water quality in the artificial wetlands in the north-west portion of the site fluctuates as the wetlands are fed by stormwater and industrial effluent from the Atlantis Industrial area, but the vegetation and biota in these wetlands is representative of this type of nutrient rich environment (Day, 2011).

The external peer reviewer also suggests 'that buffers or setbacks be recommended for all identified wetlands' (van de Haar, 2014). Wetlands on the Duynefontein site that lie outside of the 'recommended development area' have, along with their terrestrial margins and interlinking corridors, been identified as 'no development' areas, which effectively achieves the same result.

4.9.3 Specialist Opinion

The professional opinion of the reviewer is that the following findings of the freshwater ecology study review apply:

- The Freshwater Ecology Impact Study meets the requirements for a specialist assessment. The study is robust and well conceptualised. The methodology used for the study is scientifically sound and would fulfil most of the requirements set out in the relevant assessment protocol (GN R320 of 2020). The findings are scientifically rigorous and impacts were thoroughly assessed such that the essence of the report findings and the mitigation measures recommended would not change substantially should current protocols be applied;

¹⁸ The very high sensitivity of the wetland systems in the study area according to the Screening Report is attributed to the permanently saturated artificial wetlands in the north-western portion of the site. These are described in the report as coastal infiltration ponds, fed by industrial effluent and stormwater runoff from the Atlantis Industrial Area. These are highly artificial systems are of low quality, prone to algal blooms, but which provide a locally rare extent of permanent freshwater habitat and thus artificially contribute to plant and animal diversity in the area. Importantly, they play a significant role in providing a hydraulic barrier for the protection of the greater Atlantis Aquifer (part of a strategic water source area) from seawater intrusion (Day, 2011).

- The report does not list or contextualise legislation applicable at the time of the study. However, this has no material effect on the validity of the study as it is generally compliant with the requirements of this legislation;
- The baseline condition of the site is likely to have improved since the study was undertaken, given its protected status and Eskom's alien clearing programme. It is unlikely that any changes to the baseline environment would result in significant changes to the impact assessment findings or mitigation recommendations, and that the impact ratings provided in the study remain valid;
- Implementation of the monitoring programme recommended in the report will adequately account for any minor changes in baseline conditions and updated approaches such as the categorisation of wetlands according to NFEPA; and
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.10 Specialist Review: Vertebrate Fauna Impact Assessment

4.10.1.1 Status of Original Vertebrate Fauna Impact Assessment

This review is of the Terrestrial Vertebrate Fauna Impact Study ('the study') prepared by JAH Environmental Consultants (JAH Environmental Consultants, 2011) and considers only the Duynefontein site.

Fieldwork for the study was undertaken in late 2007, the report was then published in 2011 in the Draft FEIR version 1. Along with all specialist studies, the report was subjected to peer review (by Scientific Aquatic Services) in 2015, which found the report to be robust and comprehensive and no changes were required prior to its publication in the Draft FEIR version 2 (2015). Similarly, no changes were made to the report following stakeholder review and it was published unchanged in the FEIR (2016).

Key findings of the study relating to the Duynefontein site are as follows:

- Duynefontein lies within the Cape Floristic Region (CFR) which is largely restricted to the Western Cape province. This is an exceptionally biodiverse region with very high levels of species endemism. Koeberg Private Nature Reserve (KPNR) was identified as one of 11 priority conservation sites in a study encompassing the region along the West Coast between Blouberg and Silverstroomstrand, inland to the N7 National Road;
- The habitats within the footprint of the proposed Nuclear-1 are generally in fair to good condition because they have been cleared of alien vegetation and rehabilitation of the habitats is well advanced. A full complement of expected fauna is believed to occur on site;
- At Duynefontein, the amount of land that is available for development, and that is not of high faunal sensitivity, is limited but sufficient to allow for Nuclear-1. However, further future expansion of power-generating facilities within the present Eskom property, to the north of KNPS, should not be considered;
- Development of Nuclear-1 at Duynefontein would have significant negative impacts, mainly because of the direct impacts on faunal habitats within the footprint areas. Duynefontein would benefit from the no-development option because the land is already managed as part of a private nature reserve; and
- Nuclear-1 could be developed at Duynefontein, without further faunal EIA investigations.

The key impacts (those of *medium* or *higher* significance) assessed in the study were:

- Destruction of natural habitats and populations (a permanent negative impact of *high* significance that cannot be reduced through mitigation);
- Reduction in populations of Threatened species, resulting from habitat destruction and direct mortality (a permanent negative impact of *medium* significance that cannot be reduced through mitigation);
- Fragmentation of natural habitats and patterns of animal movement, resulting from buildings, infrastructure and fences (a negative impact of *medium* significance that can be reduced to *low* with appropriate mitigation);
- Mortality associated with overhead transmission lines and substations, resulting from collisions and electrocutions (a negative impact of *medium* significance that can be reduced to *low* with appropriate mitigation);
- Pollution of soil and water beyond the building site, resulting from spills of chemicals, fuel and sewage (a negative impact of *medium* significance that can be reduced to *low* with appropriate mitigation);
- Light pollution beyond the building site, resulting from excessive outdoor lighting and poor choice of lights and fittings (a long-term negative impact of *high* significance that can be reduced to *low* with appropriate mitigation);
- Alteration of surface and groundwater levels and flows and knock-on effects on local wetlands resulting from underground foundation structures and construction methods (a negative impact of *medium* significance that can be reduced to *low* with appropriate mitigation);
- Problem animal scenarios, resulting mainly from human interaction with animals (a negative impact of *medium* significance that can be reduced to *low* with appropriate mitigation);
- Cumulative impacts resulting from addition of impacts to existing impacts and the operation of impacts over time (a long-term negative impact of *high* significance that can be reduced to *medium* with appropriate mitigation); and
- Improved conservation of undeveloped land, resulting from improved legal status and/or management (a long-term, positive impact of *low* significance that can be increased to *medium* with appropriate mitigation).

4.10.2 Fauna Impact Assessment Review Evaluation Criteria

This review considers the following aspects/criteria:

- New legislation, policy, protocols or other instruments pertinent to the fauna study, notably:
 - Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity (GN R320 of 2020);
 - Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species (GN R1150 of 2020);
- Also considered are the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.10.2.2);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:

- cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.10.2.2);
- cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.10.2.3);
- g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 4.10.2.1);

Each of these is discussed below.

4.10.2.1 Changes to Legislation, Policy, Protocols or other Instruments Pertinent to the Vertebrate Fauna Impact Assessment

One of the significant changes to the NEMA 2014 EIA Regulations, as amended, since the completion of the Nuclear-1 EIA is the requirement to generate a Screening Report referred to in Regulation 16(1)(v) of the regulations, which identifies related exclusions and/ or specific requirements including specialist studies applicable to the proposed site and/or development, based on the national sector classification and the environmental sensitivity of the site. As part of this review, a Screening Report was generated for the Duynefontein site. It identifies both the Terrestrial Animal Species theme and the Terrestrial Biodiversity theme as requiring specialist investigation according to the associated protocols for those themes.

The (JAH Environmental Consultants, 2011) study examines the vertebrate fauna of the site both at a population/species level ('pattern') and at an ecosystem level ('process') and at is thus considered to comply with the intent and requirements of the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity¹⁹ (GN R320 of 2020), and the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species²⁰ (GN R1150 of 2020). It is recognised, however, that the study does not meet every specific requirement of these regulations, nor was it obliged to, as this was not a requirement at the time.

The report also does not consider or report on SCC as defined by the South African National Biodiversity Institute (SANBI) Regional Red List Assessment (SANBI, 2023), but is limited to *Threatened* species, otherwise known as RDL species. The Red Data Lists that were used to identify and assign the conservation status of faunal species have been updated since the study, such that the conservation status of some of the species listed in the report may have changed in the interim. However, such specific changes are highly unlikely to have any bearing on the impact assessment. The National Environmental Management: Biodiversity Act 10 of 2004 (NEM:BA), Threatened or Protected Species (ToPS) List and the Western Cape Nature Conservation Act 3 of 2000, are not addressed in the level of detail that is currently common practice. This is not, however, considered to have significant bearing on the findings of the impact assessment.

4.10.2.2 Appropriateness of methodology used

Field survey methods used were proven and robust and although these methods may have been refined and improved in the intervening years, the basic principles remain unchanged and the methodology is considered adequate for the purpose of this assessment.

¹⁹ The DFFE Screening Report classes the Terrestrial Biodiversity theme for the site as 'Very High' sensitivity due to the presence of (an) Endangered ecosystem(s), overlap with the Protected Areas Expansion Strategy and the proximity of the Koeberg Private Nature Reserve.

²⁰ The DFFE Screening Report classes the Terrestrial Animal Species theme for the site as 'High' sensitivity. The associated sensitivity features are related to bird species of conservation concern and two invertebrate species of conservation concern (addressed in the Invertebrate Fauna specialist report).

The amount of large-scale spatial planning data that has become available since the study was undertaken has changed the way in which biodiversity assessments are pitched. In general, placement of a site and proposed development within a context of local, regional and national spatial biodiversity and conservation plans is now the norm, to give consideration to the impact of the proposed development on national and regional conservation targets. While no CBAs or ESAs are identified for the Duynefontein site, it does overlap and is within with the KPNR²¹ (a protected area proclaimed in 1991) and would therefore impact conservation targets and the protected area network and trigger the requirement for offsets (the subject of a separate specialist report and therefore not part of this review).

It is also current practice to include a list of AIS, as identified in NEM:BA Alien Invasive Species list, in any biodiversity report as it is the landowner's responsibility to identify and remove all invasive species. No alien fauna was recorded for the Duynefontein site but given that alien fauna was recorded at the alternative sites investigated during EIA, it is clear that this is not an oversight on the part of the authors.

Despite the above-mentioned and unavoidable departures from current practice and legislated protocols in the study, the essence of the report findings and the mitigation measures recommended would not change substantially should current protocols be applied.

4.10.2.3 Changes to Baseline Conditions

Fieldwork for the study was undertaken in September and November 2007 and thus a considerable amount of time has elapsed since the site was surveyed. Given the dynamic nature of the coastal environment, especially the mobile dune field on site, it would be expected that the site has altered to some extent since the original assessment was completed. However, unless there is degradation of habitat, any such change is unlikely to meaningfully affect faunal populations. Given that the bulk of the site is protected and that Eskom has an effective alien clearing programme in place on the site, the condition of the environment is likely to have improved over the intervening period. This was certainly the case in 2014, when the botanical specialist compiled an addendum to his original report (Low, 2014) and noted that baseline conditions had changed for the site since his original survey in 2011. These changes included stabilisation of parts of the mobile dune areas and a concomitant increase in plant species and vegetation cover, moving along a succession from pioneer to mature, climax vegetation.

The authors of the study devote an entire Appendix (Appendix 4) to the discussion of the importance ecological corridors and associated buffers and how these should be integrated into a development footprint. This is certainly useful and insightful, but it does not fulfil the very specific requirements for buffering of the associated habitat of each SCC²² set out in the Species Environmental Assessment Guidelines (Verburgt & Raimondo, 2020) that accompany the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species (GN R1150 of 2020). The vertebrate faunal SCC listed in the Screening Report for the site are limited to bird species (the study also lists several herpetofauna and mammals) and the authors of the study note that none of the preferred habitats of these avifauna will be impacted by the footprint of the proposed development. It is considered unnecessary to undertake additional studies to corroborate this information and develop species-specific buffers at this point of the assessment. Implementation of the comprehensive and considered mitigation measures recommended in the study that focus on the maintenance of habitats and habitat connectivity will achieve the same end.

²¹ The KPNR is managed by Eskom as part of the emergency zone for the Koeberg Nuclear Power Plant.

²² The authors of the study do note in Appendix 1 that 'Regardless of category of occurrence, if plans are likely to impact highly threatened species (i.e., Critically Endangered and Endangered species), it may be recommended that additional surveys determine the extent of occurrence and approximate population sizes of those species so that planning and management can proceed with the necessary information', which achieves the same end in effect

4.10.3 Specialist Opinion

Large portions of the Duynefontein site are considered to be sensitive from a faunal perspective, being located within a transverse dune system and protected area. The authors recommend footprint placement in the southernmost portions of the site to reduce the significance of impacts to an acceptable level and propose a suite of carefully considered mitigation measures.

The professional opinion of the reviewer is that the following findings of the fauna study review apply:

- The Vertebrate Fauna Impact Study meets the requirements for a specialist assessment. The study is robust and well conceptualised. The methodology used for the study, while being scientifically sound and rigorous, does not entirely align with current practice, and in particular the relevant assessment protocols (GN R320 and R1150 of 2020), which were not a requirement at the time of the study. The findings are scientifically rigorous and impacts were adequately assessed;
- While the legislation utilised in the study remains applicable and appropriate, some is not mentioned / applied to the extent that is currently expected (for the identification of SCCs, for example). The Specialist Assessment Protocols (GN R320 and R1150 of 2020) are the most significant pieces of additional legislation not in place at the time of the study, and some gaps in meeting the requirements of these are identified. However, these gaps do not materially affect the validity and robustness of the study;
- Given that the last assessment of the vegetation of the site was completed approximately nine years ago, without a revised baseline assessment inclusive of a site visit it is not possible to definitively comment on the extent to which the baseline environment has changed. Based on review of historical aerial imagery of the site however, no obvious dramatic changes are evident and the condition of the site is likely to have improved given its protected status and Eskom's alien clearing programme. It is unlikely that any changes to the baseline environment would result in significant changes to the impact assessment findings or mitigation recommendations, and that the impact ratings provided in the study remain valid; and
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.11 Specialist Review: Invertebrate Fauna Impact Assessment

4.11.1 Status of Original Invertebrate Fauna Impact Assessment

This review is of the Terrestrial Invertebrate Fauna Impact Study ('the study') prepared by Ecocheck Environmental Services and Art CC (Ecocheck, 2014) and considers only the Duynefontein site. This study augmented an initial invertebrate assessment undertaken by AfriBugs CC (Afribugs, 2011) to provide a greater level of certainty to the prediction of impacts on invertebrates (although no further mention is made of the latter study). Fieldwork for the study was undertaken in two seasons: end of wet season 2012 (August – September) and height-of-summer season (December 2013).

Key findings of the study relating to the Duynefontein site are as follows:

- The site has limited invertebrate habitat variation (such as large wetlands or significant surface rock) and is characterised by significant levels of habitat transformation as a result of alien invasive vegetation;
- None of the invertebrates found during the two field investigations at Duynefontein are known to be Threatened or otherwise limited in distribution or scarce; the invertebrate communities of the

Duynefontein study site are characterised by moderate species richness, species diversity and species evenness. The authors considered it unlikely that the Duynefontein study site will host any listed Red Data List (RDL) invertebrate²³;

- The Duynefontein study site is considered to be of *medium* sensitivity from the perspective of invertebrate fauna; and
- Duynefontein was found to be a suitable site for the proposed Nuclear-1 Power Station from the perspective of invertebrate fauna.
- The key impacts (those of *medium* or *higher* significance) assessed in the study were:
- Habitat loss of conservation important species (a permanent negative impact of *medium* significance that can be reduced to *low* through mitigation);
- Loss and degradation of sensitive invertebrate habitat (a permanent negative impact of *medium* significance that can be reduced to *low-medium* with mitigation);
- Displacement of invertebrates and human-animal conflicts (a medium-term negative impact of medium significance that can be reduced to *low* with appropriate mitigation);
- Loss of ecological connectivity and ecosystem functioning (a negative impact in the medium term that can be reduced from *low-medium* to *low* significance with mitigation);
- Degradation of surrounding habitat (a negative, indirect impact of *medium* significance that can be reduced to *low* significance with mitigation); and
- Reduction in populations of *Threatened* species, resulting from habitat destruction and direct mortality (a permanent negative impact of *medium* significance that cannot be reduced through mitigation).

4.11.2 Invertebrate Fauna Impact Assessment Review Evaluation Criteria

This review considers the following aspects/criteria:

- New legislation, policy, protocols or other instruments pertinent to the invertebrate fauna study, notably:
 - Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity (GN R320 of 2020);
 - Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species (GN R1150 of 2020);
- Also considered are the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.11.2.2);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.11.2.3);

²³ One flightless species of dung beetle, *Macroderes greeni* is very localized and rare; it was found at the Duynefontein study site and could warrant future Red Data List status as more data on the species becomes available.

- cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.11.2.3); and
- g –are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 4.11.2.1).

Each of these is discussed below.

4.11.2.1 Changes to Legislation, Policy, Protocols or other Instruments Pertinent to the Invertebrate Fauna Impact Assessment

One of the significant changes to the NEMA 2014 EIA Regulations, as amended, since the completion of the Nuclear-1 EIA is the requirement to generate a Screening Report referred to in Regulation 16(1)(v) of the regulations, which identifies related exclusions and/ or specific requirements including specialist studies applicable to the proposed site and/or development, based on the national sector classification and the environmental sensitivity of the site. As part of this review, a Screening Report was generated for the Duynefontein site. It identifies both the Terrestrial Animal Species theme and the Terrestrial Biodiversity theme as requiring specialist investigation according to the associated protocols for those themes.

Two invertebrate species are listed as medium sensitivity under the Terrestrial Animal Species theme in the Screening Report, namely the African Dung Beetle *Pachysoma aesculapius* and the Bladder Grasshopper *Bullacris obliqua*, both of which are listed as *Vulnerable* on the IUCN Red List (Davis, 2013) (Couldridge, 2018). However, neither of these species was recorded from the site during either of the specialist invertebrate studies undertaken during the EIA (Afribugs, 2011) (Ecocheck, 2014). This corroborates the specialist's assertion that the site is of medium sensitivity from an invertebrate perspective (Ecocheck, 2014).

The study examines the invertebrate fauna of the site both at a population/species level ('pattern') and at an ecosystem level ('process') and at is thus considered to comply with the intent and requirements of the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity²⁴ (GN R320 of 2020), and the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species²⁵ (GN R1150 of 2020). It is recognised, however, that the study does not meet every requirement of these regulations, nor was it obliged to, as this was not a requirement at the time.

A detailed assessment is made of the potential occurrence of Species of Conservation Concern (SCC) or RDL species on the site. The RDLs that were used to identify and assign the conservation status of invertebrate species have been updated for some taxa since the study, such that the conservation status of some of the species listed in the report may have changed in the interim (these are now contained in a consolidated Regional Red List Assessment held by SANBI (SANBI, 2023). However, such changes are unlikely to have any bearing on the impact assessment, which is largely based on the assessment of loss and damage to habitats rather than individual species.

No mention is made of any legislative framework at all in the report. Commonly, the NEM:BA, ToPS List and the Western Cape Nature Conservation Act 3 of 2000 would be considered in a specialist assessment. However, this is not considered to have significant bearing on the findings of the impact assessment.

²⁴ The DFFE Screening Report classes the Terrestrial Biodiversity theme for the site as 'Very High' sensitivity due to the presence of (an) Endangered ecosystem(s), overlap with the Protected Areas Expansion Strategy and the proximity of the Koeberg Private Nature Reserve.

²⁵ The DFFE Screening Report classes the Terrestrial Animal Species theme for the site as 'High' sensitivity. The associated sensitivity features are related to bird species of conservation concern and two invertebrate species of conservation concern (addressed in the Invertebrate Fauna specialist report).

4.11.2.2 Appropriateness of methodology used

The study was commissioned specifically to augment the original assessment (Afribugs, 2011) and an appropriately rigorous approach was taken to designing the field assessments and subsequent statistical data analysis. Field survey methods used were proven and although these methods may have been refined and improved in the intervening years, the basic principles remain unchanged and the methodology is considered adequate for the purpose of this assessment.

The amount of large-scale spatial planning data that has become available since the study was undertaken has changed the way in which biodiversity assessments are pitched. In general, placement of a site and proposed development within a context of local, regional and national spatial biodiversity and conservation plans is now the norm, to give consideration to the impact of the proposed development on national and regional conservation targets. While no Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) are identified for the Duynefontein site, it does overlap with and is within the KPNR²⁶ (a protected area proclaimed in 1991) and would therefore impact conservation targets and the protected area network and trigger the requirement for offsets (the subject of a separate specialist report and therefore not part of this review).

It is also current practice to include a list of AIS, as identified in NEM:BA Alien Invasive Species list, in any biodiversity report. One alien species, the Spotted Amber Ladybird *Hippodamia variegata*, was recorded at Duynefontein. Little mention is made of this or alien species at all in the report (the difference in status of this record is just noted in blue text). However, it does indicate that the specialist considered alien species in the assessment, even if somewhat incidentally.

Despite the above-mentioned and unavoidable departures from current practice and legislated protocols in the study, the essence of the report findings and the mitigation measures recommended would not change substantially should current protocols be applied.

4.11.2.3 Changes to Baseline Conditions

Fieldwork for the study was undertaken in August - September 2012 and December 2013 and thus a significant amount of time has elapsed since the site was surveyed. Given the dynamic nature of the coastal environment, especially the mobile dune field on site, it would be expected that the site has altered to some extent since the original assessment was completed. However, unless there is degradation of habitat, any such change is unlikely to meaningfully affect invertebrate populations. Given that the bulk of the site is protected and that Eskom has an effective alien clearing programme in place on the site, the condition of the environment is likely to have improved over the intervening period. This was certainly the case in 2014, when the botanical specialist compiled an addendum to his original report (Low, 2014) and noted that baseline conditions had changed for the site since his original survey in 2011. These changes included stabilisation of parts of the mobile dune areas and a concomitant increase in plant species and vegetation cover, moving along a succession from pioneer to mature, climax vegetation.

The Species Environmental Assessment Guidelines (SANBI and BirdlifeSA, 2020) that accompany the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species (GN R1150 of 2020) set out specific requirements for buffering of the associated habitat of each SCC identified during a study. No mention is made of buffers in the (Ecocheck, 2014) study, but given that no SCCs were identified or expected for the site, this is appropriate.

The study makes a few contradictory statements regarding the potential presence of additional SCC. The author makes a somewhat oblique reference in the assessment of impacts on habitat loss of conservation important species that the study 'has not been completed' and that invertebrate SCC may be identified in the future. However, no recommendations or further mention is made of the requirement for additional

²⁶ The KPNR is managed by Eskom as part of the emergency zone for the Koeberg Nuclear Power Plant.

studies, other than for a monitoring programme which is aimed at monitoring ecosystem health rather than identifying additional species on site. In the section on habitat sensitivity, the author states that it is 'unlikely that the Duynefontein study site will host any listed Red Data invertebrate of the Western Cape Province.' If the conservation status of the rare dung beetle *Macroderes greenii* found on site is in fact elevated in the future as suggested in the report, this will not be completely true. However, this latter statement is considered to be a more accurate and considered statement in response to the data presented in the report and in the context of the EIA, this study is considered adequate for the purposes of informing the decision without the need for further study.

4.11.3 Specialist Opinion

The reviewer's professional opinion of the invertebrate fauna study is set out below:

- The Invertebrate Fauna Impact Study meets the basic requirements for a specialist assessment. The study is adequate and sufficiently thorough. The methodology used for the study, while being scientifically sound and appropriate, does not entirely align with current practice, and in particular the relevant assessment protocols (GN R320 and R1150 of 2020), which were not a requirement at the time of the study. The findings are scientifically rigorous and impacts were adequately assessed;
- While applicable legislation is not mentioned / applied to the extent that is currently expected, this does not materially affect the scope of the study. The Specialist Assessment Protocols (GN R320 and R1150 of 2020) are the most significant pieces of additional legislation not in place at the time of the study, and some gaps in meeting the requirements of these are identified. However, these gaps do not materially affect the validity of the study;
- It is unlikely that any changes to the baseline environment would result in significant changes to the impact assessment findings or mitigation recommendations, and the impact ratings provided in the study remain valid; and
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.12 Specialist Review: Marine Ecology Impact Assessment

4.12.1 Status of Original Marine Ecology Impact Assessment

This review is of the Marine Ecology Impact Study ('the study') prepared by Professor C.L. Griffiths, Dr T.B. Robinson and Dr S.H. Elwen (Griffiths, Robinson, & Elwen, 2016) and considers only the Duynefontein site.

The report was originally submitted in draft form in 2008 and then revised and completed in 2012. Although the study (Griffiths, Robinson, & Elwen, 2016) contains some edits and corrections, the consultants were not tasked with incorporating new information that became available subsequent to the original report, and the study is therefore based on information available up to 2012.

This specialist study was undertaken to assess the impacts of the development of Nuclear-1 on the marine environment during construction, operation and decommissioning²⁷ and also identifies any risks posed by the marine environment to the development.

²⁷ The study (Griffiths, Robinson, & Elwen, 2016) is contradictory in its assessment of the decommissioning phase. The study states that decommissioning is considered, and later in the report that is not formally considered as decommissioning will not impact on the marine environment. The study includes reference to decommissioning within the context of warm water effluent and site exploitation.

Due to the location and design of the Nuclear-1, impacts on the marine ecosystem are mostly within the nearshore environment.

Field surveys for the study were undertaken between August and October 2007 and included sampling representative beach types where applicable.

Key findings of the study relating to the Duynefontein site are as follows:

- Duynefontein falls within the Southern Benguela ecoregion and the southwestern Cape inshore ecozone. This region is dominated by the cold Benguela Current system, in which high biological productivity is supported by the upwelling of cool, nutrient-rich waters. However, the section of the coast at the Duynefontein is characterised by low marine species richness and very low endemism with some south coast species extending to this site, giving it a slightly elevated species richness and endemism rates compared to more northern coastal areas;
- The threat status of sandy and rocky shores in this region is classified as vulnerable and moderately protected, with no sites of special biological significance in the area;
- The beaches at Duynefontein are notable for the low number of species they support, while wave action and siltation result in beaches that are very resilient to disturbance. All the beach species have extensive geographical distributions and there are no sites of special conservation value for marine species in the immediate area;
- Although the intertidal zone is more sensitive than sandy shores, the rocky shores at the Duynefontein site represent a low-sensitivity habitat;
- The benthic environment²⁸ is comprised of both rocky and sandy seafloors occurring in the nearshore environment in the immediate vicinity of KNPS. Although these habitats were not sampled as part of this study, this is not considered to be a fatal flaw. There is sufficient information relating to commercially important benthic resources, such as abalone, and the warm effluent from the proposed development will be concentrated near the surface and is unlikely to impact these benthic habitats. The rocky substrata are inhabited by species typical of the South African west coast and are widely distributed, whilst the sandy bottom communities in this area support no species of special note. This environment has medium sensitivity to disturbance;
- The open water environment of the west coast region has highly productive fisheries driven primarily by high densities of phytoplankton and zooplankton. Several species of marine mammals inhabit the nearshore waters of the southern Benguela region. This environment demonstrates relatively high tolerance to disturbance and is rated as having low sensitivity;
- A number of marine birds are known to breed in the intertidal zone around the KNPS. Recent research has identified the Koeberg harbour and surrounding reserve as an area of significant conservation importance, which meets the criteria for both the Ramsar convention and an Important Bird Area. In particular, the protection offered by the Koeberg reserve has resulted in a notable increase in density of breeding pairs of the African black oystercatcher, which has recently been re-categorised as *Near-threatened* after being listed as *Endangered* for a number of years;
- The study addresses the marine ecology impacts associated with construction of cooling water intake and outflow systems, disruption due to discarding of spoil, entrainment of organisms during the intake of cooling water, the effect of seawater abstraction for cooling purposes, the subsequent release of warmed water, the release of brine from desalinisation, the unintentional release of radiation emissions

²⁸ The area inhabited by organisms living on and in the seafloor sediments.

and organic, bacterial or hydrocarbon pollution due to seepage of polluted ground water and the protection of organisms from exploitation due to a safety exclusion zone;

- Experience at the existing KNPS that has shown that many of these impacts can have minimal effect on marine habitats; and
- Many of the recommended mitigation measures are applicable to the construction phase, which reduces the severity of the particular impacts. The reviewer notes that the impacts in this study are not rated for significance after mitigation and cumulative impacts are not described.

The key impacts are discussed further below:

- Construction impacts arise from the construction of the cooling water uptake and outfall system (which will be localised and of short to medium duration) and discard of spoil, which will have a significant and negative affect on the marine environment and is considered long term. The study recommends that spoil only be discarded offshore, and at Duynefontein spoil disposal Alternative 6 is the preferred option followed by Alternative 5 and then Alternative 4;
- During the Construction Phase small volumes of hypersaline effluent will be released beyond the surf zone via a piped diffuser. During the Operational Phase the hypersaline effluent (brine) will be co-released with cooling water, diluting the brine with no impact on the marine environment predicted;
- The most likely source of radiological releases into the marine environment is through the unintentional release of contaminated cooling water, minimised through the technical design of the cooling system. This approach has proved adequate at KNPS, where no radionuclide release has been detected;
- Sewage from the proposed development will be treated and then released via the cooling water outlet pipe. At the point of release this effluent will meet the standards set by the Department of Water and Sanitation with no significant impact on the marine environment; and
- Accidental pollution of groundwater by organic, bacterial or hydrocarbon compounds may result in pollution of the marine environment as groundwater releases into the ocean. Should this occur, the impact would be minimal as only a small area would be affected and contaminants would rapidly be diluted and dispersed by water movements.

A potential risk to Nuclear-1 is:

- The entrainment of marine organisms in cooling water, not anticipated to have significant effects and mitigated through the installation of screens.

4.12.2 Marine Ecology Impact Assessment Review Evaluation Criteria

This review considers the following aspects/criteria:

- New legislation, policy, protocols or other instruments pertinent to the marine ecology study, notably:
 - “Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed” (GN R320 of 2020);
 - National Environmental Management: Integrated Coastal Management Act 24 of 2008 (NEM:ICMA), Dumping at Sea Regulations (GN R711 of 2017);
 - NEM:ICMA, Coastal Waters Discharge Permit Regulations (GN R382 of 2019);
 - National Coastal and Marine Spatial Biodiversity Plan (NCMSBP): Technical Report, Version 1.2 (released 12-04-2022);
 - Sea-use Guidelines Version 1.2 (released 12-4-2022);

- Also considered are the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.12.2.2);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.12.2.2);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.12.2.3);
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 4.12.2.1).

Each of these is discussed below.

4.12.2.1 Changes to Legislation, Policy, Protocols or Other Instruments Pertinent to the Marine Ecology Impact Assessment

One of the significant changes to the NEMA 2014 EIA Regulations, as amended, since the completion of the Nuclear-1 EIA is the requirement to comply the “Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed” (GN R320 of 2020). This Protocol refers to the required level of assessment that must be based on the findings of the site sensitivity verification and must comply with Appendix 6 of the NEMA 2014 EIA Regulations.

Although there is no map superimposing the activity on the sensitive marine features, the study does highlight that the inter-tidal zone and open water habitats are of low sensitivity, with the benthic environment of medium sensitivity to disturbance.

The study does not meet every specific requirement of these regulations, nor was it obliged to, as this was not a requirement at the time. However, despite the above-mentioned departure from the legislated protocol, the essence of the report findings and the mitigation measures recommended would not change substantially should current protocols be applied.

The NCMSBP was developed (subsequent to the study) to ensure that coastal and marine biodiversity assets and ecological infrastructure are effectively managed and conserved, identifying priority areas that need to be secured for the long-term support of sustainable development. The reviewer notes that the NCMSBP identifies no Marine Protected Areas (MPAs), CBAs or ESAs in the immediate marine environment off the Duynefontein site.

Regulations promulgated after the study and which pertain to permitting requirements of Nuclear-1 include the NEM:ICMA, Dumping at Sea Regulations (GN R711 of 2017), and the NEM:ICMA Coastal Waters Discharge Permit Regulations (GN R382 of 2019) will not affect the findings of the study (Griffiths, Robinson, & Elwen, 2016).

4.12.2.2 Appropriateness of methodology used

The information included in this report was obtained during a dedicated field survey at Duynefontein and secondary data (literature review) as well as information gathered following the establishment of KNPS.

Field survey methods used were proven and robust and although these methods may have been refined and improved in the intervening years, the basic principles remain unchanged and the methodology is considered adequate for the purpose of this assessment.

The reviewer notes that the impacts in the study are not rated for significance after mitigation and cumulative impacts are not described. However, the study recommends mitigation measures to reduce the severity of impacts. The study refers to the experience gained from understanding the impacts at the existing KNPS which has shown that many of the impacts can have minimal effects on marine habitats.

The approach of the study is nevertheless aligned with the “Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed” (GN R320 of 2020).

4.12.2.3 Changes to Baseline Conditions

The study (Griffiths, Robinson, & Elwen, 2016) provides databases of the density, diversity and status of species recorded in the shandy shores and rocky shores of the Duynefontein site, informing the baseline assessment of the marine ecosystems sampled. The study refers to the ecological baseline studies conducted for the existing Nuclear Power plant dating back to 1984, and again in 2007 as part of the field surveys for the “present environmental assessment”. The study refers to the appearance of an alien barnacle (*Balanus glandula*) and the absence of a mussel (*Choromytilus meridionalis*) indicating changes in the baseline benthic habitat recorded in 2007. The study reports that this mussel has, however, disappeared from many west coast shores due to the extensive invasion of these sites by the alien mussel (*Mytilus galloprovincialis*).

Fieldwork for the study was undertaken in 2007 and a considerable amount of time has elapsed since the site was surveyed. Given the dynamic nature of the marine environment it would be expected that it has altered to some extent since the 2007 baseline assessment was completed, but given that the section of the coast at the Duynefontein is characterised by low marine species richness and very low endemism, the baseline is unlikely to have changed materially.

4.12.3 Specialist Opinion

The professional opinion of the reviewer is that the following findings of the marine study review apply:

- The Marine Ecology Impact Assessment meets the requirements for a specialist assessment. The study is comprehensive and well-motivated. The methodology used for the study was scientifically sound. Although it does not entirely align with current practice, in particular the relevant assessment protocol (GN R320) (which was not a requirement at the time of the study), the findings are, nevertheless scientifically rigorous and impacts were adequately assessed;
- Given that the last assessment of the marine ecology of the site was completed approximately sixteen years ago, it is not possible to definitively comment on the extent to which the baseline environment has changed. Reviewing historical aerial imagery of the site is appropriate for a terrestrial study, with no obvious changes evident in the sandy shores (intertidal zone) and existing breakwaters. As noted above, Duynefontein coastline is characterised by low marine species richness and very low endemism and the baseline is unlikely to have changed materially, i.e. is considered adequate;
- The presence of species requiring attention (i.e. of potential conservation significance) within the marine environment (project area described in the study) is not, however, considered to have significant bearing on the findings of the impact assessment;
- It is unlikely that any changes to the baseline environment would result in significant changes to the impact assessment findings or mitigation recommendations, and that the impact ratings provided in the study remain valid; and,
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.13 Specialist Review: Social Impact Assessment

4.13.1 Status of Original Social Impact Assessment

This review is of the Social Impact Assessment (SIA) prepared by Alewyn Dippenaar of Octagonal Development cc (Octagonal Development, 2016). The January 2016 SIA is an update of an earlier version of the report, submitted with the Nuclear 1 EIA, following a peer review of that report. The review is limited to the Duynefontein site.

The key impacts (those of *medium* significance or *higher* significance) assessed in the SIA were:

- Accommodation of staff and construction workers (a negative impact of *medium* significance and only applicable during construction);
- Creation of employment opportunities (a positive impact of *medium* significance during construction);
- Business opportunities (a positive impact of *medium* significance during both construction and operation);
- Risk of sexually transmitted diseases (STDs), human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) (a negative impact of *medium* significance during construction);
- Water and Sanitation (a negative impact of *medium* significance during construction);
- Roads and Transport (a negative impact of *medium* significance during construction)²⁹;
- Traffic Impact (a negative impact of *medium* significance during construction)²⁹;
- Waste & refuse removal (a negative impact of *medium* significance during construction);
- Loss of employment after construction (a negative impact of *medium* significance at the end of construction);
- Visual impacts (a negative impact of *medium* significance during both construction and operation)²⁹;
- Impact on medical infrastructure/ facilities without mitigation (a negative impact of *medium* significance during construction);
- Impact on social law enforcement services without mitigation (a negative impact of *medium* significance during construction);
- Impact on school infrastructure/ facilities without mitigation (a negative impact of *medium* significance during both construction and operation);
- Impact on sport infrastructure/ facilities without mitigation (a negative impact of *medium* significance during both construction and operation);
- Impact on sense of place (a negative impact of *medium* significance during both construction and operation)²⁹;
- Future land use planning (a negative impact of *medium* significance during both construction and operation)²⁹; and

²⁹ There are dedicated specialist impact assessment reports addressing these impacts and consequently these are not focussed on this review.

- Perceived risks associated with nuclear incidents (a negative impact of *medium* significance during operation)²⁹.

4.13.2 Social Impact Assessment Review Evaluation Criteria

This SIA review considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments pertinent to the SIA, also considering the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.13.2.1);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations (Section 4.13.2.2):
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered;
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts;
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline;
 - Census data; and
- Time dependency of assumptions and limitation to the study, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environment that impact on these (Section 4.13.2.3).

Each of these is discussed below.

4.13.2.1 Changes to Legislation, Policy, Protocols or other instruments pertinent to the Social Impact Assessment

One of the significant changes to the NEMA 2014 EIA Regulations, as amended, since the completion of the Nuclear-1 EIA is publication of procedures (protocols) for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and 44 of the NEMA 2014 EIA regulations (GN R320 of 2020). This Protocol refers to the required level of assessment that must be based on the findings of the site sensitivity verification. Since no social assessment protocol has been promulgated by DFFE, if the study were to be compiled in the current legislative context, the SIA would need to comply with Appendix 6 of the NEMA 2014 EIA Regulations.

A number of South African and international guidelines inform socio-economic impact assessment. These include the Guidelines for Social Impact Assessment (Barbour, 2007) published by the (Western Cape) Department of Environmental Affairs and Development Planning (DEA&DP) and the Guidance for Assessing and Managing Social Impacts of Projects (Vanclay, Esteves, Aucamp, & Franks, 2015) issued by the International Association for Impact Assessment (IAIA).

Only the latter was published after the SIA was completed, and although other guidelines have been published, e.g. the Sustainable Development Goals (SDGs), none of them are binding and applying them would not materially alter the essence of the report findings and the mitigation measures recommended.

It is assumed that the SIA adequately fulfilled the content requirements stipulated in Regulation 33 of the EIA Regulations, 2006 (GN 385 of 2006). It is recognised that the study does not meet every specific requirement of Appendix 6, nor was it obliged to, as this was not a requirement at the time. However, the current specialist reporting requirements stipulated in Appendix 6 of the EIA Regulations, 2014 are not significantly different to those outlined in Regulation 33 of the EIA Regulations, 2006. Consequently, the SIA (Octagonal Development, 2016) is considered to largely fulfil the materially significant requirements currently relevant to SIAs.

Policy and Planning Documents

The SIA extensively relies on the City of Cape Town (CoCT) Integrated Development Plan (IDP), which is discussed under Section 47. No changes in social planning tools (excluding planning tools addressed in other specialist studies, e.g. town planning) have been identified.

The following policies are referenced in the SIA:

- *“The present Eskom position on vendor accommodation is that the vendor is fully responsible for accommodation of all vendor staff, safe allocation of zoned land for the construction village”.* It is assumed this policy has not changed. A change in Eskom’s position on vendor accommodation would not change the need for accommodation of staff during construction and would therefore not change the scale, intensity, duration, etc. of the impact significance rating. Furthermore, it is extremely unlikely that a construction village will be required for Duynefontein as Cape Town has a ready supply of contractors and workers. No mitigation measures are related to or dependent on this policy;
- *“Breaking New Ground”* (National Government’s policy on the provision of housing) is referenced and was published in 2004. A more recent housing related publication is the Western Cape Inclusionary Housing Policy Framework, 2022. Although the newer publication is related to housing, it has a different objective and is only incidental to the SIA, i.e. it would not change the impact rating or the mitigation measures. As an example, the mitigation measures require Eskom to *“Obtain approval for the development from the appropriate authorities (e.g. town planning procedures)”*. In doing so, any housing proposal would need to comply with housing policies at the time of development. However, the requirement for the development of housing, as pointed out above, is unlikely for the Duynefontein site.

Therefore, although the SIA references policies which might change with time, these policies will not affect the outcomes of the SIA, neither in terms of significance ratings, nor in terms of mitigation measures.

The CoCT IDP and SDF reviews, in both 2012 and 2023, do not explicitly mention the Duynefontein site, nor is a reference made to nuclear power generation (apart from a reference to the KNPS). Consequently, it is concluded that changes to the IDP and SDF since the publication of the SIA are not material to the findings of the SIA.

Best Practice Methods / Guidelines

The SIA states that the methodology employed *“is in accordance with the International Association for Impact Assessment (IAIA) and, guidelines outlined in the Western Cape Department of Environmental Affairs and Development Planning’s Guidelines for involving Social Specialists in an EIA”* and further notes that the 2016 update takes cognizance of the more recent *“Guidance for assessing and managing the social impacts of projects, Guidelines for Integrating HIV and Gender Related Issues in Environmental Assessment in Eastern and Southern Africa, produced by the United Nations Development Programme”*. These best practice guidelines are still applicable and appropriate for the SIA.

More recent best practice guidelines relevant to the SIA include the sustainable development goals (SDGs) that were adopted by the United Nations in 2015, and the IAIA Guidance for Assessing and Managing

Social Impacts of Projects (Vanclay, Esteves, Aucamp, & Franks, 2015). In this reviewer's opinion, the study is broadly compatible with these guidelines.

4.13.2.2 Changes to Baseline Conditions

The SIA (and the broader EIA) considers four zones:

- Emergency Planning Zone;
- Protective Action Zone - traditionally 5 km radius;
- Urgent Protective Zone - traditionally 16 km radius; and
- Long-term Planning Zone - traditionally 80 km radius.

All impacts in the SIA are rated with a spatial extent of 'local', which is defined in the SIA as *"the site and its immediate surroundings, including the surrounding towns and settlements within a 10 km radius"*, even though the analysis of the baseline environment uses the 16 km radius. This review has considered the 16 km radius and has examined satellite imagery for visible changes to land use over this period.

The peer reviewer of the original SIA had some concerns about the use of 2001 census data, but (it is) concluded that the limitation was adequately addressed in the SIA³⁰.

As an example of references that might be considered outdated, the SIA references population growth data, particularly migration, from the publication "Population projections for the Western Cape 2001 – 2021" (Dorrington, 2005). This 2005 publication was updated in 2013 and a narrow reading of the Peer Review report might conclude, owing to more recent data being available, that the SIA needs to be revised. However, using the parameter of population size as an indicator, the SIA projects population growth within 80 km of the site using a growth rate of 2.4%, which predicts and compares favourably with 2020 estimates of population (COGTA, 2020).

It is therefore concluded that, while current population and associated demographics have changed since the SIA was compiled, the SIA adequately accounted for these expected changes and the significance ratings and mitigation measures as reported in the SIA remain valid.

The following observations are made regarding the Duynefontein site:

- Significant expansion of Sunningdale/Parklands towards Duynefontein has taken place since 2011 (~447 ha). The high growth potential of Sunningdale/Parklands is recorded in the SIA, and the observed growth is consistent with the projections in the SIA; and
- Two new property developments, inland of Duynefontein and Melkbosstrand have taken place, with a combined footprint of ~23 ha and fall within the growth predictions of the SIA.

The increase in residential developments in these areas has an associated increase in the number of people living within the zone of influence of the SIA. However, the SIA as well as other studies conducted for the EIA (e.g. land use, emergency planning) have taken into consideration the growth of these areas, and such growth appears to be within the prediction in the SIA.

4.13.2.3 Time dependency of assumptions and limitation to the study

The SIA is subject to a number of assumptions and limitations, most of which are not affected by the passage of time since the study was conducted. The only assumption and limitations that are time sensitive relate to the views of IAPs (which would then influence the outcome of the SIA and the EIA).

³⁰ The 2022 census data has not yet been published and the 2011 census data is the most recent data.

The public participation process for the Nuclear-1 EIA elicited a remarkable level of engagement from IAPs. Consequently, it is highly unlikely that views of IAPs that could influence the SIA would have been overlooked, or that new, radically different views would arise. The strength of opinion on certain views have changed, although it is noted that the last round of public comment on the report was in 2016, i.e. after the 2011 Fukushima nuclear disaster, which would have raised awareness and alarm to the risks associated with nuclear power. At worst the reviewer expects that the same level of opposition would probably exist now as in 2011. This would not be the case in terms of (for example) coal fired energy options as there has been a significant shift in opposition to coal.

Consequently, it is concluded that there are no assumptions or limitations that are no longer valid, or which invalidate the findings of the SIA due to the passage of time.

4.13.2.4 Specialist Opinion

The professional opinion of the reviewer is that the following findings of the SIA review apply:

- The SIA references policies which might change with time but if those policies were to change, they would not affect the significance ratings, nor the recommended mitigation measures;
- Changes to the CoCT IDP and SDF since the publication of the SIA are not material to the findings of the SIA;
- These best practice guidelines utilised in the SIA are still applicable and appropriate. More recent best practice guidelines relevant to this project have been identified and it is concluded that the SIA is broadly consistent with these;
- While population and associated demographics are different from those used as the baseline in the SIA, the SIA has accounted for these changes and the significance ratings and mitigation measures as reported in the SIA remain valid;
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the SIA due to the passage of time;
- There has been substantial expansion of residential areas within 16 km of the Duynefontein site. Such expansion is consistent with predictions of expansion in the SIA and falls within the zone of influence that affects predictions of significance of impacts, both positive and negative. The extent of such changes would not change the significance rating of impacts as the underlying rating of the components of the rating scale would stay the same. Current mitigation measures would sufficiently address this change in the baseline; and
- None of the mitigation measures are time sensitive and mitigation measures remain valid and do not need to be updated and hence no change to the EMPr due to the SIA is required.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.14 Specialist Review: Economic Impact Assessment

4.14.1 Status of Original Economic Impact Assessment

This review is of the Economic Impact Assessment (EclA) prepared by Coningarth Economists / Imani Development (SA) (Pty) Ltd (Coningarth Economists, 2013) to assess the economic impacts of Nuclear-1. The objective of the study was to analyse the economic cost-effectiveness of the three sites from a broader community perspective. This includes the capital and operational costs of the service provider as well as the costs to the community, taking into account the positive and negative externalities on the economy and the environment. The study also considers the broader macroeconomic impact of the three sites on their relevant provincial economies.

The study (Coningarth Economists, 2013) found that Thyspunt was most preferred (as it is more cost effective), followed by Duynefontein and Bantamsklip, but also noted the differences are marginal and all the sites would have large positive economic impacts (unlike most other specialist studies which typically identify and assess adverse impacts). Macroeconomic benefits accruing from a Nuclear Power Station (Nuclear-1) at Duynefontein exceed those at other sites. Most mitigation measures were intended to optimise positive impacts.

Correctly, the study was not a financial analysis of Nuclear-1, i.e. the financial viability of the project.

The EclA Report was subject to peer review, was reviewed and accepted by GIBB and the inference is that the study was adequately comprehensive and met relevant criteria at the time.

Selected potential economic impacts (benefits) identified included, *inter alia*:

- Changes in land use and agricultural output;
- Impact on fishing and aquaculture;
- Changes to community structures through the influx of workers and associated infrastructural requirements;
- Changes in property prices;
- Construction of required facilities and infrastructure associated with accessibility to the site, transport and the integration of the generated power into the networks;
- Increased crime and (compromised) security;
- Improved generation capacity, which could stimulate much-needed local economic growth and reduce current power shortages; and
- Direct economic injection into the local economies.

Most impacts were rated of high or medium significance.

Cumulative impacts were not assessed, arguably a sensible omission from an EclA.

4.14.2 Economic Impact Assessment Review Evaluation Criteria

This review considers the following aspects/criteria:

- New legislation, policy, protocols or other instruments pertinent to the Economic Impact Assessment, notably:
 - Procedures for the assessment and minimum criteria for reporting on identified environmental themes (GN R320 of 2020);

Also considered are the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:

 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.14.2.2);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.14.2.3);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.14.2.2);

Each of these is discussed below.

4.14.2.1 Changes to Legislation, Policy, Protocols or other Instruments Pertinent to the Economic Impact Assessment

One of the significant changes to the NEMA 2014 EIA Regulations, as amended, since the completion of the Nuclear-1 EIA is publication of procedures (protocols) for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and 44 of the NEMA 2014 EIA (GN R320 of 2020). This Protocol refers to the required level of assessment that must be based on the findings of the site sensitivity verification. Since no economic assessment protocol has been promulgated by DFFE, if the study were to be compiled in the current legislative context, the EclA would need to comply with Appendix 6 of the NEMA 2014 EIA Regulations.

A number of South African and international guidelines inform socio-economic impact assessment. These include the Guidelines for Social Impact Assessment (Barbour, 2007) and Involving Economists in EIA Processes (Van Zyl, de Wit, & Leiman, 2005) published by the DEA&DP and the Guidance for Assessing and Managing Social Impacts of Projects (Vancly, Esteves, Aucamp, & Franks, 2015) issued by the IAIA.

Only the latter was published after the EclA was completed, and although other guidelines have been published, e.g. the SDGs, none of them are binding and applying them would not materially alter the the essence of the report findings and the mitigation measures recommended.

It is assumed that the EclA adequately fulfilled the content requirements stipulated in Regulation 33 of the EIA Regulations, 2006 (GN 385 of 2006). It is recognised that the study does not meet every specific requirement of Appendix 6, nor was it obliged to, as this was not a requirement at the time. However, the current specialist reporting requirements stipulated in Appendix 6 of the EIA Regulations, 2014 are not significantly different to those outlined in Regulation 33 of the EIA Regulations, 2006. Consequently, the EclA (Coningarth Economists, 2013) is considered to largely fulfil the materially significant requirements currently relevant to EclAs.

4.14.2.2 Appropriateness of Methodology Used

The study approach and methodology used in the EclA (Coningarth Economists, 2013) follows the methodologies (guidelines) listed above, i.e. (Barbour, 2007) and (Van Zyl, de Wit, & Leiman, 2005), still appropriate methodologies.

The study was based on a combination of desk research, field interviews and the application of data collected to macroeconomic modelling. A short preparatory field visit was undertaken in 2007, followed by a 17-day field trip in July-August 2008. Sources of information were central and provincial government publications, reports commissioned by the relevant local authorities, and data supplied by companies, institutions and individuals interviewed, sectoral organisations and Eskom.

In order to measure the economic impacts of the project, a partial general macroeconomic equilibrium analysis was performed, based on three Social Accounting Matrices (SAM). SAMs are still valid tools to assess economic impacts.

4.14.2.3 Changes to Baseline Conditions

Given that the EclA (Coningarth Economists, 2013) was conducted approximately 10 years ago, a revised baseline assessment, would be required to properly determine to what extent baseline conditions as described in the EclA match the current conditions. Economic data (demographics, sectoral [agriculture, tourism, fisheries, retail] revenue, income levels, economic growth rates, Regional Gross Domestic Product [GDP], etc.) will clearly have changed considerably. The 2013 study presented 2008 prices (costs and revenue) whereas a 2023 baseline would present much higher 2023 prices, mostly a function of inflation. However, the EclA did project prices into the future, applying an 8% discount rate to determine a Net Present Value. Furthermore, in a sense costs and revenue will have increased in tandem and it is

considered unlikely that subsequent changes to the baseline environment would alter the impact significance rating. Even if this were not the case, the mitigation measures recommended also would not change materially. In addition to which, most impacts are benefits and may possibly be found to be understated were the EclA to be updated in 2023, especially in the diversified Western Cape economy.

Though not strictly an impact, the EclA also looked at the comparative cost effectiveness of the three Nuclear-1 sites and although the quantum of input costs may have changed, the ranking is not expected to change.

4.14.2.4 Time Dependency of Assumptions and Limitations to the Study

None of the assumptions and limitations of the specialist reports are time dependent, consequently, it is concluded that all of the assumptions or limitations remain valid and the findings of the study would not be invalidated due to the passage of time.

However, the EclA did consider the No-Go alternative, comparing the costs of nuclear power to both thermal (coal) and renewable energy options. In 2013, South Africa had very little renewable energy capacity and costs (per Kilowatt [hour]) were considerably higher. The EclA found that “it seems clear that nuclear is the cheaper and more appropriate option for the three sites to produce enough power for a growing South African economy”.

This conclusion may no longer be valid.

It is not within the remit of this review, nor arguably the 2013 EclA, to decide which forms of energy generation are most appropriate; that decision is better guided by the Integrated Resources Plan 2010-2030 (IRP) (DoE, 2019) which considers a mix of energy sources.

4.14.3 Specialist Opinion

The economic impacts of Nuclear-1 are largely positive especially at Duynefontein, unlike most other specialist studies which typically identify and assess adverse impacts. Most mitigation measures were intended to optimise positive impacts.

The professional opinion of the reviewer is that the following findings of the EclA study review apply:

- The study meets the requirements for a specialist assessment. The study is robust and well conceptualised. The methodology used for the study generally aligns with current practice. The findings are adequately supported and impacts were adequately assessed;
- The procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and 44 of the NEMA 2014 EIA Regulations GN 320 of 2020 - which were not a requirement at the time of the study - do not have significant bearing on the reporting of economic impacts as there are no reporting protocols for economic assessment as yet;
- Economic data and prices have changed since the EclA was undertaken, but costs and revenue will have increased in tandem since then (offsetting each other) but impact significance ratings are still considered valid, and benefits may be understated;
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the VIA due to the passage of time.

The report is therefore considered to be suitable for decision making in its current form.

The EclA found that nuclear is the cheaper and more appropriate (energy generation) option, a conclusion which may no longer be valid. The specialist reviewer recommends that the Minister must consider the IRP (DoE, 2019), which supersedes the IRP 2010, when adjudicating the appeal.

4.15 Specialist Review: Visual Impact Assessment

4.15.1 Status of Original Visual Impact Assessment

This review is of the Visual Impact Assessment ('VIA' or 'the study') prepared by Bapela Cave Klapwijk CC (Bapela Cave Klapwijk CC, 2013) and considers only the Duynefontein site.

Site visits for the study were undertaken in March and June 2007 and in March 2008. The report was published in March 2013. The report was peer reviewed by Aurecon South Africa (Pty) Ltd in 2015, who found the report to be robust and comprehensive as well as fulfilling the Terms of Reference (Aurecon, 2015). No changes were required prior to its publication in the Draft EIR version 2 (2015). Following stakeholder engagement, the report was updated to address issues relating to visual aspects. No material changes were made to the findings of the report before being published in the FEIR (2016).

Key findings of the study relating to the proposed Duynefontein Nuclear Power Station are as follows:

- The Duynefontein Nuclear Power Station will:
 - Irrevocably alter the landscape character, high quality scenic coastal views and sense of place;
 - Present as a significant visual intrusion from surrounding residential areas because of the visual contrast (low visual integrity) and the direct line of sight (visibility). The nearest residential suburbs of Duynefontein and Melkbosstrand will be most affected while the residential suburbs of Atlantis have no view of the Duynefontein Nuclear Power Station; and
 - Alter visual quality and present as a night time visual intrusion owing to the increased area of concentrated light, particularly northwards in an area that presently has little/no conspicuous lighting.
- The large scale and prominent location of the Duynefontein Nuclear Power Station on the coastline allows little opportunity for effective visual mitigation, although visual impact reduction is possible.

The key impacts (those of *medium* or *higher* significance) assessed in the study were:

- Degradation of visual quality resulting from change to vegetation and landform during the construction and decommissioning phase (a temporary negative impact of *medium* significance that cannot be reduced through mitigation);
- Altered visual quality resulting from increased area of concentrated light during the construction and operational phases (a permanent negative impact of *medium* significance that cannot be reduced through mitigation);
- Visual change to sense of place resulting from the clearance of large, flat areas and construction traffic along new and existing roads to the site (a temporary negative impact of *medium* significance that cannot be reduced through mitigation);
- Visual change to sense of place of local coastal and inland areas due to the large scale and extent of structures, new landforms and roads (a permanent negative impact of *medium* significance that cannot be reduced through mitigation); and
- Cumulative visual impacts relate to visual intrusion, visual clutter and sense of place and range from *low* to *high* significance.

4.15.2 Visual Impact Assessment Review Evaluation Criteria

This review considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments pertinent to the VIA:

- Procedures for the assessment and minimum criteria for reporting on identified environmental themes (GN 320 of 2020) (Section 4.15.2.1);
- Elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.15.2.2);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.15.2.3);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.15.2.3); and
 - g – are any buffers proposed still appropriate given legislative/policy change and changes to the baseline (Section 4.15.2.2).
- Time dependency of assumptions and limitations to the study, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environment that impact on these (Section 4.15.2.4).

Each of these is discussed below.

4.15.2.1 Changes to Legislation, Policy, Protocols or other Instruments Pertinent to the Visual Impact Assessment

One of the significant changes to the NEMA 2014 EIA Regulations, as amended, since the completion of the Nuclear-1 EIA is the requirement to generate a Screening Report referred to in Regulation 16(1)(v) of the regulations, which identifies related exclusions and/or specific requirements including specialist studies applicable to the proposed site and/or development, based on the national sector classification and the environmental sensitivity of the site.

As part of this review, a Screening Report was generated for the Duynefontein site. It does not identify the proposed landscape/visual sensitivity as a theme for the project site, but it does list landscape/visual as requiring specialist investigation and reporting, likely due to the siting of the large-scale development in KPNR (a protected area) along the scenic coastline. As no landscape/visual assessment protocols have been promulgated by DFFE, if the study were to be compiled in the current legislative context the VIA would be required to comply with Appendix 6 of the NEMA 2014 EIA Regulations.

Since the peer review by Aurecon (2015) found no fault with the report, it is assumed that the VIA (Bapela Cave Klapwijk CC, 2013) adequately fulfilled the content requirements stipulated in Regulation 33 of the EIA Regulations, 2006 (GN 385 of 2006). It is recognised that the study does not meet every specific requirement of Appendix 6, nor was it obliged to, as this was not a requirement at the time. However, the current specialist reporting requirements stipulated in Appendix 6 of the EIA Regulations, 2014 are not significantly different to those outlined in Regulation 33 of the EIA Regulations, 2006. Consequently, the VIA (Bapela Cave Klapwijk CC, 2013) is considered to largely fulfil the materially significant requirements currently relevant to VIAs.

4.15.2.2 Appropriateness of Methodology Used

The study approach and methodology used in the VIA (Bapela Cave Klapwijk CC, 2013) follows the methodology of describing the visual baseline (affected environment) and the magnitude/intensity of visual impact guided by the methodology described in the Guideline for Involving Visual and Aesthetic Specialists in EIA Processes published by the DEA&DP (DEA&DP, 2005). This remains the current, accepted methodology.

Three site visits were undertaken to inform the VIA. Modelling the viewshed of a project is common practice in VIAs and these models are influenced by the spatial planning data available at the time of the assessment. Although more accurate spatial data may now be available, the findings of the VIA will not change in any substantial manner based on a viewshed modelled on the currently available spatial data.

4.15.2.3 Changes to Baseline Conditions

The VIA (Bapela Cave Klapwijk CC, 2013) states that the Duynefontein site is 5 km from the nearest residential suburb of Duynefontein and that only the residences on the north-eastern edge of the residential area are considered to have a medium visibility of the site as the houses behind the front row (of houses) will have their views obstructed by the houses north of them. Further south, along Otto du Plessis Drive, the existing KNPS will obstruct views of the proposed Duynefontein Nuclear Power Station.

Fieldwork for the study was undertaken in March and June 2007 and March 2013 and thus a considerable amount of time has elapsed since the site was visited. The review of the Social Impact Assessment shows that there has been significant expansion of the Sunningdale/Parklands suburbs towards Duynefontein since ~2011 and that two new property developments inland of Duynefontein and Melkbosstrand have taken place. Sunningdale/Parklands is located over 10 km from the Duynefontein site and therefore do not have views of the Duynefontein site and will not be affected by the visual impacts of the Duynefontein Nuclear Power Station. The two new property developments have not extended the residential boundary towards the Duynefontein and therefore the visual impacts are not expected to increase in significance, nor will the cumulative impacts be significantly altered.

4.15.2.4 Time Dependency of Assumptions and Limitations to the Study

None of the assumptions and limitations of the specialist reports are time dependent, consequently, it is concluded that there are all of the assumptions or limitations remain valid and the findings of the study would not be invalidated due to the passage of time.

4.15.3 Specialist Opinion

Visual impacts are a function of the physical transformation of a landscape on account of the introduced object/project, and the experiential perceptions of viewers, giving rise to the subjective nature of visual issues. Objective assessment of visual issues is therefore not achievable and thus qualitative and quantitative techniques are required and undertaken by the author in the VIA (Bapela Cave Klapwijk CC, 2013). The specialist appropriately identifies and rates the visual impacts of the proposed project and recommends achievable mitigation measures. In spite of the fact that application of these mitigation measures will only reduce the significance of the visual intrusion marginally within 5 km of the site, the mitigation measures presented are required to be implemented during the various stages of the proposed development.

The professional opinion of the reviewer is that the following findings of the visual study review apply:

- The VIA (Bapela Cave Klapwijk CC, 2013) meets the requirements for a specialist assessment. The study is robust and well conceptualised. The methodology used for the study generally aligns with current practice. The findings are adequately supported and impacts were adequately assessed;

- The NEMA 2014 EIA Regulations GN 320 of 2020 do not have significant bearing on the reporting of visual impacts as there are no reporting protocols for visual as yet;
- Changes to the area around the site have occurred since the site visits were undertaken, but due to their location, suburban expansion and new developments are not considered to significantly alter the impacts of the proposed Duynefontein Nuclear Power Station;
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the VIA due to the passage of time.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.16 Specialist Review: Heritage Impact Assessment

4.16.1 Status of Original Heritage Impact Assessment

This review is of the Heritage Impact Assessment (HIA) prepared by the Archaeology Contracts Office of the University of Cape Town, and signed off by Timothy Hart (Archaeological Contracts Office, UCT, 2012). The report was subject to peer review in 2015 as part of the EIA process and was found to be generally compliant with the relevant requirements at the time, and suitable for the purpose of a scoping level study for site selection, but, in the peer reviewer's opinion, lacking in detail required for a full HIA. The 2012 HIA was however not updated for completion of the EIA at the time.

Key findings of the HIA relating to the Duynefontein site are as follows:

- Impacts to ephemeral Late Stone Age heritage will be minimal;
- Duynefontein is palaeontologically highly sensitive. Extensive mitigation will be required which, if done appropriately, will benefit palaeontological research; and
- In cultural landscape terms the nuclear industrial presence is already established and accepted as a landmark by most Capetonians. Any additions to this will be addition to an already established identity.

The key impacts (those of *medium* significance or *higher* significance) assessed in the HIA were:

- Impact of destruction of Miocene palaeontology (a negative impact of *medium* significance, reduced to *low* with mitigation, during construction);
- Impact of destruction of Pleistocene palaeontology and archaeology (a negative impact of *high* significance, reduced to *medium-low* with mitigation, during construction);
- Impact of destruction of the cultural landscape (a negative impact of *high* significance, which cannot be mitigated, during construction and operation);
- Cumulative impacts on heritage resources (a negative impact of *medium* significance, which cannot be mitigated, during construction and operation); and
- Impacts resulting from the contribution to conservation of heritage impacts resulting from the project (a positive impact of *medium* significance, during construction and operation).

4.16.2 Heritage Impact Assessment Review Evaluation Criteria

This review considers the following aspects/criteria:

- New legislation, policy, protocols or other instruments pertinent to the heritage study, notably:
 - Site Sensitivity Verification Requirements where a Specialist Assessment is required but no specific Assessment Protocol has been prescribed (GN R320 of 2020);

- Also considered are the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.16.2.1);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.16.2.2);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.16.2.2);
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 4.16.2.2);
- Time dependency of assumptions and limitation to the study, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environment that impact on these (Section 4.16.2.3).

Each of these is discussed below.

4.16.2.1 Changes to Legislation, Policy, Protocols or other instruments pertinent to the Heritage Impact Assessment

One of the significant changes to the NEMA 2014 EIA Regulations, as amended, since the completion of the Nuclear-1 EIA is the requirement to generate a Screening Report referred to in Regulation 16(1)(v) of the regulations, which identifies related exclusions and/ or specific requirements including specialist studies applicable to the proposed site and/or development, based on the national sector classification and the environmental sensitivity of the site. As part of this review, a Screening Report was generated for the Duynfontein site. It identifies both the Archaeology and Cultural Heritage, and the Palaeontology themes as requiring specialist investigation according to the associated protocols for those themes, as the site is indicated to be of high and very high sensitivity respectively, for those themes. No specific protocols are currently available for heritage-related studies, therefore the Site Sensitivity Verification Requirements where a Specialist Assessment is required but no specific Assessment Protocol has been prescribed (GN R320 of 2020), would have been applicable to the study had it been conducted after 2020.

No changes in heritage related legislation relevant to the HIA have been promulgated since the 2012 report. The 2015 review of the HIA states that the report meets the requirements of the Minimum Standards for Archaeological & Palaeontological Components of Impact Assessment Reports (SAHRA, 2007). While an update of these Minimum Standards was more recently published for public review, it appears that the 2007 version remains the latest approved version.

The HIA has also (in the current review) been assessed in terms of the requirements of the Guide For Minimum Standards For Archaeology And Palaeontology Reports Submitted To Heritage Western Cape (Heritage Western Cape, 2021), and is assessed to be broadly compliant.

4.16.2.2 Changes to Baseline Conditions

As is standard practice, the HIA notes that physical restrictions to the effectiveness of the field surveys required educated assumptions to be made about the sensitivity, and possible degree of impact that could be experienced.

While the above-mentioned limitations would not have changed significantly since the 2012 HIA, it is possible that additional heritage resources may have been exposed in the interim due to the dynamic nature of the exposed dune environment. This review has considered the available historical aerial imagery for the site, which show some minor changes to vegetation cover (and therefore, it is assumed, inundation with sand) over the last decade, but these are not considered to be substantial.

It is however concluded that any changes to the baseline environment could be adequately addressed via the mitigation measures listed in the HIA, which include a chance finds procedure to be followed if heritage resources are exposed / discovered during the construction process.

4.16.2.3 Time dependency of assumptions and limitation to the study

The HIA is subject to a number of assumptions and limitations, most of which are not impacted by the passage of time since the study was conducted. It was assumed that palaeontological sequences previously described by others for the adjacent area would be equivalent to those for the site. It was also assumed that the Pleistocene deposits described previously by others are not localised but are potentially more extensive across the site, and therefore that the degree of sensitivity and assessment of severity of any impacts at Duynefontein must take account of a high probability of buried Pleistocene deposits.

Both of these assumptions remain valid, consequently, it is concluded that there are no assumptions or limitations that are no longer valid, or which invalidate the findings of the HIA due to the passage of time.

4.16.3 Specialist Opinion

4.16.3.1 Overview

The Duynefontein site is sensitive especially from a paleontological perspective. In terms of cultural heritage, as a nuclear industrial presence has already been established at the site, it is expected that any additions to this will be perceived as an addition to an established identity. Subsequent changes in the baseline environment could be adequately addressed via the mitigation measures listed in the HIA, which include a chance finds procedure to be followed if heritage resources are exposed / discovered during the construction process.

The professional opinion of the reviewer is that the following findings of the HIA review apply:

- The methodology used for the HIA remains appropriate for the study;
- The legislation and minimum requirements/ guidelines utilised in the HIA remain applicable and appropriate. More recent (2021) best practice guidelines, and the general assessment protocol (GN R320 of 2020) relevant to this project have been identified, and the report is considered to be broadly compliant with these as well;
- Any changes to the baseline environment or knowledge of heritage resources in the area are not considered to be substantial, to the extent that they would not result in any changes to the significance of impacts assessed, or mitigation measures proposed; and
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the HIA due to the passage of time.

4.16.3.2 Definitive Opinion and Recommendations

Based on the above it is concluded that:

- Minor changes in the baseline (e.g. previously undocumented heritage resources - likely to be similar to those already documented - being exposed) may have occurred but are largely addressed via mitigation measures provided and would not affect the significance ratings;

- While the 2015 peer review of the study found the report to be lacking in detail for a full HIA, it is this reviewer's opinion that additional detail would not materially change the impact rating for mitigation measures recorded in the report – the heritage importance of the site is adequately conveyed in the report and additional detail is unlikely to change that finding. Given the nature of the development it is recognised that opportunities for avoidance of impacts on heritage resources via amendments to the layout are limited, and the mitigation measures recommended do provide for additional heritage specialist input during construction with the intention that any heritage resources that are exposed could be adequately documented and preserved if necessary;
- The significance ratings and mitigation measures specified in the HIA therefore remain valid; and
- None of the mitigation measures are time sensitive and mitigation measures remain valid and do not need to be updated and hence no change to the EMPr due to the HIA is required;

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.17 Specialist Review: Agricultural Impact Assessment

4.17.1 Status of Original Agricultural Impact Assessment

This review is of the Agricultural Impact Assessment prepared by Jonathan Howcroft of Golder Associates/Imani Development SA (Pty) Ltd (Howcroft, 2015) to assess the impacts on agriculture associated with development of Nuclear-1 at the Duynefontein site. Howcroft's signed Declaration of Independence is dated August 2010.

It is assumed that this report is a revision of the original Agricultural Impact Assessment.

Key findings of the Agricultural Impact Assessment (Howcroft, 2015) relating to the Duynefontein site are as follows:

- A survey undertaken within a 16km radius of the Duynefontein site showed that agriculture is based on mixed farming, with an annual value of farm production in 2008 estimated at R75 million;
- An influx of people during the construction phase and - to a lesser extent during the operational phase – could increase demand for local agricultural products. However, no change in the gross value of production in the Duynefontein area is predicted, as the region is a peri-urban region in close proximity to a large expanding city, where an influx of people will not have a significant effect on the local demand for agricultural produce;
- The Duynefontein site is located with what is considered to be a stable agricultural production area as wheat and grape production in the area predated and has continued without incident during the operation of the existing KNPS; and
- There are no fatal flaws in terms of the impact on agriculture.

The potential impacts on agricultural production as described in the report (Howcroft, 2015) are summarised below, including the key construction phase impacts rated in terms of significance where indicated:

- Potential release of radionuclides in the event of an accident or emergency incident, elevating radiation levels and contaminating the food chain (and surface water bodies), mitigated by placing restrictions on growing food and animal feed in the fallout area;
- Potential groundwater contamination in the event of a spillage from the Nuclear Power Station, which will not affect the groundwater used by farmers located inland since the plant is located in close proximity to the sea, downgradient of farms;

- Climate change resulting in increased temperatures and rainfall impacting positively on agriculture in the region, but with no implications for the location of Nuclear-1 at the Duynfontein site;
- Reduced water supply affecting agricultural production, considered unlikely because water will be sourced from a desalination plant;
- Potential increase in demand for local agricultural produce resulting from an influx of people during the construction phase and to a lesser extent during the operational phase, rated as low positive significance before and after optimisation during the construction phase;
- Dust pollution during the construction phase affecting agricultural production, before mitigation is rated as low-medium significance and after mitigation rated as having a low significance; and
- Availability/cost of labour related to the demand for labour during construction diverting labour from the agricultural sector and/or such labour demanding higher wages, rated as having a low significance before and after mitigation.

4.17.2 Agricultural Impact Assessment Review Evaluation Criteria

This review considers the following aspects/criteria:

- New legislation, policy, protocols or other instruments pertinent to the agricultural impact assessment, notably:
 - Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Agriculture (GN R320 of 2020).

Also considered are the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:

 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.17.2.2);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.17.2.3);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.17.2.3);
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 4.17.2.1);

Each of these is discussed below.

4.17.2.1 Changes to Legislation, Policy, Protocols or other Instruments Pertinent to the Agricultural Impact Assessment

The study is generally compliant with the principles of the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Agriculture (GN R320 of 2020), which would have applied to this study if it had been conducted after 2020.

The Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Agriculture stipulates that the agricultural sensitivity of the site under consideration as identified by the screening tool must be confirmed by undertaking a site sensitivity verification, which makes use of a desk-top analysis, preliminary on-site inspection, and any other relevant information. Should the screening tool identify “very high” or “high” sensitivity for agricultural resources an Agricultural Agro-

Ecosystem Specialist Assessment is required. Such a report requires the status quo of the site to be described, including the current productivity of the land, as has been described in the Agricultural Impact Assessment (Howcroft, 2015) for Duynefontein. Of interest is the requirement for a map to show the proposed development footprint with a 50m buffered development envelope, overlaid on the agricultural sensitivity map generated by the screening tool. This 50m buffer is not relevant to the Duynefontein site from an agricultural perspective as there is no commercial cultivation within the proposed 800m Proactive Action Zone (PAZ).

The agricultural sensitivity of the proposed Duynefontein site as per the Screening Tool Report prepared for purposes of this review is classified as “low” for the EIA corridor (sand dunes) and varies between “high” and “medium” for the proposed 800m PAZ, the proposed 3km Urgent Protective Zone (UPZ) and surrounding areas.

It is recognised, however, that the study does not meet every specific requirement of these regulations (GN R320 of 2020), nor was it obliged to, as this was not a requirement at the time. This is not, however, considered to have significant bearing on the findings of the impact assessment.

4.17.2.2 Appropriateness of methodology used

Although the Agricultural Impact Assessment (Howcroft, 2015) discusses the proposed site (EIA corridor), the study focuses on the impact of agriculture in the surrounding region, which is a nature reserve. The terms of reference provided for this study at the time were to analyse the general land use within a 20 km radius, undertake an agricultural survey, identify farming units within a 16 km radius and identify significant agricultural support infrastructure within a 30 km radius of the Duynefontein site. The approach included consultation with agricultural stakeholders, and from the information sourced, the value of agricultural production was estimated for the Duynefontein region, with no change anticipated in the event that Nuclear-1 is developed at Duynefontein.

The Agricultural Impact Assessment (Howcroft, 2015) describes the potential for agricultural production in the EIA corridor as very limited mainly as the result of the soil consisting of sand dunes; hence no soil samples were taken at the time. The assessment reported that there is no commercial cultivation within the proposed 800m PAZ, but that some mixed farming is undertaken on the border of the proposed 3 km UPZ.

The essence of the report findings and the mitigation measures recommended would not change substantially should current protocols be applied. The methodology used for the impact assessment aligns with current practice and the relevant assessment protocol for Agriculture (GN R320 of 2020), which was not a requirement at the time of the impact assessment.

4.17.2.3 Changes to Baseline Conditions

The Agricultural Impact Assessment (Howcroft, 2015) aligns with the Screening Tool findings and the level of information provided is considered to reflect that required in an Agricultural Agro-Ecosystem Specialist Assessment (GN 320 of 2020).

The agricultural survey was undertaken of the farm units within a 16 km radius in 2008 when the Duynefontein region was already considered to be a mature site from an agricultural production perspective at the time. This is due to ongoing grape and wheat production around the existing KNPS.

Changes in employment figures for the five years preceding the proposed development, to expedite assessment of impacts on the agro-ecosystem (as required in the Agriculture Protocol Regulations [GN R320 of 2020]) were not included in the 2015 assessment.

However, as described above, the Agricultural Impact Assessment (Howcroft, 2015) estimated the value of agricultural production for the Duynefontein region, with no change anticipated, as agricultural

production in the region is established and stable, confirming that the findings and the mitigation measures recommended would not change substantially.

4.17.3 Specialist Opinion

The professional opinion of the reviewer is that the following findings of the Agricultural Impact Assessment review apply:

- The methodology used for the impact assessment, while being scientifically sound and appropriate, does not entirely align with current practice, and in particular the relevant assessment protocols for Agriculture (GN R320 of 2020), which was not a requirement at the time of the impact assessment. The findings are scientifically rigorous and impacts were adequately assessed;
- While the legislation utilised in the study remains applicable and appropriate, the Specialist Assessment Protocols for Agriculture (GN R320 of 2020) are the most significant pieces of additional legislation not in place at the time of the study, and some gaps in meeting the requirements of these are identified. However, these gaps do not materially affect the validity and robustness of the study;
- It is not possible to definitively comment on the extent to which the baseline agricultural environment may have changed. However, based on a review of historical aerial imagery of the site, together with the understanding that the agricultural production in the region is established and stable, no obvious changes are evident. It is unlikely that any further changes to the baseline agricultural environment would result in significant changes to the impact assessment findings or mitigation recommendations; and
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.18 Specialist Review: Tourism Impact Assessment

4.18.1 Status of Original Tourism Impact Assessment

This review is of the Tourism Impact Assessment Study (Imani Development, 2010) (TIA) prepared by David Scott from Imani Development. The peer review is undertaken by Chanel Barnard from Urban-Econ Development Economist on 30 May 2023 to determine the relevance and changes in the tourism sector that could influence the outcome of the study. The primary focus of the review will be the Duynefontein site for the Nuclear-1 to be developed.

The key findings of the TIA were:

- Tourism is the region's strongest asset driving economic development for the City and surrounding towns and rural areas;
- The tourism areas surrounding Duynefontein include Atlantis, Bellville, Blaauwbergstrand, Century City, Durbanville, Edgemoor, Goodwood, Langa, Melkbosstrand, Milnerton, Parow, Pinelands, Sunset Beach and Table View. These areas offer sea and eco-tourism related activities, alongside well-developed tourism infrastructure and services;
- Several proposed (since developed) hotel developments, residential development and golf estate development within Blaauwbergstrand and Melkbosstrand were identified with more developments underway as the popularity of the area grows as people migrate out of the city into smaller towns outside Cape Town's nucleus;

- The site location map indicates an impact sphere of 20 km, which considers several eco-tourism activities, tourist accommodation and house let options in the surrounding area with an estimated annual turnover of R498 million and an average occupancy rate of 64%;
- Minimal effect on the marine environment and visual impacts are assessed as unlikely to have an impact on the tourism sector;
- Limited positive impact of increased bednights due to temporary accommodation requirements during the construction and operational phase; and
- Tourism businesses were less concerned about nuclear power as their primary concern was operating their business and having uninterrupted electricity and related services, which is key to their success.

4.18.2 Tourism Impact Assessment Review Evaluation Criteria

This review considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments pertaining to the Tourism Impact Assessment, also considering the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.18.2.1);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.18.2.2);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.18.2.3);
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 4.18.2.1); and
- Time dependency of assumptions and limitation to the study, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environment that impact on these (Section 4.18.2.3).

Each of these is discussed below.

4.18.2.1 Changes to Legislation, Policy, Protocols or other instruments pertinent to the Tourism Impact Assessment

There have been changes and updates to legislation governing tourism since 2010, such as the Tourism Act 3 of 2014 (2014), the Tourism White Paper (Department of Environmental Affairs and Tourism, 1996) currently being revised, the Amended Tourism B-BBEE Sector Code (2015), etc. These instruments promote the development and transformation of the tourism sector as an economic driver. For this to be achieved, government needs to create an enabling environment for tourism business to thrive. The provision of sustainable and effective basic service delivery (including electricity supply) is part of this mandate.

4.18.2.2 Policy and Planning Documents

The reviewed examined the IDP of Cape Town (City of Cape Town, 2022), which indicates that the site is in a highly sensitive and vulnerable ecosystem. Further, the environment is recognised as one of the strongest assets that drives tourism in the local economy within the city and surrounding rural/non-urban areas. The review also highlighted the importance of facilitating and coordinating regional tourism growth, with the West Coast a primary area for further development.

Since 2010, tourism received increased attention with the establishment of the National Department of Tourism and statutory agencies (such as Tourism Grading Council of South Africa), which promote the development and growth of the tourism sector at a national, provincial and local level. This is also supported by a number of strategies and policies to guide the sector.

The City of Cape Town's Tourism Development Framework (City of Cape Town, 2024), aims to fast-track recovery of the sector post-Covid with sustainable planning, development and management of tourism. *"Cape Town will further strengthen the global leadership role it has taken with the Cape Town Declaration on Responsible Tourism (2002)"* (City of Cape Town, 2024). The Western Cape Tourism Blueprint 2030 (Western Cape Department of Economic Development and Tourism, 2020) envisions a thriving visitor economy for the province by creating a sustainable and competitive destination with the aim to contribute to the Sustainable Development Goals.

This sentiment is further echoed in the IDP (City of Cape Town, 2022), with energy security a primary concern to ensure a conducive business environment. A primary objective is to "end load-shedding in Cape Town overtime" by diversifying supply away from coal-intensive Eskom towards independent power producers (IPPs), renewables and enabling small-scale embedded generation. The Nuclear-1 project was not mentioned in the IDP as the City is moving away from relying on Eskom power supply and rather investing in independent clean energy sources and partnerships with the Atlantis Special Economic Zone (closely situated to Duynefontein).

The development of Nuclear-1 at Duynefontein remains aligned with these legal and policy updates.

4.18.2.2.1 Best Practice Methods / Guidelines

The TIA used the accommodation industry as a proxy to determine the visitation and economic contribution of the tourism sector due to the lack of secondary information available on the specific tourism visitation or tourism monetary value statistics for the site.

The use of indicators such as the number of tourist accommodation beds, average rate per night, annual occupancy rate to determine the tourist demand for a local area is considered an acceptable methodology in terms of the International Recommendations for Tourism Statistics (UNWTO, 2008). The accommodation industry generates 92% of its income from tourism consumption compared to sectors such as restaurants (25%) and passenger transport services (30%) (StatsSA, 2023). However, in terms of the methodology used in the report, the approach can be expanded to determine the number of visitors and spending for people visiting friends and family, or day visitors through the use of new regional-level tourism statistics published by WESGRO.

As in the case of the TIA (Imani Development, 2010), the use of interviews with key representatives of the tourism sector should yield the views of the sector on the impact of Nuclear-1.

The TIA used specialist observation, and perceptions and input of the various stakeholders to determine the perceived impact on the following factors:

- Hospitality systems (tourism services and facilities in area);
- General infrastructure (accessibility of area);
- Visual amenity (visual nature and image of area);

- Social amenity (community interests of area);
- Sense of place (character and appeal of area);
- Marine assets (marine-based tourism activities within area); and
- Terrestrial assets (land-based tourism activities within area).

These factors are viewed as relevant guiding principles to determine the impact of tourism. Other factors that could have been considered are destination image (perceived view of current and potential visitors), cost to business, employment level, etc.. Further, the assessment could have differentiated between high, medium and low sensitivity areas relating to the type of tourism entities within the buffer zones (5km, 10-16 km, 20km).

Although the Impact Assessment section of the TIA could be expanded, the guiding principles still reflect the impact on the tourism sector within the direct area of influence for the Nuclear-1 site at the time of the study.

4.18.2.3 Changes to Baseline Conditions

Since the completion of the TIA (Imani Development, 2010), the tourism sector has gone through several change events with positive and negative growth effects particularly in Cape Town and the surrounding areas, with the area becoming one of the top cities for international and domestic travellers. Further, the migration of South African residents to the less urban areas surrounding Cape Town has also influenced the property, retail and services industries. Second homes and short-term letting have increased. Thus, the assumption is that the number of tourist accommodation and related businesses such as restaurants, attractions, venues, etc. have increased significantly since 2010.

COVID severely affected the tourism sector in Cape Town, which is predominantly focused on international tourism. It also had an effect on residents migrating from the city centres to the outer regions of Cape Town such as Melkbosstrand, Blaauwberg, etc..

Taking the above-mentioned into consideration, the baseline will naturally be outdated in terms of the number of accommodation facilities and tourism-related services as trends indicate a major shift in the visitor, residential and second home markets for areas outside Cape Town. The TIA indicated that new tourism and residential developments are planned for the area, with expected growth and expansion in the future, although this was not quantified.

The figure below depicts current (2023) tourism facilities within the three buffer zones surrounding the Dufnefontein Site. The map shows that the majority of tourism related activities are outside the 5km buffer, but key tourist destinations such as Melkbosstrand and Blaauwberg fall within the 16-20 km buffers. These areas have undergone massive development and expansion over the past decade, thus, increasing the need and pressure for service delivery and accessibility infrastructure.

With the expected changes in the tourism sector and related visitor economy, it could be assumed that the mix and opinions of stakeholders could have changed.

In an international study conducted in 2016 (Kemal, Muzaffer, & Mehmet), tourism and related business owners expressed less negative opinions on the development of a Nuclear Powerplant compared to other groups such as educators and professionals. According to Dabrowki (Dabrowski, 2012), Nuclear Powerplants can coexist with tourism, since plants are very compact, limiting visual impact, with no emissions.

A South African study by Economic Research Southern Africa in 2018 (Nkosi & Dikgang), indicated that self-employed people supported or are less opposed to the Nuclear plan for South Africa as the need for reliable power supply is critical for business operation. The TIA (Imani Development, 2010) and other articles reiterated that where there is already a nuclear plant the views of businesses including tourism

regarding its impact on business operations were neutral or less opposed to the development of a new nuclear site than other factions of society.

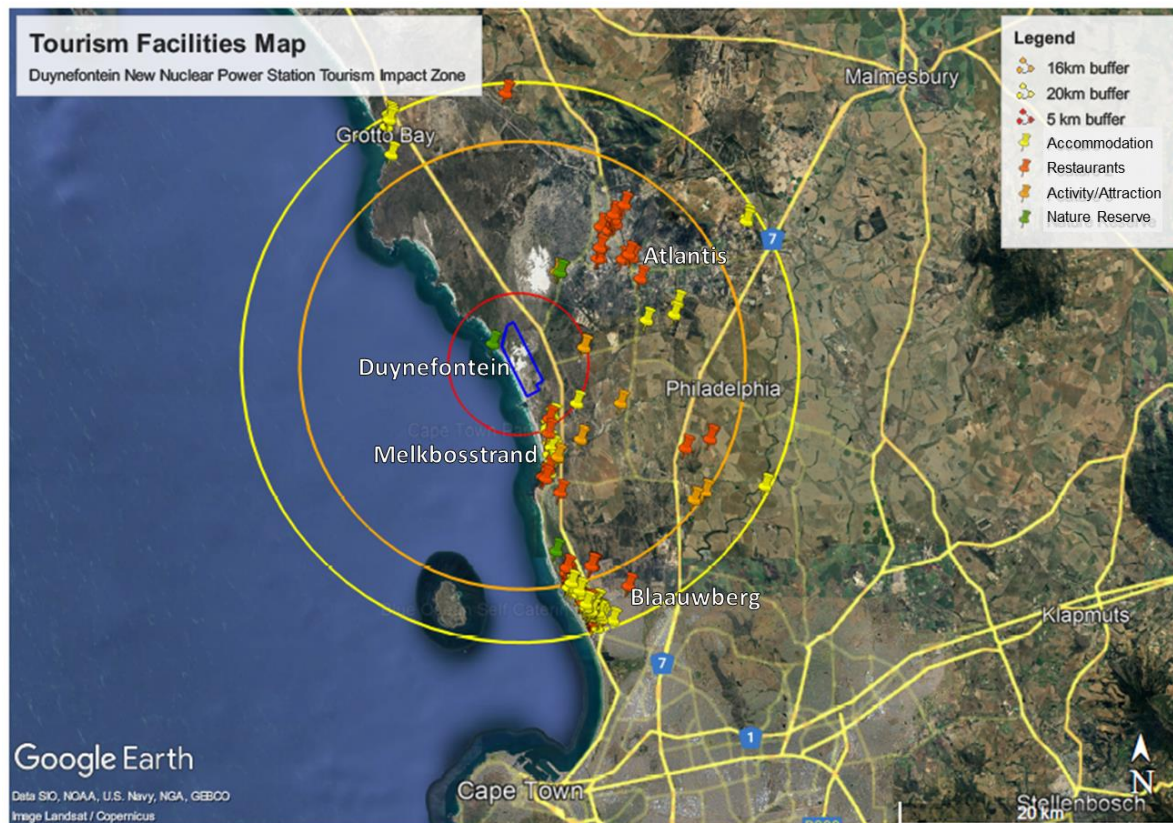


Figure 4-1: Tourism Facilities Map for 2023

4.18.2.4 Time dependency of assumptions and limitation to the study

The overall findings and qualitative observations of the TIA should still be relevant, as confirmed by other international articles.

4.18.3 Specialist Opinion

The professional opinion of the specialist is that the following findings of the TIA review:

- Post 2010 a lot of emphasis has been placed on tourism as an economic driver for South Africa and especially Cape Town with several policy changes and strategies broad about. The IDP of Cape Town aims to create a conducive business environment for tourism and the broader economy by ending load-shedding through sustainable energy sources;
- The best practice guidelines and approach for the study could be updated and expanded, however, the overall qualitative outcomes and assumptions will not change as supported by recent international literature regarding the coexistence of tourism and nuclear powerplants; and
- The baseline has most likely changed with the increased development of the surrounding area as a residential and industrial area, and tourist destination. However, more recent articles relating to tourism's relationship with nuclear power indicate that the perceived impact should remain neutral or less opposed the Nuclear-1 projects from a business operational perspective.

Based on the above it is concluded that:

- While changes in the baseline and some methodologies have occurred, these do not materially affect the perceived risk observations and proposed mitigation measures of the TIA.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.19 Specialist Review: Noise Impact Assessment

4.19.1 Status of Original Noise Impact Assessment

This review is of the Noise Impact Assessment (NIA) prepared by Jongens Keet Associates (Jongens Keet Associates, 2010) and considers only the Duynefontein site.

Fieldwork for the study was undertaken in late 2008, the report was then published in 2010 in the Draft FEIR version 1. Along with all specialist studies, the report was subjected to peer review by JH Consulting (JH Consulting, 2015), which found the report to be robust and comprehensive and no changes were required prior to its publication in the Draft FEIR version 2 (2015).

Key findings of the NIA relating to the Duynefontein site are as follows:

- The closest occupied noise sensitive land is the residential suburb of Duynefontein, with the nearest residences approximately 1 800 m south of the existing Nuclear Power Station (NPS). During the baseline noise measurement campaign, only surf noise was audible. The existing Koeberg plant was not audible at Duynefontein;
- Ambient noise impacts of Nuclear-1 at Duynefontein would have low significance beyond the Duynefontein property boundary during normal operation of Nuclear-1;
- The potential cumulative noise impact emanating from the Nuclear-1 and Koeberg power plant is not likely to elevate existing ambient noise levels; and
- Nuclear-1 could be developed at Duynefontein, without further NIA EIA investigations.

4.19.2 Noise Impact Assessment Review Evaluation Criteria

This NIA review considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments pertinent to the NIA, also considering the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.19.2.1);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.19.2.2);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.19.2.2);
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 4.19.2.2);
 - Census data; and
- Time dependency of assumptions and limitation to the study, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:

- i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environment that impact on these (Section 4.19.2.3).

Each of these is discussed below.

4.19.2.1 Changes to Legislation, Policy, Protocols or Other Instruments Pertinent to the Noise Impact Assessment

The study references the below noise standards, guidelines and regulations:

- The procedures contained in South African National Standard 10328 (SANS, 2008) *Methods for environmental noise impact assessment* as prescribed under NEMA;
- Guidelines for Community Noise, World Health Organization (WHO, 1999); and
- Stipulations contained in the Western Cape National Noise Control Regulations (NCR), GNR 154 in Provincial Gazette No. 5309 of 20 November 1998 (NCR, 2008).

As there have been no changes to the SANS (2008) and WHO (1999) guidelines for noise, they are still applicable to the assessment.

A more recent version of the Western Cape NCR is however now available (Western Cape National NCR, GN 200/2013 in Provincial Gazette No. 7141 of 20 June 2013). This updated version does not affect the findings and impact significance ratings in the NIA.

4.19.2.2 Appropriateness of methodology used

Site measurements were taken to determine the current noise climate at the site, as prescribed by SANS 10103 and SANS 10328. These methods are still applicable and considered adequate for the purpose of this assessment.

In the acoustic inventory, a key assumption made was that the proposed Nuclear-1 NPS will comprise the same technology as the existing KNPS. Noise source measurements from the existing KNPS undertaken in 2008, were then extrapolated for the proposed Nuclear-1 site. This is considered a reasonable assumption for the study.

The calculation of sound propagation was undertaken using the Concawe method in accordance with SANS 10357 (SANS, 2004). While there are now more refined and improved sound propagation models available, the basic principles remain unchanged, and the methodology is considered adequate for the purpose of this assessment.

4.19.2.3 Changes to Baseline Conditions

As the baseline noise assessment was undertaken in 2008, a considerable amount of time has elapsed since the site was surveyed. A desktop review using available historical aerial imagery for the site, shows no increase in developments (residential or industrial) contributing to ambient noise in the study area. Furthermore, the residential area of Duynefontein has not expanded northwards.

Predicted noise from the proposed Nuclear-1 site would be inaudible above the surf noise at distances beyond 400 m. As such, the baseline noise measurements at the receptors (Duynefontein site) as reported in the NIA are likely to remain valid. It is therefore considered unnecessary to undertake additional baseline noise monitoring in the study area.

4.19.3 Specialist Opinion

The professional opinion of the specialist is that the following findings of the NIA review apply:

- The NIA meets the requirements for a specialist assessment. The methodology used in the NIA remains appropriate. The study is robust and well conceptualised, findings are scientifically rigorous, and impacts were adequately assessed;
- Legislation and guideline utilised in the study remain applicable and appropriate, while updates to the Western Cape NCR since the publication of the NIA will not materially affect the validity and robustness of the study;
- Given that the last assessment of the ambient noise profile at the site was completed in 2008, without a revised baseline assessment inclusive of a site visit it is not possible to definitively comment on the extent to which the baseline environment has changed. Based on review of historical aerial imagery of the site however, no changes are evident (presence of new industrial, residential land use types etc.). It is unlikely that any changes to the baseline noise environment would result in significant changes to the impact assessment findings or mitigation recommendations. The impact ratings provided in the study therefore remain valid; and
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the NIA due to the passage of time.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.20 Specialist Review: Transport Impact Assessment

4.20.1 Status of Original Transport Impact Assessment

This specialist report is a review of the Transport Impact Assessment ('TrIA') prepared by Arcus GIBB (Pty) Ltd (Arcus GIBB (Pty) Ltd, 2012), which reported on three possible sites. This review is only for the Duynefontein site where construction of a new nuclear power plant is proposed.

The Arcus GIBB TIA was published in August 2012 and was included in the 2016 Environmental Impact Report (FEIR) for all three sites.

Key findings of the Arcus GIBB (2012) TrIA relating to the proposed Duynefontein Nuclear Power Station were as follows:

- The transport requirements of the Duynefontein Nuclear Plant (internal access and circulation) do not require significant upgrades to the internal and access road network during the Construction and the Operation Phases for both normal traffic and heavy load transport;
- Along the external transport network, several intersections along the R27 will require upgrading, including a possible interchange at the current KNPS access to the R27. The proposed Nuclear-1 will share the current KNPS access; and
- During construction, a significant number of vehicles will be required to be on standby to ensure the evacuation of construction workers in the event of an accident at either of the new or existing nuclear plants. These vehicles can also be used to shuttle construction workers to and from the site.

The key impacts (those of *medium* or *higher* significance) assessed in the Arcus GIBB study (Arcus GIBB (Pty) Ltd, 2012) were as follows:

- Traffic congestion and delay at intersections on the external road network (a negative impact of *medium* significance that can be reduced to *low* with appropriate mitigation);
- Decreased pedestrian safety in local communities due to increased traffic (a negative impact of *medium* significance that can be reduced to *low medium* with appropriate mitigation);

- Traffic congestion due to transportation of abnormal loads (a negative impact of *high* significance that can be reduced to *low medium* with appropriate mitigation);
- Lack of parking (a negative impact of *medium* significance that can be reduced to *low* with appropriate mitigation); and
- Congestion during emergency evacuation (a negative impact of *medium* significance that cannot be reduced through mitigation).

4.20.2 Transport Impact Assessment Review Evaluation Criteria

This review considered the following aspects:

- Changes to legislation, policy, protocols or other instruments pertaining to the TIA:
 - Procedures for the assessment and minimum criteria for reporting on identified environmental themes (GN 320 of 2020) (Section 4.20.2.1);
- The following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.20.2.2);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.20.2.3);

Each of these aspects is discussed below.

4.20.2.1 Changes to Legislation, Policy, Protocols pertinent to the Transport Impact Assessment

One of the significant changes to the NEMA 2014 EIA Regulations, as amended, since the completion of the Nuclear-1 EIA is the requirement to generate a Screening Report. Although a screening study was not conducted for the proposed development, transportation was identified and studied in any event as a required specialist study.

At the time of completion of the Arcus GIBB (Arcus GIBB (Pty) Ltd, 2012) study the following documents guided the extent and content of TIAs:

- National Department of Transport (NDoT) Manual for Traffic Impact Studies (D A Wepner, R J Engelbrecht & P Kruger, 1995);
- South African Trip Generation Rates (H J Stander, P Kruger, J L Coetzee & T J Lamprecht, 1995); and
- Road Access Guidelines (Provincial Administration Western Cape Department of Transport, 2002).

These documents have since been replaced with the following guidelines:

- TMH16 (Roads Coordinating Body (RCB) of the Committee of Transport Officials (COTO), 2014);
- TMH17 (Roads Coordinating Body (RCB) of the Committee of Transport Officials (COTO), 2013); and
- AMG (Western Cape Government Department of Transport and Public Works, 2020).

The basic principles and methodologies as outlined in the most recent guideline documents are not significantly different to those in 2012 guidelines. Based on the specialist review, it is unlikely that any of the findings in the 2012 Arcus GIBB TrIA would be different under the latest set of guideline documents.

Hence, it is concluded that the 2012 Arcus GIBB TrIA fulfils the significant requirements as outlined in all the relevant guideline documents.

4.20.2.2 Appropriateness of Methodology

The methodology followed in the Arcus GIBB TrIA was as follows:

- Status Quo Assessment (No-Go Alternative):
 - Traffic analysis;
 - Access arrangement and assessment;
 - Public transport;
 - Non-motorised transport;
 - Parking (if applicable);
 - Waste transport (if applicable);
 - Heavy load transport (if applicable);
 - Emergency evacuation (if applicable);
 - Air routes (if applicable);
 - Shipping lanes (if applicable);
- Construction Phase Assessment:
 - Daily construction related transport impacts:
 - Access;
 - Traffic analysis;
 - Parking;
 - Public transport;
 - Non-motorised transport;
 - Impacts of abnormal load transport to the Nuclear-1 site;
 - Emergency evacuation impacts (Duynefontein only, as it is an operating nuclear power station);
- Operational Phase Assessment:
 - Normal daily transport impacts:
 - Access;
 - Traffic analysis;
 - Parking;
 - Public transport;
 - Non-motorised transport;
 - Low to medium nuclear waste transport;
 - Emergency evacuation impacts; and
 - Air and shipping route impacts.

The methodology followed is in line with current guidelines specifically TMH16 (Roads Coordinating Body (RCB) of the Committee of Transport Officials (COTO), 2014), TMH17 (Roads Coordinating Body (RCB) of the Committee of Transport Officials (COTO), 2013) and AMG (Western Cape Government Department of Transport and Public Works, 2020). Therefore the methodology as followed in the Arcus GIBB TrIA (Arcus GIBB (Pty) Ltd, 2012) is adequate.

4.20.2.3 Changes to Baseline Conditions

The baseline conditions on which the Arcus GIBB study was based were twofold: firstly the road and related infrastructure and secondly the traffic and Non-Motorised Traffic (NMT) volumes. Since then, there have been no significant changes to the road network and all other associated transportation-related infrastructure. However, it is possible that the MyCiTi services provided by the City of Cape Town have changed based on the revealed demand to/from Duinefontein and Atlantis. However this was studied and reported on by Arcus Gibb (Arcus GIBB (Pty) Ltd, 2012).

What has changed since the 2012 study is an increase in the traffic volumes on the network. Based on historic traffic counts, the traffic volumes along the R27 have been increasing by approximately 1.5% per annum. This is relatively low growth and lower than what most impact assessments would assume for future growth and lower than the 2% per annum assumed by Arcus Gibb. This means that the future conditions as assessed in the Arcus Gibb study would be more conservative than what occurred on the network. Arcus GIBB reported that all the study intersections operated at acceptable levels of service during the peak hours under the base conditions and will continue to do so, provided that the proposed mitigation was implemented. Based on the specialist review, the proposed mitigation measures are still relevant and appropriate.

4.20.3 Specialist Opinion

The surrounding road network has not changed significantly since the original study was conducted. The traffic volume along the surrounding road network increased over the past 15 years, but the increase in traffic volume will not result in any change in the findings and recommendations. The mitigation measures recommended in the Arcus GIBB TrIA are still relevant.

The professional opinion of the reviewer is that the following findings of the transport/traffic study review apply:

- The TrIA (Arcus GIBB (Pty) Ltd, 2012) meets the requirements for a specialist assessment. The study is robust and along the requirements of all historical and latest guidelines. The methodology used for the study generally aligns with current practice. The findings are adequately supported and impacts were adequately assessed;
- These best practice guidelines utilised in the TrIA are still applicable and appropriate;
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

4.21 Specialist Review: Town Planning Assessment

4.21.1 Status of Original Town Planning Assessment

This review is of the Town Planning Assessment prepared by Carl Erasmus of GIBB (Pty) Ltd (GIBB (Pty) Ltd, 2016). The Town Planning Assessment (GIBB (Pty) Ltd, 2016, p. 4) states the intention of the study to “holistically analyse the site by:

- Understanding the town planning context in which the site is located;
- Considering the future planning of the area; and
- Evaluating the potential impact of the proposed Nuclear-1 facility from a town planning perspective.

The key impacts (those of *medium* significance or *higher* significance) assessed in the Town Planning Assessment were:

- The site is located within the growth path of the City of Cape Town, and therefore the proposed development may have an impact on future development of the region in terms of land that could otherwise be utilised for future development (for example, because areas around the site will need to be protected, residential densities may need to be lower than if the development were not there);
- There is existing urban development around the proposed site that will be impacted upon, especially to the south and east of the site; and
- Locating the facility at the Duynefontein site may impact on the existing transport model / evacuation model already in place for the KNPS.

4.21.2 Town Planning Assessment Review Evaluation Criteria

This review of the Town Planning Assessment considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments pertinent to the SIA, also considering the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 4.21.2.1.2);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 4.21.2.2);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 4.21.2.2);
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 4.21.2.1);
 - Census data; and
- Time dependency of assumptions and limitation to the study, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environment that impact on these (Section 4.21.2.2).

Each of these is discussed below.

4.21.2.1 Changes to Legislation, Policy, Protocols or other instruments pertinent to the Town Planning Assessment

4.21.2.1.1 Policy and Planning Documents

- a. Blaauwberg District Plan

The Town Planning Assessment (GIBB (Pty) Ltd, 2016) only makes reference to one policy and planning document, namely the 2012 Blaauwberg District Plan (City of Cape Town, 2012). This plan has subsequently been superseded by the 2023 Blaauwberg District Plan (City of Cape Town, 2023)³¹. Both District Plans are underpinned by a composite spatial development plan / framework – the spatial development plan contained in the 2012 Blaauwberg District Plan is shown in Figure 4-2, and the spatial development framework contained in the 2023 Blaauwberg District Plan is shown in Figure 4-3.

The only relevant and significant difference between the 2012 District Plan and the new 2023 version is that the City no longer regards the Atlantis corridor³² as a future growth corridor. Instead, the 2023 District Plan shows the urban edge shifting southwards compared with the 2012 District Plan (i.e. a smaller land area is now identified for future development). All other relevant spatial planning guidelines contained in the 2012 District Plan remain unchanged in the 2023 District Plan, viz.:

- The Blaauwberg district contains remnants of globally critical biodiversity (including vast areas to the north of the urban edge). As growth is accommodated in this district, a high level of priority should be given to conserving sufficient critical endangered habitats in order to sustain this biodiversity;
- The principle for the 0 – 5 km zone (Protective Action Zone) is that no new development will be permitted unless place bound and directly related to the nuclear power station;
- The principle for the 5 -16 km zone (Urgent Protective Action Zone) is that limited development will be considered subject to assessments. And that in general the number of permanent residents, employees and visitors should be limited; and
- The City, in association with Eskom, for the NNR, will develop tools to assess and report on the cumulative impacts of development applications in relation to available evacuation time. Development applications will be assessed through the Traffic Evacuation model.

b. City of Cape Town Municipal Spatial Development Framework

The Town Planning Assessment (GIBB (Pty) Ltd, 2016) did not make any specific reference to the City of Cape Town Municipal Spatial Development Framework (MSDF). This is a curious omission considering that MSDF sets overall spatial vision for the broader Cape Town metropolitan area, as well as sets policy objectives and desired outcomes *vis-à-vis* spatial planning in Cape Town (i.e. it is the highest-order spatial plan / policy governing spatial planning in Cape Town³³). The latest version of the MSDF is dated 2022 (City of Cape Town, 2022).

c. City of Cape Town Development Management Scheme

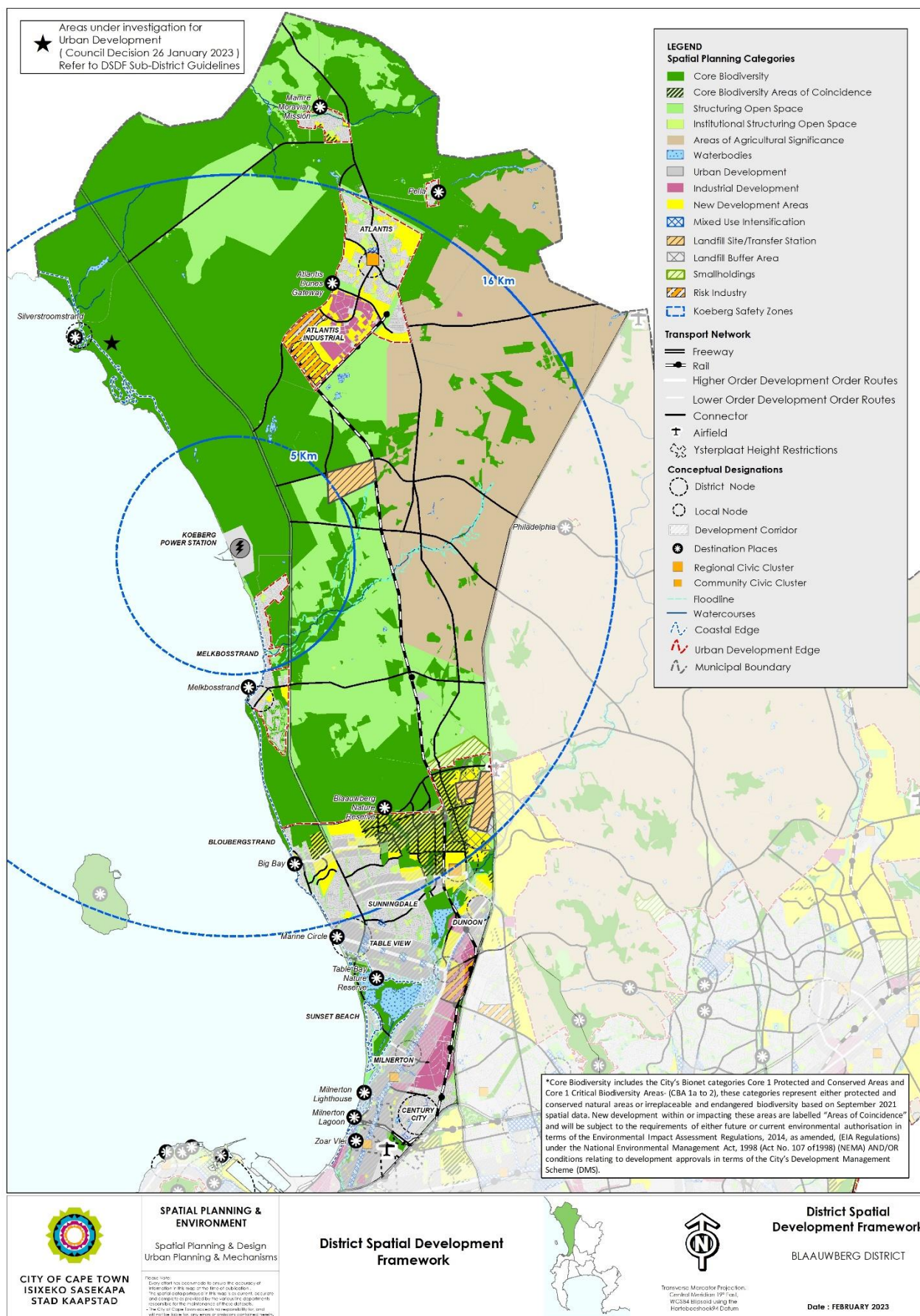
The Town Planning Assessment (GIBB (Pty) Ltd, 2016) fails to make reference to item 158 of the City's Development Management Scheme (DMS) (City of Cape Town, 2015b), which contains specific provisions relating to the Koeberg Restriction Area Overlay Zoning. More specifically, Item 158 of the DMS contains procedural guidance and restrictions for all urban development within the Emergency Planning Zone (0 – 16 km) of the KNPS.

³¹ The approval of the 2018 MSDF and the fact that the previous District Plans were almost ten years old, amongst others, gave rise to the need to review the 2012 District Spatial Plans to ensure alignment with the MSDF.

³² This growth corridor is broadly defined in the 2012 Blaauwberg District Plan as the area abutting the Atlantis rail line, the proposed M12, proposed Parklands main road extension and the N7 which falls within the (old) urban edge (City of Cape Town, 2012).

³³ In terms of the consistency principle that applies to the plans and policies of different spheres of government, should the provisions of the Blaauwberg District Plan and any related lower order plans / SDFs be deemed to be inconsistent with the MSDF, the MSDF will take precedence.





4.21.2.1.2 Best Practice Methods / Guidelines

No best practice guidelines relevant to this project were identified in the Town Planning Assessment. It is the opinion of the specialist reviewing the Town Planning Assessment that other than the sustainability criteria applied in the town planning report, there are no relevant best practice guidelines pertaining to town planning within the context of the EIA, since development decisions in the area surrounding the Duynefontein site are regulated by the relevant legislation including key principles derived from the Spatial Planning and Land Use Management Act 16 of 2013 (SPLUMA) (Republic of South Africa, 2013) through to the City of Cape Town's Municipal Planning By-law (MPBL) (City of Cape Town, 2015a) and the associated DMS (City of Cape Town, 2015b), Municipal Planning is a municipal competency in terms of the Constitution (Republic of South Africa, 1996), and therefore all town planning and land use management decisions taken by the City of Cape Town must be taken in accordance with the MSDF, as directed by the Local Government: Municipal Systems Act 32 of 2000 (Republic of South Africa, 2000), all of which are based on considerations of sustainable development.

4.21.2.2 Changes to Baseline Conditions

The broader EIA considers four zones:

- Emergency Planning Zone;
- Protective Action Zone - traditionally 5 km radius;
- Urgent Protective Action Zone - traditionally 16 km radius; and
- Long-term Protective Action Planning Zone - traditionally 80 km radius.

The Town Planning Assessment does not refer to any specific baseline conditions for these four zones, but rather only gives a very high-level overview of land use in the Blaauwberg District, including a map (Figure 4) which broadly identifies the location of commercial development in the Blaauwberg District.

It is not absolutely clear whether or not the Terms of Reference associated with the Town Planning Assessment compiled by GIBB (GIBB (Pty) Ltd, 2016) required a detailed assessment of baseline conditions such as land use. It is therefore difficult to comment on the adequacy of the information contained in the GIBB report in this regard. Notwithstanding, it is considered likely that the baseline conditions associated with relevant town planning aspects (e.g. land use and population density) have changed in the period since the Town Planning Assessment was completed. However, the degree of this change is considered marginal given the prevailing spatial planning policy and guidelines.

Based on a land use survey conducted in 2020 for the DSSR (Eskom, 2022), updated information is available which describes the land use within the 20km annulus around the Duynefontyn site. This information could be incorporated into the Town Planning Assessment Report, if considered necessary to do so.

4.21.2.3 Time dependency of assumptions and limitation to the study

The Town Planning Assessment is subject to three overarching assumptions / considerations (GIBB (Pty) Ltd, 2016, p. 5). None of the assumptions / considerations listed are impacted by the passage of time since the study was conducted.

4.21.3 Specialist Opinion and Recommendations

The professional opinion of the specialist is summarised below:

- Notwithstanding the publication of the updated policy and guideline documents, it was found that there is not materially relevant and significant difference between the 2012 Blaauwberg District Plan (reviewed as part of the Town Planning Assessment) and the updated policy and guideline documents

identified in this review, that would render the Nuclear-1 EIA as not fit for purpose. In fact, if anything, the updated policy and guideline documents are more restrictive than the 2012 Blaauwberg District Plan with regards to making provision for future development within the Emergency Planning Zone, and therefore there may now be a reduced risk vis-à-vis the Nuclear-1 EIA;

- It is considered likely that the baseline conditions associated with relevant town planning aspects (e.g. land use and population density) have changed in the period since the Town Planning Assessment was completed. However, the degree of this change is considered marginal given the prevailing spatial planning policies and guidelines; and
- None of the assumptions / considerations listed are impacted by the passage of time since the study was conducted.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

5 Findings of Technical Study Reviews

This chapter presents the findings of the reviews of technical studies, undertaken by the reviewers listed in Table 5-1.

Table 5-1: Technical specialist reviewers

Technical Assessment	Assigned Reviewer	Organisation
Geological Hazard Assessment	Bruce Engelsman	SRK
Seismic Risk Assessment	Bruce Engelsman	SRK
Geotechnical Suitability Assessment	Bruce Engelsman	SRK
Freshwater Supply	Jennifer Barnard	SRK
Position of 1:100 Sea Floodline	Rob Gardiner	SRK
Human Health Risk Assessment	Dr. Willie van Niekerk	Infotox (Pty) Ltd
Emergency Response Report	Dr. Dawid de Villiers	SciRAD Consulting
Site Control Report	Bruce Engelsman	SRK
Transmission Integration Report	Ahmed Hansa	Eskom
Radioactive Waste Management	Jennifer Barnard	SRK
Beyond Design Accident Report	Dr. Dawid de Villiers	SciRAD Consulting

5.1 Specialist Review: Geological Hazard Impact Assessment

5.1.1 Status of Original Geological Hazard Impact Assessment

This review of the Geological Hazard Impact Assessment was prepared by Erna Hattingh and Johann Neveling of The Council for Geoscience (CGS, 2011). The March 2011 impact assessment was peer reviewed at the time of submission.

The study focussed on identifying geological hazards that could impact on the safe implementation of a Nuclear Power Station. As such, impacts that the proposed project has on the natural geological environment are not of concern.

The key aspects assessed in the Geological Hazard Impact Assessment relate to the geological environment impacting on the project and were:

- Locally induced (by steam turbines) vibratory ground motion at the site, assigned a low significance rating;
- Surface rupture related to any capable faults that may cause surface deformation as a result of tectonic faulting and impact on the proposed project, assigned a medium significance rating; and
- Subsurface stability primarily related to liquefaction of subsurface soils and impact on the proposed project, assigned a low significance rating.

Volcanic risk to the project has negligible risk at the Duynefontein site.

5.1.2 Geological Hazard Impact Assessment Review Evaluation Criteria

This Geological Hazard Impact Assessment review considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments pertinent to the Geological Hazard Impact Assessment, also considering the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:

- i.e. – is the methodology used in the assessment still appropriate or is it outdated (Section 5.1.2.1);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is new data available, or should new data be gathered (Section 5.1.2.2);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 5.1.2.2);
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 5.1.2.2); and
- Time dependency of assumptions and limitation to the study, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environment that impact on these (Section 5.1.2.3).

Each of these is discussed below.

5.1.2.1 Changes to Legislation, Policy, Protocols or other Instruments Pertinent to the Geological Hazard Impact Assessment

No changes in legislation relevant to the Geological Hazard Impact Assessment have been promulgated since the 2011 impact assessment. Similarly, no changes in policy or planning documents have been identified.

5.1.2.2 Best Practice Methods / Guidelines

As indicated in Section 1.2.1 of EIA for Nuclear-1 and Associated Infrastructure Geological Hazard Environmental Impact Report dated March 2011 (CGS, 2011), numerous international standards are used to guide geological hazard assessments for nuclear power station sites due to the threat of seismic risk to safe operation of nuclear power stations. The extensive guidelines used in developing the geological hazard studies (and the Geological Hazard Impact Assessment) are continually updated. Several reference guidelines cited in CGS's report (CGS, 2011) have therefore been updated, but these changes are unlikely to impact the the outcomes of the (CGS, 2011) study.

An example of a guideline that has been updated since report (CGS, 2011) is the

- International Atomic Energy Agency (IAEA, 2002), IAEA Safety Series No. NS-G-3.3. Evaluation of seismic hazard for nuclear power plants — a safety guide. (IAEA, 2002) now superseded by IAEA Safety Standards Series No. 79.

5.1.2.3 Changes to Baseline Conditions

Since the issue of CGS's report (CGS, 2011), extensive additional studies have been undertaken for the geotechnical characterisation, seismic risk and geological hazard studies at the Duynefontein site. The intent in updating such studies is to reduce uncertainty pertaining to characterisation of the geological setting of the site. Technical studies are continually being updated through investigations and improvements in analytical methods etc. at nuclear sites.

Methods to the identify geological hazards have been updated since the issuing of (CGS, 2011), but these changes are unlikely to impact the CGS report and assigned impact significance ratings.

5.1.2.4 Time dependency of assumptions and limitation to the study

The Geological Hazard Impact Assessment is subject to a number of assumptions and limitations. Actual geological setting will not have changed since the March 2011 study was conducted as geological process evolves over considerable timeframes (many millions of years). There may now be a better understanding of the geological setting (e.g. more certainty pertaining to fault characterisation), but this is not considered to be material to the baseline or significance ratings of impacts.

5.1.3 Specialist Opinion

The understanding of geological hazards at the Duynefontein site (and surrounds) develops continuously with time and has since the issuing of (CGS, 2011). Even though the geological baseline continually evolves, it is unlikely that the outcomes of the previous impact assessment will change and it is noted that the only aspects of significance are hazards imposed on the proposed project by the geological setting and not impacts on the geological environment caused by the proposed project.

Based on the above it is concluded that:

- Changes in the baseline (i.e. improved understanding of geological hazards at the Duynefontein site and surrounds) will not affect the significance ratings pertaining to geological hazards imposed on the proposed project as previously identified;
- Best practice guidelines influencing geological hazard studies for nuclear power stations are continuously updated, but it is unlikely that this will change the outcomes of the previously documented significance ratings; and
- The March 2011 Geological Hazard Impact Assessment will not require updating for decision making as no impacts by the project on the geological environment are identified.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

5.2 Specialist Review: Seismic Risk Assessment

5.2.1 Status of Original Seismic Risk Impact Assessment

This review is of the seismic risk Impact Assessment that was prepared by Erna Hattingh and Johann Neveling of The Council for Geoscience (CGS, 2011). (CGS, 2011) was peer reviewed at the time of submission.

The key aspects assessed in the seismic risk impact assessment were:

- Vibratory Ground Motion, specifically relating to seismic hazard and the potential impacts that seismic loading would have on the proposed project: this impact was assigned a *medium* significance rating, but this reduced to a *low* significance with mitigation.

5.2.2 Seismic Risk Impact Assessment Review Evaluation Criteria

This Seismic Risk Impact Assessment review considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments pertinent to the Seismic Risk Impact Assessment, also considering the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - i.e. – is the methodology used in the assessment still appropriate or is it outdated (Section 5.2.2.1);

- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is new data available, or should new data be gathered (Section 5.2.2.2);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 5.2.2.2);
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 5.2.2.2);
 - Census data; and
- Time dependency of assumptions and limitation to the study, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environment that impact on these (Section 5.2.2.3).

Each of these is discussed below.

5.2.2.1 Changes to Legislation, Policy, Protocols or other instruments pertinent to the Seismic Risk Impact Assessment

No changes in legislation relevant to the Seismic Risk Impact Assessment have been promulgated since the 2011 impact assessment.

5.2.2.1.1 Policy and Planning Documents

No changes in policy or planning documents have been identified.

5.2.2.1.2 Best Practice Methods / Guidelines

Numerous international standards/guidelines are used to guide seismic risk assessments for nuclear power station sites due to the significance of seismic risk to safe operation of nuclear power stations.

A large proportion of the extensive guidelines followed in developing the seismic risk studies (and the seismic risk impact assessment) benefit from regular updates. Several reference guidelines cited in (CGS, 2011) have therefore been continuously updated. An example of a guideline that has been updated since report (CGS, 2011) is the

- International Atomic Energy Agency (IAEA, 2002), IAEA Safety Series No. NS-G-3.3. Evaluation of seismic hazard for nuclear power plants — a safety guide. (IAEA, 2002) now superseded by IAEA Safety Standards Series No. 79.

5.2.2.2 Changes to Baseline Conditions

Since the issue of (CGS, 2011), extensive additional studies have been undertaken for the geotechnical characterisation, seismic risk and geological hazard at the Duynefontein site. With time, an approach aimed at removing uncertainty pertaining to how these technical aspects influence seismic hazard is followed.

Aspects pertaining to the identification of seismic risk will have been updated since the issuing of (CGS, 2011). Updating the Seismic Risk Impact Assessment to capture any changes will produce greater detail than currently exists. However, it is unlikely that additional impacts and/or changes to previously impact

significance ratings will need to be addressed as impacts relating to the safe operation of the proposed project dominate and no impacts of the project on the environment are identified.

5.2.2.3 Time dependency of assumptions and limitation to the study

The seismic risk impact assessment is subject to a number of assumptions and limitations. The actual geological physical environment will not have changed since the March 2011 study was conducted as geological processes evolve over considerable timeframes (many millions of years). Better understanding of the geological setting (e.g. removal of uncertainty pertaining to fault characterisation) will be available, but this will only increase the level of detail pertaining to seismic risks that the proposed project will be subjected to and it is unlikely that significance ratings previously documented will change.

5.2.3 Specialist Opinion

5.2.3.1 General Opinion

The understanding of seismic sources, their propagation from source to site and amplification once arriving at the Duynfontein site has developed since the issuing of (CGS, 2011). However, (CGS, 2011) concentrates on the potential impacts that seismic loading will have on the proposed project, and not of the project impacting the environment and updating this study will not alter recommended design mitigations.

Based on the above it is concluded that:

- Changes in the baseline (i.e. based on improved understanding of geological hazards, ground motion prediction and site response at the Duynfontein site and surrounds) have occurred, but this will only present greater detail in describing how seismic risks could impact the proposed project;
- Updates in best practice guidelines influencing geological hazard studies, ground motion prediction approaches and site response analyses for nuclear power stations have occurred but this will not alter the outcomes of the previous study and will only present greater detail pertaining to the seismic risks imposed on the proposed project;
- The March 2011 Seismic Hazard Impact Assessment is fit-for-purpose and will not require updating for decision making.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

5.3 Specialist Review: Geotechnical Characterisation Assessment

5.3.1 Status of Original Geotechnical Characterisation Impact Assessment

This review is of the Geotechnical Characterisation Impact Assessment prepared by Bruce Engelsman of SRK (SRK, 2014). This November 2014 impact assessment was peer reviewed at the time of submission.

The key impacts assessed in the Geotechnical Characterisation Assessment were:

- Slope failure resulting in safety risks to the proposed project, was assigned a low significance rating;
- Excessive site disturbance due to project implementation resulting in environmental damage (surface disturbance), assigned a low significance rating.

5.3.2 Geotechnical Characterisation Impact Assessment Review Evaluation Criteria

This Geotechnical Characterisation Impact Assessment review considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments pertinent to the Geotechnical Characterisation Impact Assessment, also considering the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - i.e. – is the methodology used in the assessment still appropriate or is it outdated (Section 5.3.2.1);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 5.3.2.3);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 5.3.2.3);
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 5.3.2.3); and
- Time dependency of assumptions and limitation to the study, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environment that impact on these (Section 5.3.2.4).

Each of these is discussed below.

5.3.2.1 Changes to Legislation, Policy, Protocols or Other Instruments Pertinent to the Geotechnical Characterisation Impact Assessment

No changes in legislation relevant to the Geotechnical Characterisation Impact Assessment have been promulgated since the 2014 impact assessment.

Similarly, no changes in policy or planning documents have been identified.

5.3.2.2 Best Practice Methods / Guidelines

Related to the Environmental Impact Assessment for a Proposed Nuclear Power Station ('Nuclear-1') and Associated Infrastructure: Geotechnical Characterisation Assessment Study, November 2014 (SRK, 2014), it is noted that the study focussed on identifying geotechnical hazards that could impact on the safe implementation of a nuclear power generating facility. Impacts that the proposed project may have on the natural geotechnical environment are of less concern.

As indicated in Section 1.1 of (SRK, Geotechnical Characterisation Assessment Study, 2014), the following key technical aspects drew attention:

- Free field seismic response and site-specific response spectra;
- Liquefaction potential;
- Stresses in the foundation materials;
- Foundation stability;
- Soil-structure interaction;
- Settlement and heave;
- Earth pressure and stability of earth structures/buried structures; and

- Nearest sources of suitable construction materials and their characteristics.

As far as best practice methods and guidelines are concerned, changes to the approaches (Engineering & National Centre for Earthquake Engineering, 1996) used to assess liquefaction potential have been adopted since the November 2014 assessment. These changes entail marginal differences in the approach to considering earthquake loading in the liquefaction potential assessment and will not influence the previous impact assessment outcomes.

5.3.2.3 Changes to Baseline Conditions

The original study (SRK, 2014) relies on published geological/geotechnical data, the results of intrusive geotechnical investigations, other technical studies (hydrogeological impact assessment, geological hazard assessment and seismic risk assessment) and analysis of these data for the Duynefontein site. Changes to the baseline conditions (and their potential impacts) related to these aspects since the November 2014 geotechnical characterisation impact assessment are:

Intrusive geotechnical and laboratory testing investigations have been ongoing at the site since the November 2014 impact assessment, and new data exist for the site. The same suite of geotechnical data that was considered in the November 2014 impact assessment is now available across a broader footprint at the site (data now extending further northwards and eastwards than previously considered in the November 2014 impact assessment). Even though these additional data are now available, the geotechnical characterisation of the site will remain similar over this larger footprint;

- An extensive geotechnical database supporting the KNPS (KNPS) exists and these data were considered in the original study (SRK, 2014). No new desktop data is therefore relevant that could alter the integrity of original study (SRK, Geotechnical Characterisation Assessment Study, 2014); and.
- The Geotechnical Characterisation Impact Assessment also relies on data/results from the hydrogeological impact assessment, the geological hazard assessment and seismic risk assessment, and these studies have been updated since their previous release. Aspects of the sensitivity mapping submitted in the original study (SRK, 2014) will therefore change, but this is anticipated to be marginal.

5.3.2.4 Time dependency of assumptions and limitation to the study

The original study (SRK, 2014) is subject to a number of assumptions and limitations, none of which are impacted by the passage of time since geological processes (influencing the geotechnical profile) evolve over considerable timeframes (many millions of years) and as such, geotechnical parameters will not have changed.

5.3.3 Specialist Opinion

The geotechnical database at the Duynefontyn site has been expanded since the original study (SRK, 2014). Consideration of these additional data will not change the findings of the original study (SRK, 2014) as the geotechnical profile description does not significantly change spatially across the site. Mitigation measures, i.e. design recommendations to reduce the impact of the geotechnical setting on the proposed project are already described in the original study (SRK, Geotechnical Characterisation Assessment Study, 2014) and would adequately address these additions to the baseline.

Based on the above it is concluded that:

- New methods and data (i.e. an expanded intrusive geotechnical investigation footprint) are now available, but would not affect the outcomes pertaining to the geotechnical characterisation of the site;
- Changes in the best practice methodologies used to assess liquefaction potential at the site, the hydrogeological, geological hazard and seismic risk assessments will marginally alter the previous

geotechnical sensitivity mapping of the site, but this is not likely to alter the significance ratings pertaining to the geotechnical impacts on the proposed project;

- The significance ratings and mitigation measures primarily considering the geotechnical setting impacting on the proposed project, remain valid; and
- None of the mitigation measures (design recommendations) are time sensitive and mitigation measures listed in the original study (SRK, 2014) remain valid.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

5.4 Specialist Review: Freshwater Supply Impact Assessment

5.4.1 Status of Freshwater Supply Environmental Impact Report

This review is of the Freshwater Supply Environmental Impact Report prepared by Peter Rosewarne of SRK (Rosewarne P. N., 2015). The September 2015 Freshwater Supply Report is an update of an earlier version of the report, submitted with the Nuclear 1 EIA, in response to the recommendations of the Peer Review Report compiled by GCS (Pty) Ltd (Appendix E37 of the Revised Draft FEIR Version 2).

The report provides a high level screening of freshwater supply alternatives for the nuclear power plant and in terms of the available options found that, for the Duynefontein site:

- The KNPS is connected to the municipal water supply scheme but additional surface water supply from existing municipal supply sources cannot be guaranteed;
- There is extensive use of groundwater in the surrounding area;
- The Aquarius Wellfield was previously developed to supply groundwater to the KNPS but has not been used recently because of quality concerns. This wellfield requires extensive rehabilitation but could supply the required construction and a proportion of operational demand;
- Surface water and, to a lesser extent groundwater, is likely to be adversely affected by climate change; and
- Desalination of sea water is the most viable option for an assured water supply with least environmental impact and would not be affected by climate change. This option would have the least environmental impact and is Eskom's preferred option for fresh water supply.

A high level discussion of impacts of the various alternatives, and structured significance rating tables are provided. All of the identified impacts (drying up of coastal springs/degradation of wetlands, sea water intrusion, installation of beach wells, and disposal of brine) are rated as having either a low or low-medium environmental significance with mitigation.

5.4.2 Freshwater Supply Review Evaluation Criteria

This review of the Freshwater Supply Environmental Impact Report considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments, also considering the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 5.4.2.1);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:

- cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 5.4.2.2);
- cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 5.4.2.2); and
- g – no buffers are proposed and are therefore not dealt with further;
- Time dependency of assumptions and limitation to the study, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environment that impact on these (Section 5.4.2.3).

Each of these is discussed below.

5.4.2.1 Changes to Legislation, Policy, Protocols or other instruments pertinent to the Social Impact Assessment

The Freshwater Supply Environmental Impact Report includes a short section listing the legislation and water quality standards associated with freshwater supply. No changes to the legal framework relevant to the freshwater supply study have been identified in this review. Although no reference is made to the Western Cape Water Supply System Reconciliation Strategy Study and associated documents, these were available at the time of the study and have bearing on the study in terms of an evaluation of alternatives since they outline the projected future demand in the system and the options for augmenting supply to the system. Only one document has been published since the release of the Freshwater Supply Environmental Impact Report, an annual status report in 2018. Interestingly, this report assumes that a 60 ML/day desalination plant would be constructed at the KNPS to augment supply. According to the Freshwater Supply Environmental Impact Report the daily demand from an operational nuclear power plant at Dufnefontein would be in the order of 6 ML/day.

This reviewer has therefore concluded that there are no changes to legislation or policy that would negatively impact on the findings of the Freshwater Supply Environmental Impact Report. Furthermore, there is tacit support in the reconciliation study for the development of seawater desalination associated with a nuclear power plant for the broader augmentation of supply to the broader system, i.e. for wider use than just at the nuclear power plant.

In terms of the EIA Regulation, 2014, it is noted that there are specific listed activities associated with desalination, as there were in the EIA regulations, 2010 (although this EIA process is conducted in terms of the 2006 EIA regulations). Desalination would need to be applied for as a listed activity if the application was in terms of either 2010 or 2014 versions of the regulations, and an EIA process that considered desalination would be expected provide a more detailed description and analysis of the associated impacts than is presented in this study. However, and as an example, impacts of brine discharge on marine ecology are addressed in the marine ecology report (Griffiths, Robinson, & Elwen, February 2016), and the high level approach taken in this study is therefore not seen as a shortcoming.

In terms of the requirements of Appendix 6 of the EIA regulations, 2014, the specialist report is broadly compliant with the requirements of these regulations.

5.4.2.2 Changes to Baseline Conditions

Baseline condition relevant to this study are as follows:

- Availability of water from the CoCT. Water for the KNPS is supplied from the Voëlvlei Dam, approximately 12.5 km southwest of Tulbagh. Water is transferred via a series of pipelines and

reservoirs to the KNPS. While improvements to the CoCT water supply system have taken place since the study, the priority for the CoCT (as stated in the study) is to supply Atlantis. In the unlikely event that a surplus of water were to become available from the CoCT, supply from the CoCT would be a more viable option, with a low environmental significance. However:

- The study highlights that surface water, and to a lesser extent groundwater, is likely to be adversely affected by climate change;
- As the preferred option is desalination, these improvements have no bearing on the Nuclear-1 EIA;
- The availability of groundwater. An examination of the National Groundwater Archive shows that, while there are a large number of boreholes within 16 km of the site, there is no record of boreholes having been established since the publication of this study. Although there doesn't appear to be a significant increase in the exploitation of the groundwater resource, the above comment regarding climate change is similarly applicable to the long term viability of groundwater as a water source; and
- There are no changes in terms of the availability or quality of seawater for the desalination option.

5.4.2.3 Time dependency of assumptions and limitation to the study

Not applicable to this study.

5.4.3 Specialist Opinion

The professional opinion of the reviewer is that the following findings of the Freshwater Supply Environmental Impact Report review apply:

- The Freshwater Supply Environmental Impact Report has assessed the relative environmental merits of a number of freshwater supply options and concludes that the provision of freshwater from a desalination plant, both during construction and operation, is Eskom's preferred, and the environmentally preferred option, for the freshwater supply;
- There are no changes in legislation, policy, or protocols that would invalidate this study. Although desalination would need to be applied for as a listed activity if the application was in terms of either 2010 or 2014 EIA regulations, However, impacts are addressed in other specialist reports.
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time;
- The developmental pressures that have resulted in desalination being Eskom's preferred solution to fresh water supply still exist; and
- There are no changes to the environment in terms of quality and availability of sea water for the preferred supply option, namely desalination.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

5.5 Specialist Review: Position of 1:100 Flood Line from the Sea

5.5.1 Status of 1:100 Flood Line from the Sea Report

This review is of the report titled "Estimating the 1:100 year Flood Line from the Sea" prepared by Prestedge Retief Dresner Wijnberg (PRDW) (PRDW, 2009).

A number of specialists working on the Nuclear-1 EIA requested that an estimate be made of the 1:100 year flood line due to flooding from the sea. The PRDW flood line study is a technical study that is

referenced in a number of other specialist studies. The study does not predict the significance of impacts but is a technical assessment which informs the assessment by other specialists. The 1:100 year flood line study is referenced in the Botany and Dune Ecology Impact Assessment; EcIA; Terrestrial Vertebrate Fauna Impact Study; Wetland Ecosystems Specialist Study; Geological Hazard Environmental Impact Report; Hydrology Environmental Impact Report; and Terrestrial Invertebrate Fauna Assessment.

The total flood elevation is calculated by summation of the tide, storm surge, and wave run-up for 80 regularly spaced beach profiles and then interpolated onto a digital elevation map of the site topography. The 1:100 year flood line is the intersection of this summation of (storm surge, wave run up, tide) with the calculated surface elevation and the surface topography.

The study predicts the 1:100 flood line for the 2009 beach profile and a future (2075) beach profile, taking into account sea level rise and beach erosion based on the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) (IPCC, 2007). The selection of the 2075 date for the prediction of a future flood line is based on the 60 year design life of the development and assumed a start date of 2015.

5.5.2 Flood Line Review Evaluation Criteria

This review of the PRDW flood line study considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments pertinent to the PRDW flood line study, also considering the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 5.5.2.1);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 5.5.2.2);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 5.5.2.2);
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 5.5.2.2); and
- Time dependency of assumptions and limitation to the study, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environment that impact on these (Section 5.5.2.3).

Each of these is discussed below.

5.5.2.1 Changes to Legislation, Policy, Protocols or other instruments pertinent to the PRDW flood line study

The PRDW flood line study is not in response to environmental legislation and hence there are no legal requirements influencing the validity guided by legislation. Being a technical study, the review considered whether there are significant changes to the method used to determine the flood line.

A number of methods (i.e. protocols) of calculating input values into a model, and the method of the model itself, were made in the prediction of the 1:100 flood line. These are listed as follows, including a comment on whether the method used is still valid:

Climate change, in terms of the bulleted points listed below is based on a position paper developed by PRDW. Any changes to this model would or may affect each of these items. In this review, sea level rise is used as an indicator of the validity of the climate change data underpinning this study and is discussed under section 5.5.2.2.

Since the observed regional trends in relative sea level rise are relatively small compared to the uncertainties in the long-term global projections, for long-term design purposes the position paper proposes the application of global sea level rise projections directly applicable to Southern Africa. The position paper further recommends considering the following three sea level rise scenarios to 2100: the mid-point of the IPCC (2007) projections of 0.4 m, the upper end of the IPCC (2007) projections of 0.8 m, and in specific cases the design should also be evaluated for future design adaptations or contingency planning in the event of an extreme upper limit sea level rise of 2.0 m;

- The position paper conservatively recommends increasing the storm surge prediction by 21% to the year 2100, based on a 10% increase in wind speed. Since shelf waves, edge waves and meteo-tsunamis have similar forcing mechanisms to storm surge, i.e. changes in wind or atmospheric pressure, the position paper also recommends increasing the water level changes caused by these processes by 21%; and
- The position paper conservatively recommends increasing the wave height by 17% to the year 2100, based on a 10% increase in wind speed. The authors of the review paper are not aware of data on changes in wave directions for South Africa and recommend sensitivity testing to wave direction on a project-specific basis;
- The highest astronomical tide is used. Prediction of tides is based on the South African tide tables and no change in these has occurred since the publication of this study and therefore remain valid (corrections to sea level change are made elsewhere in the method);
- Storm surge, defined as the influence of meteorological effects such as winds and barometric pressure that result in actual sea level being above or below the predicted astronomical tide level, is estimated using the best statistical estimate of the extrapolation to extreme values from measured tidal residual data for a 100 year return period. This is a calculated value, and the review of this study would expect the same method to be used if the study were to be performed now;
- The prediction of extreme waves and wave transformation modelling utilises a method that is described in a series of site safety studies conducted by PRDW in 2008 and 2009, and no detail is provided in this study;
- Coastal erosion³⁴ was predicted using a model referenced in the publication *"US Army Corps of Engineers. Coastal Engineering Manual. Part 4. Ch.3, April 2002"*, and is based on a well known model of predicting shore response to climate induced sea level change developed in 1962. There is no reason to expect this model to no longer be valid.

Based on the above, it is concluded that there are no changes in legislation, policy, or protocols that would invalidate this study.

³⁴ The report notes that "Beach profile measurements indicate accretion within approximately 1 km of the north breakwater at Koeberg"

5.5.2.2 Changes to Baseline Conditions

It is not possible in the scope of this review to comment on whether the hydrographic and bathymetric conditions on which the flood lines are based have changed, nor whether the rate of erosion as predicted in the study is accurate or not.

A key input parameter into the model, when predicting the 1:100 flood line in 2075, is the rate of sea level rise. The study utilises the 'upper end' prediction of sea level rise from the Fourth Assessment Report of the IPCC, (IPCC, 2007). This predicts a 0.8 m increase in sea levels by the year 2100, which is calculated (in the study) to be 0.6 m by the year 2075.

The IPCC published their fifth assessment report in 2013 (IPCC, 2015), as reported in (Garner, et al., 2018), and increased the projection of 'upper end' sea level rise to 0.9 m by 2100 (see Figure 5-1). More recently the sixth assessment report (IPCC, 2022) has been published by the IPCC and, using the NASA sea level projection tool (https://sealevel.nasa.gov/data_tools/17), a sea level rise of 0.6 m by the year 2090³⁵ is calculated. Therefore, despite the apparent increase in projections as seen in Figure 5-1, the inputs into the model are likely to remain unchanged.

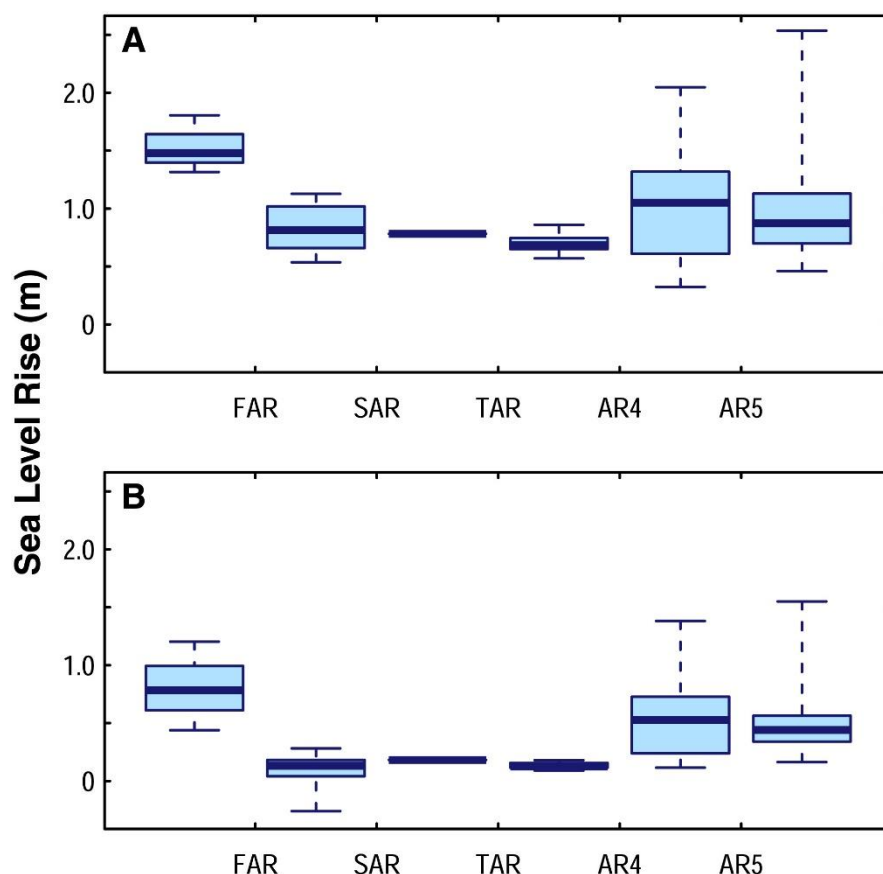


Figure 5-1: Box and whisker plots showing sea level rise ranges over time

Source: (Garner, et al., 2018)³⁶

³⁵ The study uses the mid-point of the lower IPCC (2007) projections of 0.4 m and the upper end of the IPCC (2007) projections of 0.8 m. Using this same method for the projections in IPCC Assessment Report 6, the lower projection is 0.43 m and the upper projection is 0.77 m, giving a midpoint of scenario for continued high emissions, is used to calculate sea level rise.

³⁶ Shown are the varying ranges of (a) upper sea level rise (SLR) projections and (b) lower SLR projections. Box edges extend from the 25th to 75th percentiles; the solid line in each box shows the 50th percentile. Whiskers extend to data extremes, essentially ranging from 0 to 100th percentiles to show the full range of SLR projections in each case. The horizontal axis uses the Intergovernmental Panel on Climate Change assessment reports to divide the literature based on publication date. FAR = first assessment report; SAR = second assessment report; TAR = third assessment report; AR4 = fourth assessment report; AR5 = fifth assessment report.

It is therefore concluded that more recent projections in sea level rise will not materially affect the prediction of the 1:100 year flood line.

5.5.2.3 Time dependency of assumptions and limitation to the study

The prediction of the 1:100 floodline of the sea is influenced by climate change predictions, as published by the IPCC. As new research into climate change becomes available, predictions may change. However, to date the predictions used in study encompass the more recent predictions as discussed in the previous section.

Therefore, although the assumptions underlying this assessment have changed, and will continue to change, these changes will not materially affect the prediction of the 1:100 year flood line.

5.5.3 Definitive Opinion and Recommendations

The study to predict the 1:100 year Flood Line from the Sea is a technical study which is referenced in a number of specialists reports that predict the significance of environmental impacts. This flood line study does not in itself predict any environmental impacts, and as such should not affect the decision on the EIA.

There have been more recent publications of climate change predictions, but as has been demonstrated in this review for the specific case on sea level rise (which is just one of the factors that determines the 1:100 year flood line), the flood line study encompasses the prediction of sea level rise and therefore the review concludes that there will be no material effect on the 1:100 year flood line predictions.

Based on the above it is concluded that:

- There are no changes in legislation, policy, or protocols that would invalidate this study; and
- Based on the discussion on predictions of sea level rise in Section 5.5.2.2, the more recent projections in sea level rise will not materially affect the prediction of the 1:100 year flood line.

Sea level rise is one of the parameters that influences the 1:100 year flood line and is used in this review as an indicator of the factors that could affect the flood line prediction, i.e., suggesting that other factors would similarly not influence the flood line.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study

The specialist reviewer recommends that Nuclear-1 design complies with recommendations in separate SSRs commissioned the National Nuclear Regulator (NNR) licensing process for for a Nuclear Power Station at Duynefontein.

5.6 Specialist Review: Human Health Risk Impact Report

5.6.1 Status of the Original Human Health Risk Impact Report

This review is of the Human Health Risk Impact Report ("HRIR"), prepared by Dr WCA van Niekerk of INFOTOX (Pty) Ltd in October 2010 (INFOTOX, 2010) as part of the EIA conducted by GIBB. The report covered the assessment of three candidate sites along the west and south coasts of South Africa for the establishment of Nuclear Power Stations. This report deals with the Duynefontein site, situated on the Cape West Coast, approximately 30 km north of Cape Town, adjacent to the current KNPS.

This report follows on the Specialist Study (*Human Health Risk Assessment Including Radioactive Effluent*), which was compiled specifically for the Duynefontein site by INFOTOX (INFOTOX, 2008) as part of the EIA and EMPr for the proposed Nuclear-1.

It is compulsory, as part of the licensing requirements of the South African NNR, that an assessment be conducted of potential human health impacts that may occur at off-site locations as a result of radioactive substances (radionuclides) that may be discharged from the proposed nuclear power station.

In accordance with the terms of reference for the assessment of potential impact on human health in the EIA, this study was based on the premise that the NNR will issue a license for a site only if full compliance with regulatory requirements is demonstrated.

The site assessment for Duynefontein followed the approach of developing a technology envelope (TE) that encompasses all relevant and foreseeable discharges, without being limited to a particular reactor design. The approach is based on an upper limit of radiological discharges for the required generation capacity. Any reactor technologies can be selected to achieve the desired power generation capacity at the site, as long as it can be demonstrated that radionuclide discharges will be within the TE, thus complying with NNR dose limits and dose constraints, with due consideration to the principles of ALARA³⁷. Following the principle of a TE thus avoids uncertainties in radiological discharges for different reactor technologies, and the community health risk assessments presented in the HRIR will thus still be valid.

The holistic source-pathway-receptor approach was followed for the assessment of radionuclide discharges into air. Radioactive substances discharged into air may be dispersed from the nuclear power station into the study area and human receptors in the critical group may be exposed to these substances. Mathematical air dispersion modelling was conducted by Airshed Planning Professionals (Pty) Ltd (Airshed, 2010). The transport of contaminants from source, the media transfer, and possible routes of exposure were considered in the quantification of radiological dose.

The following exposure scenarios were considered and evaluated to determine the annual effective doses to the public:

- Inhalation of airborne radionuclides;
- External exposure to contaminated air (cloud immersion);
- External exposure to contaminated soil (ground shine);
- External exposure to contaminated water;
- Ingestion of contaminated water;
- Ingestion of contaminated soil;
- Ingestion of contaminated crops; and
- Ingestion of contaminated animal products and seafood.

These pathways and routes of exposure to radionuclides are comprehensive and were included in the health risk assessment to cover all potential exposures of members of the community. INFOTOX followed standard international practice for the assessment of radionuclide-specific lifetime radiogenic cancer risk (Eckerman KF, 1999); (USEPA, 2002); (USEPA, 1997); (ICRP, 1996)

The aim of radiological exposure assessment is to identify one or more groups of people whose habits, location, age, or other characteristics would cause them to receive a higher dose than the rest of the exposed population. More recently, the notion of basing dose assessments, in particular prospective dose assessments, on the characterisation of an individual rather than a group, was introduced (ICRP, 2006) and (ICRP, 2007). This individual is defined as the 'representative person' and the term is described as

³⁷ As low as reasonably achievable.

the equivalent of the 'average member of the critical group', representing the more highly exposed individuals.

5.6.2 Health Risk Impact Review Evaluation Criteria

5.6.2.1 Overview

This Health Risk Impact Review considers the following aspects/criteria:

- Changes to legislation, policy, protocols, or other instruments pertinent to the HRIR:
 - Is the methodology used in the health risk assessment still appropriate, or is it outdated?
- Changes in the baseline conditions of the HRIR:
 - Is the age of baseline data used for the specialist report of concern, i.e., are the original data used still fit for purpose, or are the data outdated to such an extent that it might invalidate the study, are newer data available, or should new data be gathered?
 - Are there changes to the environment that might affect the evaluation of cumulative impacts?

5.6.2.2 Changes to Legislation, Policy, Protocols, or other Instruments Pertinent to the HRIR

5.6.2.2.1 Regulatory Framework

The regulatory framework within which the radiological dose assessment must demonstrate compliance is constituted by the NNRA, and Regulations, and supported by various NNR documents, as presented in Section 4.1.1 of the INFOTOX report (INFOTOX, 2010). These documents are still applicable in health risk assessment relating to new nuclear power stations and potential community radiological exposure.

5.6.2.2.2 Radiological Health Risk Assessment Methodology

INFOTOX followed standard international practice for the assessment of radionuclide-specific lifetime radiogenic cancer risk (Eckerman KF, 1999); (USEPA, 2002); (USEPA, 1997); (ICRP, 1996). The risk assessment methodologies have not changed.

New revisions of the USEPA Exposure Factors Handbook (USEPA, 1997) have been published since the INFOTOX report in 2020. Exposure factors include parameters such as human body weights for different age groups, water ingestion rates, consumption rates of food commodities, etc. Updates in the Exposure Factors Handbook are generally small, and changes that were introduced would not have significant effects on exposure calculations. This would not be measurable in the generally low radiological exposure values in the INFOTOX (INFOTOX, 2010) assessment.

5.6.2.3 Changes to Baseline Conditions

Potential development of new residential areas since 2010 and in future, should be considered in terms of validity of the health risk assessment conducted in 2010. The selection and characterisation of the exposed population is a fundamental element in the assessment of potential risk to members of the community.

Around the footprint of the proposed nuclear power station several boundaries were defined. The owner-controlled boundary is at 2 km. Access to this area is strictly controlled and no unauthorised persons are allowed within this boundary. To the south of the KNPS there is a residential area known as Duynefontein. It is close to, but outside of the owner-controlled boundary. The closest point of the Duynefontein residential area is situated approximately 2.5 km from the proposed nuclear power station site. This is the closest residential area adjacent to the existing KNPS. The remaining land around the KNPS was proclaimed as the KPNR and Eskom has committed itself to maintaining it as a nature reserve (INFOTOX 2008). As far as can be ascertained, this is still the case (<https://www.westcoastway.co.za/koeberg->

[nature-reserve/](#)). There are no records of residential developments being allowed within KPNR, and the Duynefontein housing estate has not transgressed the 2-km owner-controlled boundary. Thus, the closest receptor area is still Duynefontein and this has not changed since the original Specialist Study (*Human Health Risk Assessment Including Radioactive Effluent*) was compiled specifically for the Duynefontein site by INFOTOX (INFOTOX, 2008) as part of the EIA and EMPr for the proposed Nuclear-1.

The Duynefontein community is closest to the site and can be expected to receive a higher dose of radioactivity from the proposed nuclear power station than communities further away. The Duynefontein residential area remains a valid representation of the critical group, or the representative person in the INFOTOX HRIA (INFOTOX, 2010). Any residential developments since 2010 would likely be further away and subject to lower levels of radiological exposure. In any case, the point of departure for the health risk assessment study area was the 10 km radius around the power station.

It was noted in 2008 that the land within the 5 km buffer zone (around the existing Koeberg site) is largely unpopulated, and this has not changed since. Urban development in the immediate area is limited to Duynefontein, Van Riebeeckstrand and the northern extension of Melkbosstrand, all to the south of Duynefontein. Atlantis is the most significant residential and industrial town to the north-east of the proposed site, with a resident population of approximately 56 000, but Atlantis is situated at least 10 km from the site. The area between the coastline and Atlantis has been included as a core conservation area of the West Coast biosphere reserve, and this has not changed since 2008.

Agricultural activities in the area were mainly located north east and south east of the proposed site, and this was assessed in the INFOTOX (INFOTOX, 2008) report, with particular attention to radiation uptake in the food chain. It was also noted in the 2008 report that the expansion of agricultural activities closer to the proposed site is unlikely, because of the poor quality of soil and erratic rainfall. Thus, the agricultural assessment should not have changed since 2008, and is unlikely to change in the future.

Mathematical dispersion modelling uses emissions information of substances together with meteorological data of the area to estimate ambient air concentrations at various distances from the source. The Airshed modelling report (Airshed, 2010) applied several years' meteorological data for the Duynefontein area, and modelling conducted since 2010 is not expected to lead to significantly different results in radiological exposure estimates.

5.6.3 Definitive Opinion and Recommendations

INFOTOX (INFOTOX, 2010) considered site-specific scenarios for multiple pathways of exposure to radionuclides discharged from the proposed nuclear power station at Duynefontein. The assessment of a candidate site must demonstrate compliance with the NNR dose limits and dose constraints, and must also take into consideration the principles of ALARA. Should a calculated dose be within the acceptable NNR requirements and ALARA, it can be concluded that the cancer risk would be within the *de minimis* lifetime risk range. Protection against the development of radiogenic cancer is adequate for protection against hereditary effects and any other radiation-associated diseases.

The INFOTOX (INFOTOX, 2010) report formed part of the EIA conducted by GIBB. The review presented in this report concludes that the assumptions, scientific methodologies, and health-risk findings for the Duynefontein site have not changed since 2010, and are unlikely to change in the future.

Because of the insignificant impacts of a nuclear power station on public health due to regulatory control through radiological dose limits and dose constraints, as well as through the rigorous application of the ALARA principle, there would be no measurable difference in the frequency of cancer, hereditary effects and other diseases that may be associated with exposure to ionising radiation, whether a nuclear power station is constructed at the Duynefontein site or not.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

5.7 Specialist Review: Emergency Response Report

5.7.1 Status of Original Emergency Response Report

This review is of the Emergency Response Report (“the study”), dated November 2014, prepared by Johan Slabbert of PSI Risk Consultants cc (PSI Risk Consultants, 2014). The document does not contain a version number, but would have been subject to peer review during the submission of the Nuclear-1 EIA.

The objective of a nuclear Emergency Plan is to provide for adequate response during a nuclear accident to ensure the protection of people and the environment. As such, it is an evolving document describing the structure of the organisation, the roles and responsibilities for the people involved, the concept of the operation, and the means and principles to be used during an emergency.

As a first step in creating an Emergency Plan, one has to show the NNR that the particular site conditions are favourable/accommodating for the development of such a plan. The study therefore sets out to qualitatively assess this so-called “feasibility of a nuclear emergency plan” for each of the three proposed sites (i.e. Duynefontein, Thyspunt and Bantamklip).

The following aspects are investigated in the study:

- The concept of feasibility of an emergency plan;
- The technical basis of a nuclear emergency plan and emergency planning zones. It includes a radiological consequence assessment of assumed reference accidents (of GEN III nuclear power plants) to illustrate the concept of emergency planning zones;
- The site related factors that need to be taken into account in demonstrating the feasibility of an emergency plan (i.e. land use, population distribution, transport & communication infrastructure and atmospheric dispersion potential). These factors are also applied to the three sites in order to come to a conclusion on the feasibility of the respective sites;
- The organisational structure needed for an emergency plan; and
- The lessons learned from the Fukushima nuclear accident and how it ties into the emergency plan.

The key findings of the study relating to the Duynefontein site are as follows:

- An emergency plan is feasible for the site;
- Sharing a site with the KNPS will make the creation of an emergency plan easier. For example, emergency planning zones are already in place. Also, the Koeberg emergency plan is also maintained with the latest relevant information (e.g. population data, traffic models). This information can be shared with the new power plant; and
- Despite the previously mentioned, the final and detailed emergency plan still has to be approved by the NNR. This approval will be based on detailed safety assessments to provide final justification for the technical basis of a site’s emergency plan.

5.7.2 Emergency Response Report Review Evaluation Criteria

This review considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments pertinent to the study (Section 5.7.2.1),
- The following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 5.7.2.2),

- i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environment that impact on these (Section 5.7.2.3).
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 5.7.2.4),
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 5.7.2.4),
 - Census data.

Each of these is discussed below.

5.7.2.1 Changes to Legislation, Policy, Protocols or other Instruments pertinent to the Radiological Impact Assessment

There were no relevant changes in current legislation, nor relevant new legislation promulgated since the 2015 publication date of the study. However, in 2016 the NNR issued an Interim Regulatory Guidance document, RG-0011 (NNR, 2016), which provided more detailed information on how to prepare the documents the NNR requires on the topic of siting of a nuclear facility. This document is basically an elaboration on the *Regulations on Licensing of Sites for New Nuclear Installations* (Department of Energy, 2011), which was already considered in the study.

5.7.2.2 Appropriateness of Methodology Used

The study follows the NNR guidelines and legislation to demonstrate the feasibility for the site. In addition, the study provides an overview of the other aspects of an emergency plan, which will be expanded upon as the plan progresses. The methodology used is therefore still applicable and appropriate for the study.

5.7.2.3 Time Dependency of Assumptions and Limitation to the Study

There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time.

5.7.2.4 Changes to Baseline Conditions

Site-specific weather data, collected over a one-year period was used in the study. While the current annual average wind speeds and wind directions may differ from those used in the study, the change will not be significant. The emergency plan zones or air dispersion potential will therefore not be impacted.

Land use around the proposed site has not changed. In contrast, the current total population (and the associated age distribution) would have increased from the 2008 totals (as used in the study). As a consequence, traffic and communication infrastructure would have been impacted. The fact that loadshedding is now an everyday occurrence also impacts on traffic plans and in some instances, also the impairment of communications. These changes however, are not that significant to prevent the feasibility of the site to be put at risk. Evidence of this is that the emergency plan for KNPS is still maintained despite these changes. In any case, as explained earlier, the feasibility stage is but the first of many steps in the development of a functional emergency plan.

The baseline data, as used in the study, is therefore still adequate for use. Also, there are no changes to the environment that might affect the evaluation of cumulative impacts.

5.7.3 Specialist Opinion

The professional opinion of the reviewer is that the following findings of the Emergency Response Report apply:

- The study was done according to NNR accepted methodology and in doing so demonstrates that the Duynfontein site is feasible for an emergency plan. The study also provides additional information to the reader to inform about the content of the eventual emergency plan for the site. The Emergency Response Report therefore meets the requirements for a specialist study;
- The fact that the site will be shared with the KNPS gives it the advantage of access to the latest relevant information to ensure the applicability of their Emergency Plan. Any changes to baseline conditions will therefore not change this outcome; and
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

5.8 Specialist Review: Site Control Assessment

5.8.1 Status of Original Site Control Impact Assessment

This review is of the Site Control Impact Assessment that was prepared by Peter Rosewarne of SRK (SRK, 2014). The report was peer reviewed at the time of submission.

The purpose of the Site Control Impact Assessment (SRK, 2014) was to assess risks or impacts to site security, site access, noting that an owner-controlled boundary exists.

The key aspects assessed in the Site Control Impact Assessment were:

- The potential of allowing regulated public access to site, which has some amenity value (assigned a low-medium significance); and
- The fact that reduced access (or maintaining controlled access) to the site supports preservation of the environment.

Since the KNPS exists on a site as a national key point, strict site control frameworks have been in place for some time and the proposed project will not alter such access restrictions, but may increase them.

5.8.2 Site Control Impact Assessment Review Evaluation Criteria

This Site Control Impact Assessment review considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments pertinent to the Site Control Impact Assessment, also considering the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 5.8.2.1);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 5.8.2.2);

- cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 5.8.2.2);
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 5.8.2.2);
 - Census data; and
- Time dependency of assumptions and limitation to the study, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environment that impact on these (Section 5.8.2.3).

Each of these is discussed below.

5.8.2.1 Changes to Legislation, Policy, Protocols or other instruments pertinent to the Site Control Impact Assessment

No changes in legislation relevant to the Site Control Impact Assessment have been promulgated since the 2014 impact assessment.

5.8.2.1.1 Policy and Planning Documents

No changes in policy or planning documents have been identified.

5.8.2.1.2 Best Practice Methods / Guidelines

As indicated in Section 1.2.2 of the Site Control Impact Assessment (SRK, 2014), the legislative framework is limited to South African legislation. Considering the setting of the site (housing the existing KNPS) it is envisaged that even if local legislation has changed, or new legislation introduced, impact significance ratings pertaining to site access will not change.

5.8.2.2 Changes to Baseline Conditions

Baseline conditions pertaining to site access have not changed on the site.

5.8.2.3 Time dependency of assumptions and limitation to the study

There were no restricting limitations to this specialist study.

5.8.3 Specialist Opinion

The site access control setting of the Duynefontein site, considering that the KNPS is operational on the site, has not altered since the Site Control Impact Assessment (SRK, 2014) and the assessment done previously will not require updating.

Based on the above it is concluded that:

- The site has existing strict access control being a national key point site, and the introduction of the proposed project will not change the access control setting. The Site Control Impact Assessment (CGS, 2011) is considered fit-for-purpose.
- *The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.*

5.9 Specialist Review: Transmission Integration Report

5.9.1 Status of Original Transmission Integration Assessment

This review is of the original Transmission Integration Assessment that was prepared by Eskom in 2008.

The purpose of the Transmission Integration Assessment was to provide context for the required local generation in the Cape and assess the best location for Nuclear-1.

The original study was reviewed in 2015 and the review report issued as part of the revised EIA submission in 2016.

5.9.2 Transmission Integration Assessment Review Evaluation Criteria

This Transmission Integration Assessment review considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments pertinent to the grid integration study, also considering the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - i.e. – is the methodology used in the assessment still appropriate or is it outdated (Section 5.9.2.1);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 5.9.2.2);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 5.9.2.2);
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 5.9.2.2);
 - Census data; and
- Time dependency of assumptions and limitation to the study, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environment that impact on these (Section 5.9.2.3).

Each of these is discussed below.

5.9.2.1 Changes to Legislation, Policy, Protocols or other instruments pertinent to the Transmission Integration Assessment

No changes in legislation relevant to the Transmission Integration Assessment have been promulgated since 2015.

5.9.2.1.1 Policy and Planning Documents

Since the 2015 review report was completed:

- The IRP 2019 was gazetted, describing electricity generation planning for South Africa;
- An EA was granted for the Nuclear-1 at Dufnefontein; and

- A Section 34(1) determination was issued in accordance with the Electricity Regulation Act of 2006 for 2 500 MW new nuclear and NERSA concurred with the decision in August 2021. The 2 500 MW for Nuclear New Build Programme was informed by South Africa's Nuclear Energy Policy of 2008 whereby Principle 3. States that "*Nuclear Energy shall form part of South Africa's strategy to mitigate climate change.*"

The IRP 2019 included:

- Life extension of KNPS from 2024 to 2044 (60 years);
- Post 2030, decommissioning of 24 100 MW of coal fired power plants which supports the need for additional capacity from clean energy technologies including nuclear;
- Commence preparations for a nuclear build programme to the extent of 2 500 MW at a pace and scale that the country can afford because it is a no-regret option in the long term;
- Eskom will build nuclear, and the rest of the capacity will be built by another party; and
- Small nuclear units will be a much more manageable investment compared to a fleet approach.

Updated Transmission Development Plans have also been developed and the latest version (2023-2033) included strengthening of the Western Cape grid for various projects but not yet nuclear. According to the DMRE, the procurement of the 2 500 MW new nuclear in 2024 provides adequate time for construction, commissioning, and connection to the electricity grid of this new capacity.

5.9.2.1.2 Best Practice Methods / Guidelines

The South African Grid Code was updated in 2019 (version 10) which provides for the rules of the operation of the interconnected power system (IPS) which ensures a safe, efficient and reliable system.

5.9.2.2 Changes to Baseline Conditions

Baseline assumptions pertaining to grid integration have changed since the 2015 review assessment. The Renewable Independent Power Producer Programme (REIPPPP) for example, has resulted in large scale wind and some solar being procured in the Western Cape. Major customers such as Saldanha Steel and Mossgas have reduced their operations substantially. This has negatively impacted capacity of the Western Cape Transmission Grid to host additional generation.

5.9.2.3 Time dependency of assumptions and limitation to the study

There were no restricting limitations to this specialist study.

5.9.3 Specialist Opinion

The transmission integration aspects of the Duynefontein site, considering the proposed life extension of KNPS until 2044, may have to be altered from the review report in 2015.

Based on the above it is concluded that:

- New nuclear at Duynefontein can potentially be integrated into the national grid;
- Over and above the planned 765 kV corridor via the Northern Cape, a new High Voltage Direct Current corridor may also be required to evacuate the power to the load centres in Gauteng and KwaZulu Natal (This will be largely dependent on a successful EIA and timeous acquisition of servitudes, resource capacity across the Engineering, Procurement and Construction Management value chain and available capital);
- The potential integration at Duynefontein, in the event of an increase in fault levels in the Western Cape, will have to be addressed as part of the integration study.

The specialist reviewer recommends as follows:

- *Commission a new Grid Integration Study once EA is granted, incorporating the most recent data for Nuclear-1 (such as total capacity, timing, unit sizes, etc); and*
- *The Minister must consider the Section 34(1) determination issued in accordance with the Electricity Regulation Act of 2006 for 2 500 MW new nuclear, with which NERSA concurred in August 2021, when adjudicating the appeal.*

5.10 Specialist Review: Management of Radioactive Waste Impact Assessment

5.10.1 Status of Original Impact Assessment on the Management of Radioactive Waste

This review is of the Impact Assessment of the Management of Radioactive Waste Study ('the study') prepared by AquiSim Consulting (Pty) Ltd (AquiSim Consulting (Pty) Ltd, 2010) to consider the impacts of the management of the radioactive waste that will be generated during the operation and decommissioning of the Nuclear-1 at the Duynefontein site. The signed Declaration of Independence is dated August 2010.

The purpose of the study is to address the radioactive waste management issues identified through the Nuclear-1 EIA process in a manner that will satisfy the requirements of the NNR. As (was) agreed with the Department of Environmental Affairs (DEA³⁸) and the NNR, the nuclear safety and issues relating to radioactivity are better placed within the regulatory process of the NNRA. The intention of this study (AquiSim Consulting (Pty) Ltd, 2010) is to present an assessment of the waste management issues in an objective manner that is consistent with the requirements of the Safety Analysis Report (SAR) process in order to facilitate regulatory approval and assure stakeholders of the adequate safety of the waste management procedures.

Key findings of the study relating to the Duynefontein site are as follows:

- Nuclear-1 generates liquid, gaseous and solid radioactive waste as by-products of operations and decommissioning activities. The solid radioactive waste comprises compactable waste, non-compactable waste, abnormal waste and spent fuel. Waste other than radiological waste that will be generated can be categorised as conventional (domestic) and hazardous waste;
- Radioactive waste management practices envisaged for Nuclear-1 are consistent with the International Atomic Energy Agency (IAEA) guidelines for a Radioactive Waste Management Programme for Nuclear Power Stations, from generation to disposal;
- Nuclear-1 aims to minimise production of all solid, liquid and gaseous radioactive waste, both in terms of volume and activity content, as required for new reactor designs. This is being done through appropriate processing, conditioning, handling and storage systems. In addition, production of radioactive waste is minimised by applying good practice for radiological zoning, providing active drainage and ventilation, appropriate finishes and the use of current best practice for the handling of solid radioactive waste. Where possible, Nuclear-1 reuses or recycles materials;
- Processing of gaseous and liquid waste is aimed at reducing activity levels in the reactor building and in effluent generated by operations. It also ensures that radiation doses to members of the public due to discharges to the environment (i.e., controlled discharges) do not exceed a fraction of the dose limit for the public (dose constraint). For this purpose, Annual Authorised Discharge Quantities are defined for these waste streams. Compliance monitoring will be undertaken at the source and in the

³⁸ DEA is now referred to as the DFFE.

environment. Processing of solid waste is aimed at reducing the volume of waste (e.g., compaction) containing dispersible activity (e.g. immobilisation), or reducing the activity of abnormal waste (e.g. decontamination). The proposed processing and conditioning of solid waste are conducive to safe storage and consistent with the at Vaalputs³⁹ waste acceptance criteria;

- Systems are designed to store processed solid radioactive waste for a period of up to three years within the facility. The storage containers are consistent with the requirements for the disposal of low-level waste and intermediate level solid waste at the radioactive waste disposal facility at Vaalputs. High level solid waste which cannot be disposed at Vaalputs until a suitable facility is constructed, will be stored on site until a suitable facility is available;
- The transfer and associated transport of waste to Vaalputs will be undertaken in conjunction with waste shipments from the KNPS. This will be done according to the appropriate provisions of the IAEA Regulations for the Safe Transport of Radioactive Material;
- The concept for the disposal of solid waste at Vaalputs consists of near-surface trenches using metal containers for low-level waste and concrete containers for intermediate level waste (and – eventually - deep storage of high level solid waste [spent fuel]). The long-term safety of the facility, which complies with international best practice for the disposal of low and intermediate level waste, has been demonstrated for a national inventory⁴⁰ of radioactive waste. The inventory derived for this purpose, included waste of the proposed Nuclear-1. Vaalputs therefore has enough capacity to dispose of the low-level waste and intermediate level solid waste anticipated to be generated by Nuclear-1;
- The Fuel Handling and Storage System proposed for management and storage of Nuclear-1 fuel will have sufficient capacity to safely store all the spent fuel produced throughout the life of the plant and to store the spent fuel for a further 10 years after decommissioning if needed. Only after 70 years will the storage facility on site (or elsewhere, e.g Vaalputs) need to be upgraded to store and manage spent fuel. This should provide sufficient time to define and develop a long-term management strategy for Nuclear-1 spent fuel, e.g. a central geological disposal facility (likely Vaalputs) or an alternative; and
- The potential environmental impacts identified and assessed include all potential types of radioactive wastes expected to be generated by the proposed Nuclear-1. The assessment results indicate that with the implementation of appropriate mitigation measures all potential impacts are low, as further described below.

The study describes the potential impacts during the Commissioning, Operational and Decommissioning Phases of Nuclear-1 as:

- Contamination of water resources due to the release of radioactive emissions in liquid waste, assigned *low* significance after mitigation;
- Contamination of the atmosphere due to the release of radioactive emissions in gaseous waste, assigned *low* significance after mitigation;
- Contamination of water resources due to the release of radioactive emissions in LILW or High Level Waste (HLW) stored at the Nuclear Power Station, assigned *low* significance after mitigation;

³⁹ According to the National Radioactive Waste Management Policy and Strategy (DME, 2005), the Vaalputs site, located in the Northern Cape Province of South Africa is and will continue to be used as the National Disposal Site for low and intermediate level waste (LILW). The bulk of the LILW currently disposed of at Vaalputs, originates from the KNPS (AquiSim Consulting (Pty) Ltd, 2010).

⁴⁰ To ensure sufficient storage capacity, the available capacity should be carefully controlled by maintaining an inventory of the radioactive waste stored and, where necessary, its location (AquiSim Consulting (Pty) Ltd, 2010).

- Contamination of water resources by radioactive emissions due to disposal of LILW at Vaalputs, assigned *low* significance after mitigation; and
- Contamination of water resources by radioactive emissions due to accidental spillage of radioactive waste during transport, assigned *low* significance after mitigation.

5.10.2 Management of Nuclear Waste Impact Assessment Review Evaluation Criteria

This review considers the following aspects/criteria:

- New legislation, policy, protocols or other instruments pertinent to the management of nuclear waste impact assessment study, notably:
- Also considered are the following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 5.10.2.2);
- Changes to baseline conditions, also considering the following elements of Appendix 6 of the NEMA 2014 EIA Regulations:
 - cA – the age of base data used for the specialist report, i.e. is the original data used still fit for purpose, is it outdated to such an extent that it might invalidate a study, is newer data available, or should new data be gathered (Section 5.10.2.3);
 - cB – are there changes to the environment that might affect the evaluation of cumulative impacts (Section 5.10.2.3); and
 - g – are any buffers proposed still appropriate given legislative/policy changes and changes to the baseline (Section 5.10.2.1).

Each of these is discussed below.

5.10.2.1 Changes to Legislation, Policy, Protocols or other Instruments Pertinent to the Radioactive Waste Impact Assessment

One of the significant changes to the NEMA 2014 EIA Regulations, as amended, since the completion of the Nuclear-1 EIA is the requirement to comply the “Site Sensitivity Verification Requirements where a Specialist Assessment is required, but no Specific Assessment Protocol has been prescribed” (GN R320 of 2020). This Protocol refers to the required level of assessment that must be based on the findings of the site sensitivity verification and must comply with Appendix 6 of the NEMA 2014 EIA Regulations.

The reviewer notes that the NNR regulates all nuclear activities and the management of radioactive waste in terms of the NNRA, and the 2006 regulations regarding safety standards and regulatory practices (GN R388 of 2006). The main purpose of these regulations is to protect persons, property and the environment against nuclear damage. The reviewer notes that GN R388 of 2006 has not been amended in the period following the study.

The reviewer notes that the study refers to the need for detailed regulations on specific issues relevant to long-term management for spent fuel and geological disposal of HLW, with no further developments in this regard available at the time of the review.

5.10.2.2 Appropriateness of methodology used

The study has found that the radioactive waste management practices envisaged for Nuclear-1 are consistent with the IAEA guidelines for a Radioactive Waste Management Programme for Nuclear Power Stations, from generation to disposal. The methodology includes a comprehensive review of the regulatory

framework for the management of radioactive waste⁴¹, and a Radioactive Waste Management Programme, which is a requirement for an application for a nuclear installation licence. The study includes the required mitigation measures and monitoring requirements.

The study does not, however, provide a map (listed as a requirement of the Protocol, specifically Appendix 6 of the NEMA 2014 EIA Regulations) superimposing the waste management structures and infrastructure on the environmental sensitivities of the site with buffers. The reviewer notes that a map for the waste management facilities would not add value as the waste infrastructure is located within the the proposed Nuclear-1 footprint. The study however, does include the provisional trench layout for the disposal of LILW at Vaalputs, located within the approved Vaalputs site boundary.

The methodology followed for the study (AquiSim Consulting (Pty) Ltd, 2010) is appropriate as it addresses the radioactive waste management issues identified through the Nuclear-1 EIA process in a manner that satisfied and still satisfies the requirements of the NNR. The approach of the study is considered to align with the “Site Sensitivity Verification Requirements where a Specialist Assessment is required but no Specific Assessment Protocol has been prescribed” (GN R320 of 2020).

5.10.2.3 Changes to Baseline Conditions

The reviewer notes that changes to the baseline could have occurred since the study was prepared, related to volume of waste produced and stored at the existing KNPS, or since disposed of at the Vaalputs site.

The waste in storage at the existing KNPS is not relevant to the design requirements for waste storage of the proposed Nuclear-1 as it is a separate facility. The Vaalputs facility complies with international best practice for the disposal of low and intermediate level waste and the national inventory of radioactive waste, which included waste of Nuclear-1. Vaalputs therefore has enough capacity to dispose of LILW projected to be generated by Nuclear-1.

The study reported that the transfer and associated transport of the waste to Vaalputs will be undertaken in conjunction with waste shipments from the existing KNPS, therefore the cumulative impact of transporting the additional waste from Nuclear-1 has been assessed.

5.10.3 Specialist Opinion

The professional opinion of the reviewer is that the following findings of the nuclear waste management study review apply:

- The Impact Assessment of the Management of Radioactive Waste Study meets the requirements for a specialist assessment. It is clear from the discussions presented in the study that all forms of radioactive wastes are (will be) strictly controlled and that numerous specialised systems and management practices are (will be) in place to prevent uncontrolled contact with these substances;
- The study has addressed the radioactive waste management issues identified through the Nuclear-1 EIA process in a manner that satisfied and still satisfies the requirements of the NNR. It has presented an assessment of the waste management issues in an objective manner that is consistent with the requirements of the SSR;
- The study aligns with the objectives of the protocol (GN R320 of 2020) adequately addressing environmental impacts;

⁴¹ It emphasises that the NNR regulates all nuclear activities and the management of radioactive waste in terms of the NNRA, and the 2006 regulations regarding safety standards and regulatory practices (GN R388 of 2006).

- The study refers to the need for detailed regulations on specific issues relevant to long-term management for spent fuel and geological disposal of HLW, which remains valid at the time of the review;
- It is highly unlikely that any changes to the baseline environment would result in significant changes to the impact assessment findings or mitigation recommendations, and the impact ratings provided in the study remain valid; and
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

5.11 Specialist Review: Beyond Design Basis Accidents Report

5.11.1 Status of Original Beyond Design Basis Accidents Report

This review is of the Beyond Design Basis Accident Report ("the study"), dated September 2015, prepared by Johan Slabbert of PSI Risk Consultants cc (PSI Risk Consultants, 2015). The document does not contain a version number, but would have been subject to peer review during the submission of the Nuclear-1 EIA.

A nuclear power plant is designed and later operated according to strict safety protocols. This includes measures to prevent or minimise the consequences of accidents involving the radioactive material (e.g. fuel, reactor core) used in the power plant. However, history has taught us that beyond design basis accidents can occur. These kinds of accidents happen due to a nuclear power plant being subject to circumstances for which the plant was not designed to withstand. For example, the Fukushima-Daiichi nuclear power plant was built to withstand an earthquake with a maximum magnitude of 7.5, but in 2011 the plant was struck by an earthquake of magnitude 9. A beyond design basis accident can lead to a significant release of radioactive material to the public and the environment, and must therefore be prevented. Unfortunately, this kind of accidents are difficult to foresee as they either have never occurred before or the likelihood for the circumstances to occur is very low.

The study focuses on the prevention of nuclear accidents. It attempts to link nuclear power plant safety concepts and beyond design basis accidents. In doing so, the study illustrates that every possible effort is made in the latest GEN III nuclear power plant designs to prevent these accidents. As a result, the risk to the public and the environment due to beyond design basis accidents is practically eliminated.

The study is not an assessment, but rather a document that provides information on the following aspects to show that safety is of paramount importance in nuclear power plant design and operation:

- The important safety principles upon which a nuclear power plant design and operation are based and how these principles relate to beyond design basis accidents;
- The defence in depth concept, its application and the associated safety assessment methodologies. The latter are used to test the validity of the of the mentioned safety principles;
- Discussion on how the three major civil nuclear power plant accidents (i.e. Three Mile Island, Chernobyl and Fukushima-Daiichi) exposed weaknesses in the application of the previously mentioned nuclear safety principles, and the lessons learned from these accidents;
- The IAEA and its role in the even of an accident;
- The South African nuclear regulatory framework that the new nuclear power plant will be subject to; and

- Finally, an example of how other countries addresses the aforementioned principles to ensure that new nuclear power plants exhibit the highest level of safety.

The key findings of the study relating to the Duynefontein site are as follows:

- The GEN III Nuclear-1 designs are based on the latest technological advances and incorporated the lessons that were learned from the three major beyond design basis accidents. This includes the explicit consideration of severe accidents, including a reactor core melt. Previously these events were classified as beyond design basis accidents;
- As such, the GEN III Nuclear-1 proposed at Duynefontein will have a low risk of releasing radioactivity to the public and the environment during a severe accident; and
- Despite all these assurances, a detailed safety analysis report has to be submitted to the NNR for scrutiny before authorisations are granted for the construction and operation of a new Nuclear Power Station. This report has to prove that values for the major risk factors (that of the core damage frequency and the large radioactivity release frequency) do not exceed the risk values set by the NNR. This is accomplished by analysing the potential external and internal events that can initiate the kind of accidents which are possible for the specific chosen Nuclear Power Station design and the chosen site.

5.11.2 Beyond Design Basis Accidents Report Review Evaluation Criteria

This review considers the following aspects/criteria:

- Changes to legislation, policy, protocols or other instruments pertinent to the study the study (Section 5.11.2.1),
- The following elements (and numbering format) of Appendix 6 of the NEMA 2014 EIA Regulations:
 - e – is the methodology used in the assessment still appropriate or is it outdated (Section 5.11.2.2),
 - i – are any of the assumptions or uncertainties recorded in the original report time sensitive, and if so, are there changes in the physical, social or legislative environment that impact on these (Section 5.11.2.4).

Each of these is discussed below.

5.11.2.1 Changes to Legislation, Policy, Protocols or other Instruments pertinent to the Beyond Design Basis Accidents Report

There were no relevant changes in current legislation, nor relevant new legislation promulgated since the 2015 publication date of the study. The NNR issued an Interim Regulatory Guidance document, RG-0011 (NNR, 2016) in 2016, which provided more detailed information on how to prepare the documents the NNR requires on the topic of siting of a nuclear facility. This document is basically an elaboration on the *Regulations on Licensing of Sites for New Nuclear Installations* (Department of Energy, 2011). While the document discusses the approach to accidents, beyond design basis accidents are not directly mentioned.

The IAEA regularly publishes guidance documents on various radiation protection topics, amongst others nuclear power plant safety. While they may have published new information on beyond design basis accidents, the technicalities of the content will be more helpful towards the detailed safety analysis report (SSR) than this EIA report. It is therefore not included in this review as it will not change the outcome of this report.

5.11.2.2 Appropriateness of Methodology Used

The study uses well documented IAEA and other relevant documentation to describe beyond design basis accidents and the nuclear safety protocols utilised in GEN II Nuclear Power Station designs to prevent these accidents. The scope of the report does not ask for complex calculations as the reader just has to be informed and, as a result, given assurances, that Nuclear-1 operations can be done safely while meeting the NNR risk criteria. The approach taken by the report is appropriate and still applicable for the intended audience.

5.11.2.3 Time Dependency of Assumptions and Limitation to the Study

There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time.

5.11.2.4 Changes to Baseline Conditions

The baseline conditions at the site are not relevant to this study as the content is not site specific.

5.11.3 Specialist Opinion

The professional opinion of the reviewer is that the following findings of the Beyond Design Basis Accidents Report apply:

- The study was done to inform the reader of the nuclear safety protocols in place during design and operation of a Nuclear Power Station and by adhering to them, the prevention of beyond design basis accidents. The study is well balanced between describing complex concepts and providing relevant explanations and examples. The study also makes it clear that its discussions and findings will eventually be followed up with a more detailed report wherein all the given assurances will be substantiated with analyses and calculations, tailored specific for the chosen site and the chosen nuclear power plant design. The study therefore meets the requirements for a specialist study.
- The content of the report is not site specific. Any changes to baseline conditions will therefore not change this outcome.
- There are no assumptions or limitations that are no longer valid, or which invalidate the findings of the study due to the passage of time.

The report is therefore considered to be suitable for decision making in its current form and the specialist reviewer does not recommend any updates to the study.

6 Review Report and CCIAR Stakeholder Engagement

The directive issued by Minister Creecy dated 8 August 2022 required that the EIA Review Report and CCIAR Report (CCIAR) are released to all registered IAPs, including appellants, the competent authority (DFFE) and all relevant organs of state (at a national and lower levels) for a period of at least 30 days as prescribed by the EIA Regulations, 2014, as amended. The release of the CCIAR and EIA Review Reports and public participation process has been undertaken in accordance with Chapter 6 of the EIA Regulations, 2014 as amended and the POPIA. The purpose, objectives of and approach to stakeholder engagement are outlined in this section.

6.1 Purpose of Stakeholder Engagement in 2023

As noted in Section 3.5.1 of this report, the public participation process undertaken by GIBB for the Nuclear-1 EIA was comprehensive and far exceeded the requirements of 2006 EIA Regulations as well as current requirements.

The purpose of the stakeholder engagement coordinated by SRK (in 2023) is not to reopen comment on the issues previously identified in- and/or the merits of- the EIA undertaken by GIBB, since SRK not appointed to respond to such comments. Rather the purpose of the current round of stakeholder engagement is to solicit comment only on the **reviews** in the EIA Review Report compiled by SRK and the CCIAR compiled by Promethium.

6.2 Objectives and Approach to Stakeholder Engagement

The overall aim of stakeholder engagement was to ensure that all registered IAPs had adequate opportunity to provide input into the process and raise their comments and concerns. More specifically, the objectives of this stakeholder engagement were to:

- Identify and register any new stakeholders that may not have participated in the public participation process undertaken during the EIA;
- Notify all registered⁴² stakeholders of release of the Review Report and CCIAR;
- Provide stakeholders with the opportunity to participate effectively in the process and identify **relevant** (new) issues and concerns; and
- Provide stakeholders with the opportunity to comment on the Review Report and CCIAR.

Note: As of 1 July 2021, sections of the POPIA, which aims to promote protection of personal information, came into effect. The EIA Regulations, 2014 require, *inter alia*, transparent disclosure of registered stakeholders and their comments. In terms of the EIA Regulations, 2014, stakeholders who submit comments, attend a meeting or request registration in writing are deemed registered stakeholders who must be added to the project's Registered Stakeholder Database with their contact details. Therefore, registered stakeholders are deemed to give their consent for relevant information (including name and contact details) to be processed and disclosed, in fulfilment of the requirements of the EIA Regulations, 2014 and the National Appeal Regulations, 2014.

6.3 Current Stakeholder Engagement Process

The key stakeholder engagement activities undertaken during the public participation process for the Review Report and CCIAR are summarised in Table 6-1.

⁴² Through the EIA process undertaken by GIBB

Table 6-1: Stakeholder engagement activities for the current process

Task	Objectives	Dates
Place site notification posters around the Duynfontein site.	To notify all registered IAPs of the commencement of the current public participation process	20 July 2023
Advertise the release of the Review Report and CCIAR for public comment.		29 June 2023 – 21 July 2023
Notify IAPs of release of the Review Report and CCIAR for public comment via post, email and SMS.		20 July 2023
Submit Draft Review Report and CCIAR to DFFE		20 July 2023
Public comment period	To provide stakeholders with the opportunity to review and comment on the Review Report and CCIAR.	24 July 2023 -23 August 2023, <u>extended to 22 September 2023</u>
Public Open Day	To present the findings of the Review Report and CCIAR to stakeholders and provide an opportunity for questions and discussion.	7 August 2023
Virtual <u>Stakeholder</u> Meeting		15 August 2023
Compile Issues and Responses Summary and finalise the Review Report and CCIAR	To record and respond to all relevant issues and concerns raised and collate these comments in the final Review Report, and incorporate relevant comments into the CCIAR.	<u>23 September – 10 October 2023</u>
Submit Final Review Report, CCIAR and Issues and Response Summary to DFFE	To provide authorities with information for decision-making on this project.	<u>13 October 2023</u>

The key activities undertaken during the current public participation process are described further below.

6.3.1 Newspaper Advertisements and Posters

Newspaper advertisements in English, Afrikaans and isiXhosa announcing the availability of the Review Report and CCIAR for public comment and inviting IAPs to register on the project database were placed in 15 newspapers listed in Table 6-2.

Table 6-2: Newspapers advertisements during the current public participation process

Newspapers	Distribution	Language	Publication Date
Sunday Times	National	English	23 July 2023
I'solezwe lesiXho	Provincial	isiXhosa	29 June 2023
Cape Times	Provincial	English	21 July 2023
Die Burger	Provincial	Afrikaans	21 July 2023
Iliso LaBantu News	Provincial	isiXhosa	11 July 2023
Weskusnuus	Local	Afrikaans	11 July 2023
Swartland Gazette	Local	Afrikaans	18 July 2023
Table Talk	Local	English	19 July 2023
Tygerberger Milnerton	Local	Afrikaans	19 July 2023
Tygerberger Tableview	Local	Afrikaans	19 July 2023
City Vision	Local	English, isiXhosa	20 July 2023
Eikestad Nuus	Local	Afrikaans	20 July 2023
Paarl Post	Local	Afrikaans	20 July 2023

Newspapers	Distribution	Language	Publication Date
Southern Suburbs Tatler	Local	English	20 July 2023
Die Namakwalander	Local	Afrikaans	21 July 2023

In addition to the advertisements, a set of site notification posters (in English, Afrikaans and isiXhosa) were placed on the Duynefontein site boundary and at the KNPS entrance along Otto du Plessis Drive. These notification posters contained brief details of SRK's Review process as well as providing contact details for inquiries and comments. In addition, a set of A4 sized posters were also placed at the Koeberg Visitor Centre and the Public Libraries. Copies of the newspaper advertisements, site notification posters as well as a figure indicating the location of the site notification posters are included in Appendix D.

6.3.2 Identification of Key Stakeholders

The stakeholder database opened and maintained by GIBB during the public participation process between 2006 and 2016 and the list of appellants⁴³ were provided to SRK by Eskom. The stakeholder database has since been supplemented with data provided to SRK by Eskom (e.g. updated contact details of councillors, authorities and relevant organs of state etc.).

The stakeholder database included stakeholders from local, provincial and national authorities, conservation bodies, Non-Governmental Organisations (NGO), surrounding IPPs, local businesses and forums and surrounding landowners and occupants. Stakeholders were notified (see Section 6.3.3) of the opportunity to register on the Registered Stakeholder Database and / or to provide comment on the Review Report and CCIAR.

As specified in the EIA Regulations, 2014, the Registered Stakeholder Database will be updated throughout the current process and thereafter and submitted to the DFFE. The Registered Stakeholder Database updated following the public comment period is attached as Appendix C.

To comply with POPIA, the Registered Stakeholder Database is not provided in or attached to reports made available in the public domain.

6.3.3 Notification of the availability of the Review Report and CCIAR for Public Comment

The release of the Review Report and CCIAR for public review was communicated to all registered stakeholders between 29 June 2023 and 23 July 2023, in the following manner:

- An SMS (Short Message Service) inviting all registered IAPs to access and comment on the Review Report and CCIAR, posted on 20 July 2023;
- A total of 16 advertisements were placed in 15 newspapers and 3 respective languages (see Table 6-2) from 29 June to 23 July 2023;
- A set of site notices was placed on the site boundary and at the KNPS entrance on 20 July 2023;
- Eskom's Nuclear Operating Unit Stakeholder Management Department emailed the notice to the secretariat of and requested distribution of the notice to members of the following forums:
 - Public Safety Information Forum (PSIF) – Koeberg;
 - Public Safety Information Forum (PSIF) – Vaalputs;
 - Rate Payers Associations of Melkbosstrand;

⁴³ A series of appellant submissions received from Eskom were without contact details and / or home addresses. These appellants could therefore not be notified of the current public participation process.

- Rate Payers Associations of Table View;
- Police Forums of Atlantis;
- Police Forums of Table View;
- Police Forums of Melkbosstrand;
- Emergency Planning, Steering & Oversight Committee; and
- Milnerton City Councillor's Forum.

Hard copies of the Review Report and CCIAR were placed at the following venues:

- Atlantis Public Library;
- Cape Town Central Library;
- Koeberg Public Library;
- Tableview Public Library;
- Koeberg Visitor Centre; and
- SRK's office in Rondebosch, Cape Town.

An electronic version of the report could also be accessed on SRK's website www.srk.co.za (via the 'Knowledge Centre' and 'Public Documents' links) as well as Eskom's website (www.eskom.co.za).

Registered stakeholders were notified of the release of the Review Report and CCIA for public review. Notification letters were sent by email, or alternatively post to all registered IAPs between 11 -20 July 2023. A 30-day comment period commenced on 24 July 2023 and registered IAPs were requested to submit comments to SRK by 23 August 2023, subsequently extended to 22 September 2023.

Proof of stakeholder notifications are provided in Appendix D. Comments received in response to the Review Report and CCIAR are provided in Appendix I and have been included in the Issues and Responses Summary, attached as Appendix J.

6.3.4 Public Open Day

A Public Open Day⁴⁴ was held on 7 August 2023 from 14:00 - 18:00 at the Koeberg Visitor Centre, to provide stakeholders with the opportunity to discuss any the findings of the Review Report and the CCIAR with representatives of SRK and the Project Team.

Copies of the Public Open Day posters and attendance register are provided in Appendix E and Appendix F of the Final Review Report.

6.3.5 Online Stakeholder Meeting

SRK hosted an Online Stakeholder Meeting on MS Teams on 15 August 2023 from 16h00 – 17h30. During the meeting SRK presented the key findings of the Review Report and Promethium presented the key findings of the CCIA and together with the technical team, responded to stakeholder comments. The stakeholder meeting presentation, minutes and attendance register are provided in Appendix G and Appendix H. Comments made during the meeting and responses have also been recorded in the Issues and Responses Summary (Appendix J).

⁴⁴ No formal presentation will be provided.

6.3.6 Issues and Concerns Raised by Registered Stakeholders during current process

Comments received were incorporated into the Issues and Responses Summary (Appendix J). Stakeholders who submitted written comments during the current process or raised comments during the online stakeholder meeting are listed in Table 6-3. All written comments received during the current process are included in Appendix I.

Table 6-3: Stakeholders who submitted comments

#	Stakeholder	Affiliation	Comment Received
1.	<u>George Bennett</u>	<u>GNB Communications</u>	<u>24 July 2023</u>
2.	<u>Ina Mbiza</u>	<u>Pinault Group Pty Ltd</u>	<u>25 July 2023</u>
3.	<u>Annelise de Bruin</u>	<u>City of Cape Town (CoCT): Spatial Planning and Environment</u>	<u>26 July 2023</u>
4.	<u>Lurwin Jeneke</u>	<u>CoCT: Policy and Strategy, Future Planning and Resilience</u>	<u>18 August 2023</u>
5.	<u>Justine Hansen</u>	<u>Marcorp IT Professionals</u>	<u>21 August 2023;</u> <u>11 September 2023;</u> <u>22 September 2023</u>
6.	<u>Adrian Pole</u>	<u>Adrian Pole Attorneys on behalf of Southern African Faith Communities' Environment Institute (SAFCEI), Earthlife Africa – Johannesburg (ELA-JB) and Greenpeace Africa</u>	<u>23 August 2023; 22 September 2023</u>
7.	<u>Adri La Meyer</u>	<u>Department of Environmental Affairs and Development Planning (DEA&DP)</u>	<u>23 August 2023</u>
8.	<u>Sarietha Engelbrecht</u>	<u>CoCT: Office of the Executive Mayor</u>	<u>8 September 2023</u>
<u>Comments raised during the Online Stakeholder Engagement Meeting</u>			
9.	<u>Francesca de Gasparis</u>	<u>SAFCEI</u>	<u>15 August 2023</u>
10.	<u>Annelise De Bruin</u>	<u>CoCT</u>	<u>15 August 2023</u>
11.	<u>Adrian Pole</u>	<u>Adrian Pole Attorneys on behalf of SAFCEI, Earthlife Africa – Johannesburg (ELA-JB) and Greenpeace Africa</u>	<u>15 August 2023</u>
12.	<u>George Bennet</u>	<u>GNB Communications</u>	<u>15 August 2023</u>

Key comments and concerns raised by stakeholders can be summarised as follows:

- Outdated and inadequate baseline studies (despite most specialist reviewers finding that there are no material deficiencies and the studies remain fit for purpose). This concern related to many specialist studies;
- Contested purpose of the EIA Review with an expectation that EIA specialist reports would be supplemented, as opposed to reviewed to determine, inter alia, whether they should be supplemented;
- SRK's (and specialist reviewers') independence (or lack thereof);
- Interpretation of transitional provision in section 53(4) of the NEMA 2014 EIA Regulations;
- The need and desirability of nuclear power, noting the increased contribution of renewables to the energy mix; and

- Outdated climate change projections in the CCIAR.

6.4 Next steps

Following the close of the comment period, the Issues and Responses Summary was compiled for inclusion with the Final Review Report. The Review Report and CCIAR will be submitted to the DFFE on 13 October 2023. Registered stakeholders⁴⁵ will be informed of the submission of the Final Review Report and CCIAR including the Issues and Responses Summary, which will be made available on SRK's and Eskom's websites for information.

⁴⁵ For which SRK has email addresses or cell phone numbers

7 Conclusions and Recommendations

7.1 Conclusions

The conclusions and key findings of the review of the *FEIR and EMP* can be summarised as follows:

- The project description as presented in the FEIR is therefore considered still valid.
- While the information presented in the EIA relating to the IRP, current and proposed additional generation capacity may be out of date, this will not affect either the motivation that additional power generation capacity is urgently required in South Africa (more so than at the time the EIA was completed).
- It is not within the remit of this review to decide which forms of energy generation are most appropriate; that decision (and the Minister's final decisions regarding the Nuclear-1 Project) is political in nature.
- The EIA process undertaken was adequate to meet current requirements in terms of the EIA Regulations, 2014;
- The original public participation process provided DFFE with a comprehensive understanding of stakeholder interest and comments (relating specifically to the Duynefontein site) to inform decision making;
- The assumptions and limitations in the EIA remain valid, and no re-assessment of impacts is required due to changes in assumptions;
- The validity of the baseline data was evaluated in the reviews of the specialist studies which found that no material changes to the baseline have occurred which would invalidate the FEIR;
- A robust impact assessment methodology was employed and relevant impacts were assessed. The validity of the impacts assessed by specialists was evaluated in the reviews of the specialist studies, which found that no material omissions in the impact assessments which would invalidate the FEIR;
- There has been a substantial increase in the development of renewable energy projects, in recent years (since the EIA was concluded). The statement in the FEIR that that renewable energy (wind and solar power) could not provide adequate base load or integrate easily into the existing power network may no longer be correct; however the energy mix is informed by the IRPs;
- The conclusions and recommendations in the FEIR remain valid and the FEIR is fit-for-purpose to inform a decision; and
- The EMP is regarded as a dynamic document and will be routinely updated by Eskom as new information becomes available, e.g. once detailed design is finalised. This is standard practice. In this regard, the legislation annexure of the EMP will also need to be updated to reflect recent policies, plans, regulations, treaties and other legal instruments.

The conclusions and key findings of the *specialist study reviews* can be summarised as follows:

- All specialist reviews concluded that specialist reports are considered to be suitable for decision making in their current form. The majority of specialist reviewers did not recommend any updates to the studies, however:
 - Since the initial specialist review was undertaken, the National Biodiversity Offset Guideline (Department of Forestry, Fisheries and Environment, 2023) has been gazetted. The specialist reviewer recommends that the Minister must reconsider the merits of an offset as a condition of authorisation in adjudicating the appeal, to take account of the National Biodiversity Offset Guideline;

- The EclA found that nuclear is the cheaper and more appropriate (energy generation) option, a conclusion which may no longer be valid. The specialist reviewer recommends that the Minister must consider the IRP (DoE, 2019), which supersedes the IRP 2010, when adjudicating the appeal;
- The specialist reviewer of the 1:100 year flood line recommends that Nuclear-1 design complies with recommendations in separate SSRs commissioned for the NNR licensing process for a Nuclear Power Station at Duynefontein;
- The Grid Integration Report specialist review, which recommended a new Grid Integration Study.

The findings of the CCIA are presented in the separate CCIAR.

7.2 Recommendations

7.2.1 Eskom

The principal recommendations of the **reviews** of specialist studies, the FEIR and EMPr are that Eskom must:

- Acquire relevant (environmental) permits and licences, in terms of the legislation applicable at the time, once the appeal process has been finalised;
- Ensure that the Nuclear Power Plant design complies with recommendations in separate SSR commissioned for a Nuclear Power Station at Duynefontein;
- Commission a new Grid Integration Study once the appeal process has been finalised, incorporating the most recent data for Nuclear-1; and
- Update the EMP as new information becomes available, e.g. once a vendor is appointed and detailed design is finalised.

7.2.2 Appeal Decision

The principal recommendations in terms of adjudicating the appeal are that the FEIR remains valid and is fit-for-purpose to inform a decision, subject to:

- Eskom implementing the recommendations listed above (Section 7.2.1) once the appeal process has been finalised;
- The Minister reconsidering the merits of an offset as a condition of authorisation in adjudicating the appeal, to take account of the National Biodiversity Offset Guideline;
- The Minister considering SSRs when adjudicating the appeal;
- The Minister considering the Section 34(1) determination issued in accordance with the Electricity Regulation Act of 2006 for 2 500 MW new nuclear, when adjudicating the appeal; and
- The Minister considering the IRP 2019 (DoE, 2019), which supersedes the IRP 2010, and which considers a mix of energy sources; when adjudicating the appeal.

7.3 Way Forward

The Review Report including the Issues and Response Summary (and CCIAR) was submitted to the Minister for decision-making. Stakeholders will be informed via email and sms (where contact details are available) that the final reports have been and are available on SRK's website.

Prepared by

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

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Appendices

Appendix A: Curriculum Vitae of the EAPs

Appendix B:

Curriculum Vitae of the Specialist and Technical Reviewers

Appendix C:
Registered Stakeholder Database

Appendix D:
Proof of Stakeholder Notification

Appendix E:
Open Day Posters

Appendix F:
Open Day Attendance Register

Appendix G:
Online Stakeholder Meeting Presentation

Appendix H:
Online Stakeholder Meeting Attendance and
Minutes

Appendix I:
Comments Received

Appendix J:
Issues and Responses Summary