Proposed Coega Gas-to-Power Plant - Gas Infrastructure

Draft Environmental Impact Assessment Report

Report Prepared for

Coega Development Corporation

SRK Report Number 553652/ Infrastructure /3

DEFF Reference Number: 14/12/16/3/3/2/2013

Report Prepared by

srk consulting

March 2021

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SRK Consulting (South Africa) Pty Ltd
Ground Floor Bay Suites
1a Humewood Rd.
Humerail
Port Elizabeth 6001
South Africa
e-mail: portelizabeth@srk.co.za
website: www.srk.co.za

Tel: +27 (0) 41 509 4800
Fax:+27 (0) 41 509 4850

SRK Project Number 553652

March 2021

Compiled by:

Nicola Rump
Principal Environmental Consultant

Abby van Nierop
Environmental Consultant

Email: nrump@srk.co.za

Peer Reviewed by:

Chris Dalgliesh
Director,
Principal Environmental Consultant

Authors:

N Rump & A van Nierop

Profile and Expertise of EAPs

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

SRK Consulting was established in 1974 and comprises over 1 400 professional staff worldwide, offering wide-ranging expertise in the natural resources and environmental sectors. SRK's Port Elizabeth environmental department has a proven track record of managing large, complex environmental and engineering projects in the Eastern 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 are detailed below and Curriculum Vitae provided in Appendix A.

Project Reviewer: Christopher Dalgliesh, BBusSc (Hons); MPhil (EnvSci)
Registered EAP No. 2019/413
Chris Dalgliesh is a Director and head of SRK's Environmental Department in Cape Town. He has more than 33 years environmental consulting experience covering a broad range of projects, including EIA and ESIA (EMPR), environmental and social due diligence, socio-economic impact assessments, stakeholder engagement, strategic environment assessments and management plans, state of environment reporting, environmental management frameworks, site safety reports for the nuclear industry, natural resource management and waste management

Project Manager: Nicola Rump, MSc, EAPSA
Nicola Rump is a Principal Environmental Scientist in SRK's Port Elizabeth office and has been involved in environmental management for the past 12 years working on South African and international projects including EIAs and ISO 14001 auditing for a variety of activities. Her experience includes Basic Assessments, Environmental Impact Assessments, Environmental Management Plans, Environmental Auditing and Stakeholder Engagement. Nicola is the Environmental Assessment Practitioner for this Environmental Impact Assessment process.

Project Consultant: Abby van Nierop, BSc Hons
Abby van Nierop is an Environmental Scientist in the Port Elizabeth office. Abby has been involved in environmental management for the past 7 years. Her expertise includes assistance with Environmental Impact Assessments (EIAs), Basic Assessments, Environmental Management Programmes (EMPrs), Water Use Applications (WUAs), environmental compliance auditing compliance auditing and as a Public Participation Co-ordinator.

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 CDC. 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.

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.
- In addition to the previous point, and with reference to SRK's standard disclaimer, the results of specialist studies have been summarised in the report without any attempt to manipulate the findings of the specialists. All recommendations from specialists are captured in the report, and where this has involved changing the wording of the recommendation, such changes are intended to make the recommendations clearer and enforceable, and without any intent to alter the understood intent of those recommendations.
- To the best of our knowledge all comments and inputs from stakeholders and interested and affected parties have been captured in the report and no attempt has been made to manipulate such comment or input to achieve a particular outcome. Written submissions are appended to the report while other comments are recorded within the report. For the sake of brevity, not all comments are recorded verbatim and are mostly captured as issues, and in instances where many stakeholders have similar issues, they are grouped together, with a clear listing of who raised which issue(s).
- 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.

Nicola Rump

Name

SRK Consulting - Certified Electronic Signature
srk consulting
553652/44266/Report
6357-7827-7424-RUMP-13/03/2021
This signature has been printed digitally. The Author has given permission for its use for this document. The details are stored in the SRK Signature Database

Signature

13 March 2021

Date

Applicant's Details

<table>
<tr><td>DEFF Reference No</td><td>14/12/16/3/3/2/2013</td></tr>
<tr><td>Name of Applicant</td><td>The Coega Development Corporation (CDC)</td></tr>
<tr><td>Company Registration</td><td>82003891/07</td></tr>
<tr><td>Responsible Person</td><td>Mr Sadick Davids</td></tr>
<tr><td>Postal Address</td><td>Pvt Bag X6009
Port Elizabeth
6000</td></tr>
<tr><td>Physical Address</td><td>Corner Alcyon & Zibuko St
Zone 1
Coega SEZ
Port Elizabeth
6100</td></tr>
<tr><td>Telephone</td><td>+27 41 403 0400</td></tr>
<tr><td>Cell</td><td>+27 84 570 2849</td></tr>
<tr><td>Facsimile</td><td>+ 27 41 4030401</td></tr>
<tr><td>E- mail</td><td>Sadick.davids@coega.co.za</td></tr>
<tr><td>Application Area</td><td>Erf 220, Erf 252 – LNG & Gas Hub
Erf 255, 329, 220, 252, 281, 275, 312 and Erf 329 - Cryogenic & NG Pipelines
Erf 251, Erf 255, Erf 355 - Seawater intake pipeline, FSRU and jetty
Zone 10 and Zone 13 of the Coega Special Economic Zone (SEZ)
Cacadu District Municipality of the Nelson Mandela Bay Municipality located in the Eastern Cape.
Co-ordinates:
<table>
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<tr><td>FSRU</td><td>-33.799913</td><td>25.697476</td></tr>
<tr><td rowspan="4">LNG & Gas Hub</td><td>-33.77569625</td><td>25.70683012</td></tr>
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<tr><td>-33.78009666</td><td>25.71070894</td></tr>
<tr><td rowspan="2">Seawater Intake Pipeline</td><td>-33.787041</td><td>25.704399</td></tr>
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<tr><td rowspan="2">Gas Pipeline</td><td>-33.744569</td><td>25.675601</td></tr>
<tr><td>-33.783885</td><td>25.705453</td></tr>
</table>
Also see Figure 1-2</td></tr>
</table>

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Acronyms and Abbreviations

+ve	Positive
AEL	Atmospheric Emissions Licence
AIR	Atmospheric Impact Report
BID	Background Information Document
BA	Basic Assessment
CCIA	Climate Change Impact Assessment
CDC	Coega Development Corporation
CCCE	Combined Cycle Combustion Engine
CCGT	Combined Cycle Gas Turbine
CBA	Critical Biodiversity Area
CBA	Critical Biodiversity Areas
CIA	Cumulative Impact Assessment
CNG	Compressed Natural Gas
DEDEAT	Department of Economic Development, Environmental Affairs and Tourism
DEFF	Department of Environment, Forestry and Fisheries (National) (formerly DEA)
DEA	Department of Environmental Affairs (National) (now DEFF)
DEA&DP	Department of Environmental Affairs and Development Planning
DHSWS	Department of Human Settlements, Water and Sanitation
DMRE	Department of Mineral Resources and Energy
DSR	Draft Scoping Report
EIS	Ecological Importance and Sensitivity
ESA	Ecological Support Area
EC	Electrical Conductivity
ECA	Environment Conservation Act 73 of 1989
EAP	Environmental Assessment Practitioner
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
ELC	Environmental Liaison Committee
EMP	Environmental Monitoring Committee
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
FSR	Final Scoping Report
FSRU	Floating Storage Regasification Unit
FEPA	Freshwater Ecosystem Priority Areas
GA	General Authorisation
GN	Government Notice

GHG	Greenhouse Gas Emissions
GDP	Gross Domestic Product
HRSG	Heat Recovery Steam Generators
IPP	Independent Power Producer
IDP	Integrated Development Plan
IEP	Integrated Energy Plan
IEM	Integrated Environmental Management
IRP	Integrated Resources Plan
IAPs	Interested and Affected Parties
IUCN	International Union for Conservation of Nature
LNG	Liquid Natural Gas
LN	Listing Notice
MIA	Marine Impact Assessment
MPA	Marine Protected Area
MVA	Megavolt ampere
MW	Megawatt
NAAQS	National Ambient Air Quality Standard
NCCAS	National Climate Change Adaptation Strategy
NEMA	National Environmental Management Act 107 of 1998 as amended
NEM:AQA	National Environmental Management: Air Quality Act 39 of 2004
NEM:BA	National Environmental Management: Biodiversity Act 10 of 2004
NEM:ICMA	National Environmental Management: Integrated Coastal Management Act 24 of 2008
NEM:PAA	National Environmental Management: Protected Areas Act
NEM:WA	National Environmental Management: Waste Act 59 of 1998
NHRA	National Heritage Resources Act 25 of 1999
NWA	National Water Act 36 of 1998
-ve	Negative
NMBM	Nelson Mandela Bay Municipality
OCGE	Open Cycle Gas Engine
OCGT	Open Cycle Gas Turbine
ORV	Open Rack Vaporiser
OEM	Original Equipment Manufacturers
p.a.	Per annum
PES	Present Ecological State
PPP	Public Participation Process
RMIPPPP	Risk Mitigation Independent Power Producer Procurement Programme
S&EIR	Scoping and Environmental Impact Reporting
SANBI	South African National Biodiversity Institute

SAHRA	South African National Heritage Resources Agency
SANS	South African National Standards
SDF	Spatial development Framework
SEZ	Special Economic Zone
SCC	Species of Conservation Concern
SRK	SRK Consulting (South Africa) (Pty) Ltd
StatsSA	Statistics South Africa
SCV	Submerged Combustion Vaporiser
STEP	Subtropical Thicket Ecosystem Planning Project
ToR	Terms of Reference
TIA	Traffic Impact Assessment
VEC	Valued Environmental and Social Components
WML	Waste Management Licence
WMA	Water Management Area
WUL	Water Use Licence
WI	Wobbe Index

Units

°C	Degrees celsius
ha	Hectare
km	Kilometre
km^2	Square kilometre
km/h	Kilometres per hour
l	Litres
l/s	Litres per second
m	Metre
mamsl	Metres above mean sea level
mbgl	Metres below ground level
m^3/h	Cubic metres per hour
Mm^3	Million cubic metres
mm	Millimetre
m/s	Metres per second
Mt	Million Tonnes
Ø	Internal diameter
tph	Tonnes per hour

Glossary

Aquifer	An underground body of water.
Attenuation	Processes that naturally transform contaminants to less harmful forms or immobilize contaminants so that they are less of a threat to the environment
Auto – refrigeration	The process in which LNG is kept at its boiling point, so that any added heat is countered by energy lost from boil off.
Base Load Power Plant	A power plant that provides a continuous supply of electricity and is only turned off during maintenance.
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.
Berth	Designated location in port/harbour for the mooring of vessels
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
Breakwater	Structures constructed on coasts as part of coastal defence or to protect an anchorage from the effects of both weather and longshore drift
Closed Cycle Gas Turbine	A turbine that uses gas for the working fluid and recirculates the gas within the system.
Combined Cycle Gas Turbine	A turbine that utilises natural gas to generate electricity and the by-products (waste heat) of this process to power steam engines and generate further electricity.
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 proposed project through meaningful discussions and the open sharing of information.
Cumulative Impacts	Direct and indirect impacts that act together with current or future potential impacts of other activities or proposed activities in the area/region that affect the same resources and/or receptors.
Ecology	The study of the interrelationships of organisms with and within their environment.
Ecosystem	The interconnected assemblage of all species populations 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 and development 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 Assessment Report	The report produced to relay the information gathered and assessments undertaken during the Environmental Impact Assessment.

Environmental Management Programme	A description of the means (the environmental specification) to achieve environmental objectives and targets during all stages of a specific proposed activity.
Ephemeral	A waterbody that does not flow or contain water year-round, in response to seasonal rainfall and run-off.
Factor of Safety	Ratio between the forces causing failure (gravity forces of the material weight) and the forces preventing failure (shear strength of the soils)
Fauna	The collective animals of a given region.
Feasibility Study	The determination of the technical and financial viability of a proposed project.
Floating Power Barge	A special purpose ship on which a power plant is installed to serve as a power generation source.
Floating Storage Regasification Unit	Floating vessel that receives liquefied natural gas and converts this to its gaseous form on board.
Flora	The collective plants of a particular region, habitat or geological period.
Fossil	Rare objects that are preserved due to unusual circumstances.
Heritage Resources	Refers to something, 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.
Hydrology	(The study of) surface water flow.
Impact	A change to the existing environment, either adverse or beneficial, that is directly or indirectly due to the development of the project and its associated activities.
Independent EAP	An independent person with the appropriate qualifications and experience appointed by the Applicant to manage the Environmental Impact Assessment process on behalf of the Applicant.
Independent Power Producer	Independent Power Producer is an entity, which is not a public electric utility, but which owns and or operates facilities to generate electric power for sale to a utility, central government buyer and end users.
Integrated Environmental Management	The practice of incorporating environmental management into all stages of a project's life cycle, namely planning, design, implementation, management and review.
Jetty	A structure that projects from the land out into the water
Liquefaction	The process by which natural gas is converted into liquid natural gas
Liquid Natural Gas	Natural gas that has been converted to liquid form.
Mid-Merit Power Plant	A 'load following' power plant. The power plant adjusts its power output as demand for electricity fluctuates.
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.
Natural Gas	A hydrocarbon gas that is usually obtained from underground sources, often in association with petroleum and coal deposits. Natural gas generally contains a high percentage of methane and inert gases.
Open Cycle Gas Turbines	A turbine that uses gas for the working fluid and does not reuse the exhaust by-products of the process but releases these outside of the system.
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.
Particulate matter	Broad term used for fine particles found in the ambient atmosphere, including soil dust, dirt, soot, smoke, pollen, ashes, aerosols and liquid droplets.

Peaking Power Plant	Power plants that generally run only when there is a high demand, known as peak demand, for electricity.
Port	A location on a coast or shore containing one or more harbours where ships can dock and transfer people or cargo to or from land
Quay	A structure on the shore of a harbour where ships may dock to load and unload cargo. Includes one or more berths and may include piers, warehouses or other facilities necessary for handling the ships.
Ranking	A position in a hierarchy or scale.
Rating	A classification of something based on a comparative assessment of their quality, standard, or suitability.
Regasification	The process by which LNG is heated, converting it into its gaseous state.
Scoping	A procedure to consult with stakeholders to determine issues and concerns and for determining the extent of and approach to an EIA (one of the phases in an EIA). This process results in the development of a scope of work for the EIA and specialist studies.
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.
Terminal	The set of facilities at a port where loading and unloading of cargo/container takes place. Terminals are named on the basis of the type of cargo that can be handled by them. Some of the most common types of terminals are container terminal, bulk cargo terminal, LNG terminal
Ullage	The empty space in large tanks used to store liquids.
Waterbody	A body of water forming a physiographical feature, for example the sea.
Watercourse	A natural freshwater feature, including pans.

1 Introduction

1.1 Background and Introduction

The Coega Development Corporation (CDC) proposes to develop a gas to power project, including three power plants and associated infrastructure, within the Coega Special Economic Zone (SEZ) (see Figure 1-1, Figure 1-2 for site locality) and have appointed SRK Consulting (South Africa) (Pty) Ltd (SRK) to conduct an Environmental Impact Assessment (EIA) in terms of the National Environmental Management Act 107 of 1998 (NEMA).

The overall project would broadly involve the following components:

- A Liquefied Natural Gas (LNG) terminal, consisting of a berth with off-loading arms within the Port of Ngqura, cryogenic pipelines, storage and handling facilities and re-gasification modules (both on and off-shore);
- Gas and LNG pipelines and distribution hub, for the transmission, distribution and reticulation of natural gas within the Coega SEZ and Port of Ngqura - the subject of this EIA;
- Three Gas to Power plants, each with a 1000 MW generation capacity (specific generation technologies may vary); and
- Electricity transmission lines to evacuate electricity to the previously approved 400 kV lines in the SEZ.

The overall/ultimate proposed project will comprise of three power plants with power generation capacities of up to 1000 MW each. A total power generation capacity of up to 3000 MW will therefore be available once the full extent of the project has been developed (which may be spread over a number of phases in a modular fashion, each with a generation capacity of approximately 500MW, which may also be broken down into smaller sub-phases), the timing of which is unknown at this stage and is dependent on the CDC securing successful clients for the development of each component.

This Draft Environmental Impact Report (Draft EIR) deals with the gas infrastructure components of the project, facilitating the supply of gas to the power plants, and gas and LNG to third party off-takers.

Four separate EIA applications have been lodged for the project (each of the three power plants and one for the gas infrastructure). This approach is intended to facilitate transfer of discrete projects and associated authorisations to developers following a bidding process.

As developers and their chosen technologies have not yet been identified, various technologically feasible options are applied for in each EIA, and the assessment presented is based on the worst case scenario for each impact. The aim of this approach is to identify the envelope limits within which the project impacts will fall, and which will be acceptable to the receiving environment with implementation of mitigation measures where relevant.

The NEMA and the Environmental Impact Assessment (EIA) Regulations, 2014 (promulgated in terms of NEMA) warrant that listed activities require Environmental Authorisation (EA). The Department of Environment, Forestry and Fisheries (DEFF) is the competent authority for projects supplying energy to the national grid. A Scoping and Environmental Impact Reporting (S&EIR, also referred to as an EIA) process is required to support an application for EA.

1.2 Purpose of the Report

The EIA Report documents the steps undertaken during the Impact Assessment Phase to assess the significance of potential impacts and determine measures to mitigate the negative impacts and

enhance the benefits (or positive impacts) of the proposed project. The report presents the findings of the Impact Assessment Phase and the public participation that forms part of the process.

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

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

- Inform the stakeholders about the proposed project and the S&EIR (also referred to as EIA) process followed;
- Obtain contributions from stakeholders (including the applicant, consultants, relevant authorities and the public) and ensure that all issues, concerns and queries raised are fully documented and addressed;
- Assess in detail the potential environmental and socio-economic impacts of the project;
- Identify environmental and social mitigation measures to address the impacts assessed; and
- Produce an EIA Report that will assist DEFF to decide whether (and under what conditions) to authorise the proposed development.

1.3 Scope of Work

CDC requires that an EIA process be conducted and the associated reports produced and submitted to the competent authority (in this case DEFF), to inform DEFF decision whether to issue the necessary EA for the project.

In broad terms the Scope of Work (SoW) includes:

- Conducting an S&EIR process compliant with the EIA Regulations, 2014 for the project;
- Submitting an application through the EIA process for an EA in terms of NEMA;
- Conducting the associated stakeholder engagement (public participation) process, including consultation with relevant authorities, in compliance with the requirements of the EIA Regulations, 2014 and other applicable legislation; and
- Compilating of the EMPr for the proposed Gas Infrastructure to include site-specific mitigation.

The proposed gas infrastructure will consist of all key supporting infrastructure required for the operation of the CDC's proposed gas to power plants in the Coega SEZ. This will be made up specifically of infrastructure for the import, storage and transmission of LNG via the Port of Ngqura, to the various power plants, and seawater for cooling to and from the zone 10 power plants (should they be seawater cooled), and heating water to the onshore storage and regasification unit. Additional capacity of supply of LNG and natural gas (NG) to third party offtakers, potentially including the Dedisa peaking power plant, should this be converted to gas, will also be included. The key infrastructure includes the following:

- Up to two floating storage and regasification units (FSRUs), moored in the Port, which will receive, store and regasify the LNG from the LNG carrier. This will be phase 1 of the project. It is proposed that onshore storage and regasification facilities will replace the FSRU once the demand for NG reaches a point where onshore storage and regasification is the more feasible option, at which point the FSRU will be removed;
- A new jetty with offloading platform and berthing facilities in the port of Ngqura;
- A trestle structure to support the gas and cryogenic pipelines running within the port from the offloading platform parallel to the eastern breakwater, to the point where the pipelines will cross under the breakwater near the admin craft basin;

- An LNG and gas hub, consisting of storage and regasification facilities (for development in phase 2, once the FSRU is no longer the most feasible option), and a truck delivery centre for third party offtakers. Gas metering, admin, control rooms, workshops, and vents will be included in the LNG and gas hub;
- Gas (for transmission of NG) and cryogenic (for transmission of LNG) pipelines from the FSRU and jetty to the three proposed power plants, as well as the boundary of the Dedisa power plant in Zone 13;
- Pipelines for the transmission of seawater from the abstraction point in the port, to the zone 10 power plants (if seawater cooled) and regasification plant at the LNG and gas hub.

The following aspects are excluded from the SoW:

- Sources of gas – we assume LNG would be imported from suitably authorised sources;
- An evaluation of different energy sources as part of the energy generation mix, apart from interim use of liquid fuel. It is assumed, based on the IRP, that this has been decided at a strategic level, and it is assumed this included an assessment of environmental factors. Apart from describing the motivation (or need) for gas generated power as part of the energy mix, this assessment will not consider relative merits of different energy sources;
- The transmission of electricity from the power plants to the Grassridge and/or Dedisa substations – it is understood that the bulk powerlines required for this are already authorised (DEA Ref: 12/12/20/781) and therefore will not be assessed as part of this EIA;
- Activities (or the equivalent listed activities at the time) previously authorised via separate EIA processes for the whole SEZ, including the clearing of vegetation, rezoning of land, and installation of bulk services infrastructure. Relevant listed activities are listed in **Error! Reference source not found.** with reasons as to why they are not being applied for; and
- The evacuation of power from Grassridge and/or Dedisa substations to consumers.

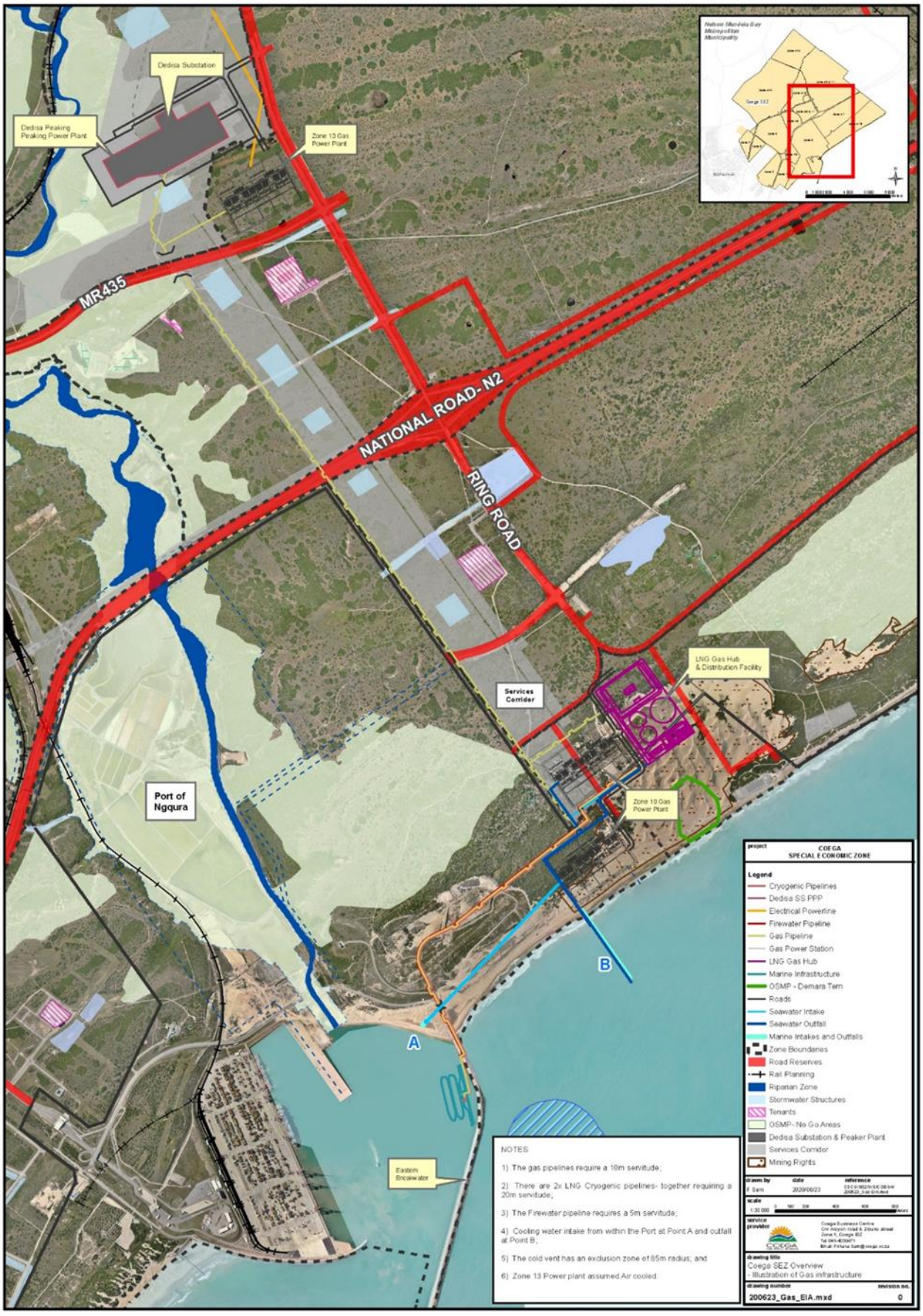


Figure 1-1: Map of the Coega SEZ showing the CDC gas to power project

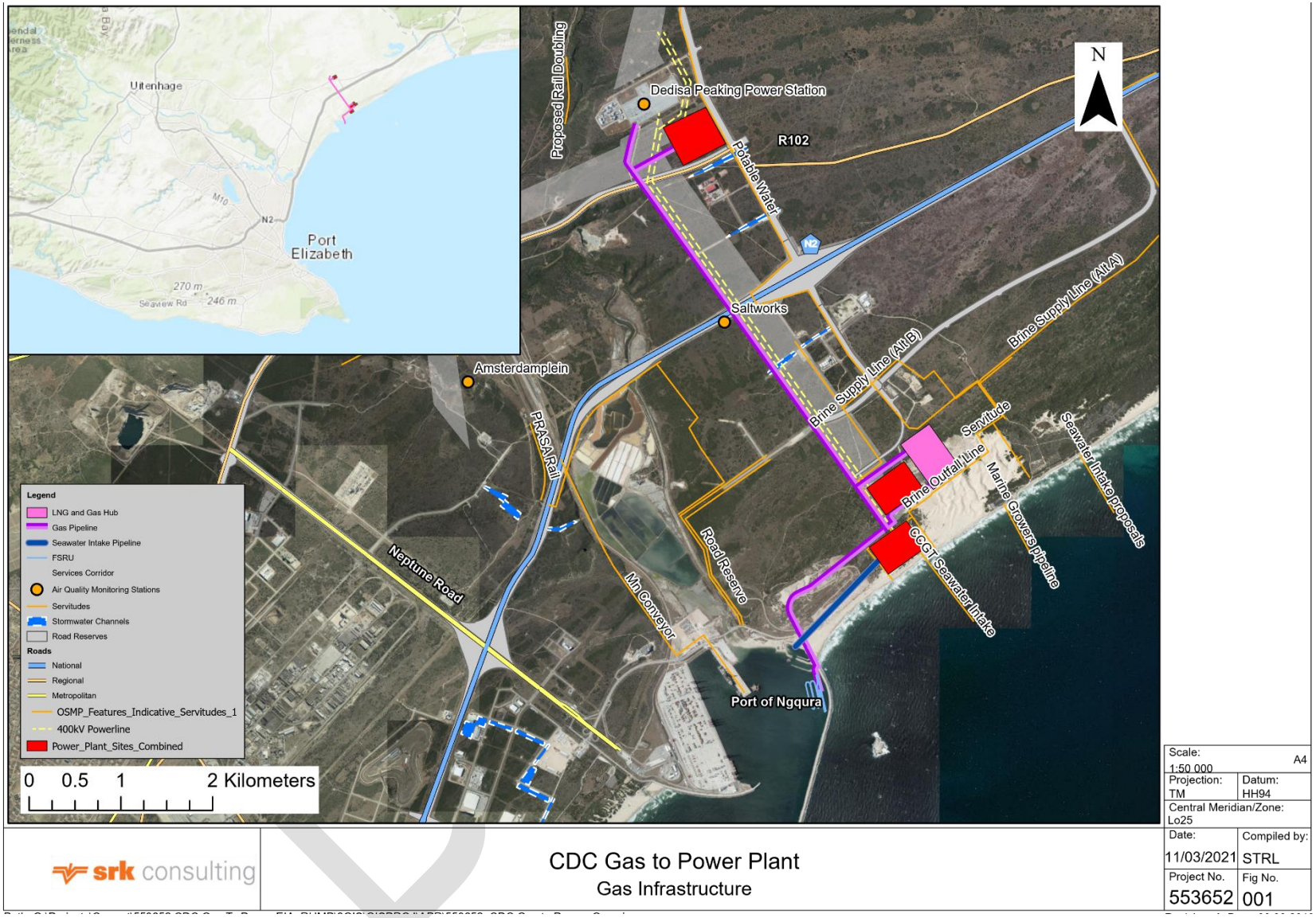


Figure 1-2: Site locality map for the gas infrastructure

1.4 Structure of this Report

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

Section 1: Introduction

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

Section 2: Governance Framework and Environmental Process

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

Section 3: Project Description

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

Section 4: Description of the Affected Environment

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

Section 5: Stakeholder Engagement

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

Section 6: Environmental Impact Assessment

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

Section 7: Conclusions and Recommendations

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

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

1.5 Content of Report

The EIA Regulations, 2014 (Government Notice (GN) R 982, which came into effect on 8 December 2014, as amended by GN R326 of 2017, Appendix 3, Part 3) prescribe the required content in an EIA Report. These requirements and the sections of this EIA Report in which they are addressed, are summarised in Table 1-1.

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

GN 982, Appendix 3 Ref.:	Item	Section Ref.:
(3) (a)	Details of:	

GN 982, Appendix 3 Ref.:	Item	Section Ref.:
(3) (a) (i)	The Environmental Assessment Practitioner (EAP) who prepared the report	Page ii Appendix A
(3) (a) (ii)	The expertise of the EAP, including a Curriculum Vitae	Page ii Appendix A
	Location of the activity, including	
(3) (b) (i)	The 21 digit Surveyor General code of the properties	Table 3-2
(3) (b) (ii)	The physical address and farm name (where available)	Table 3-2
(3) (b) (iii)	The coordinates of the boundary of the property / properties (where (3) (b) (i) and (3) (b) (ii) are not available)	Table 3-2
(3) (c)	A plan indicating the location of the proposed activity / activities and associated infrastructure, or:	Figure 1-1 and Figure 1-2
(3) (c) (i)	For linear activities: a description and coordinates of the corridor in which the proposed activity/ activities is to be undertaken	Table 3-2 and Figure 1-2
(3) (c) (ii)	On land where the property has not been defined, the coordinates within which the activity is to be undertaken	Table 3-2 and Figure 1-2
(3) (d)	A description of the scope of the proposed activities, including:	
(3) (d) (i)	All listed and specified activities triggered and being applied for	Table 2-1
(3) (d) (ii)	A description of the associated structures and infrastructure related to the development	Chapter 3
(3) (e)	A description of the policy and legislative context and an explanation of how the proposed development complies with and responds to the legislative and policy context	Chapter 2
(3) (f)	A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location	Section 3.6
(3) (g)	A motivation for the preferred development footprint within the approved site	Section 6.3
(3) (h)	A full description of the process followed to reach the proposed development footprint within the approved site, including:	
(3) (h) (i)	Details of the development footprint alternatives considered	Section 6.3
(3) (h) (ii)	Details of the public participation process undertaken, including copies of the supporting documents and inputs	Chapter 5 Appendix C - H
(3) (h) (iii)	A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them	Appendix H
(3) (h) (iv)	The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	Chapter 4
(3) (h) (v)	The impacts and risks identified, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts can be reversed, may cause irreplaceable loss of resources, and can be avoided, managed or mitigated	Chapter 6
(3) (h) (vi)	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks	Section 6.4
(3) (h) (vii)	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected, focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	Section 6.6.1 – Section 6.8.8
(3) (h) (viii)	The possible mitigation measures that could be applied and level of residual risk	Section 6.6.1 – Section 6.8.8
(3) (h) (ix)	If no alternative development locations for the activity were investigated, the motivation for not considering such	Section 6.3

GN 982, Appendix 3 Ref.:	Item	Section Ref.:
(3) (h) (x)	A concluding statement indicating the preferred alternative development location within the approved site	Section 6.3 to 7.1
(3) (i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including:	
(3) (i) (i)	A description of all environmental issues and risks that were identified during the environmental impact assessment process	Chapter 6
(3) (i) (ii)	An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures	Section 6.6.1 - 6.8.8
(3) (j)	An assessment of each identified potentially significant impact and risk, including:	
(3) (j) (i)	Cumulative impacts	Section 6.8
(3) (j) (ii)	The nature, significance and consequences of the impact and risk	Section 6.6.1 - 6.8.8
(3) (j) (iii)	The extent and duration of the impact and risk	Section 6.6.1 - 6.8.8
(3) (j) (iv)	The probability of the impact and risk occurring	Section 6.6.1 - 6.8.8
(3) (j) (v)	The degree to which the impact and risk can be reversed	Section 6.6.1 - 6.8.8
(3) (j) (vi)	The degree to which the impact and risk may cause irreplaceable loss of resources	Section 6.6.1 - 6.8.8
(3) (j) (vii)	The degree to which the impact and risk can be mitigated	Section 6.6.1 - 6.8.8
(3) (k)	Where applicable, a summary of the findings and recommendations of any specialist report and an indication as to how these findings and recommendations have been included in the final assessment report	Section 6.6.1 - 6.8.8
(3) (l)	An EIS which contains:	
(3) (l) (i)	A summary of the key findings of the environmental impact assessment	Section 7.2
(3) (l) (ii)	A map at an appropriate scale which superimposes the proposed activity and its associated structures and the infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers	Section 7.3
(3) (l) (iii)	A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives	Section 7.2
(3) (m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation	Section 7.6
(3) (n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment	Section 6.3
(3) (o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation	Section 7.6
(3) (p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed	Section 1.6
(3) (q)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation	Section 7.7
(3) (r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised	NA
(3) (s)	An undertaking under oath or affirmation by the EAP in relation to:	p. iv
(3) (s) (i)	The correctness of the information provided in the reports	p. iii
(3) (s) (ii)	The inclusion of comments and inputs from stakeholders and I&APs	p. iii
(3) (s) (iii)	The inclusion of inputs and recommendations from the specialist reports where relevant	p. iii

GN 982, Appendix 3 Ref.:	Item	Section Ref.:
(3) (s) (iv)	Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties	p. iii

1.6 Assumptions and Limitations

1.6.1 EIA Process

The scope of the EIA is limited to project as described in Chapter 2. The scope of EIA excludes any consideration of:

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

- That, due to the cost of preparing detailed designs and plans, such detailed design/ planning information would only be developed in the event of EA being granted. As such, it is anticipated that, as is typically the case in an EIA process, the EIA will assess broad land uses and concept designs;
- That the project as described in this report is viable from an engineering design perspective, as well as economically, and that the project has been correctly scoped to align with other infrastructure that is outside the scope of this EIA such as the CDC Marine Pipeline Servitude EIA;
- That a worst case scenario approach is adopted in assessing the various aspects of the project so that the impacts assessed will cover whatever option is put forward by the chosen bidder;
- That where overlaps in location occur, all mining operations with existing mineral rights will have ceased prior to commencement of construction activities for the CDC's Gas to Power project.

It is noted that the FSR for the Marine Pipeline Servitude (MPS) was recently accepted by DEFF, and the FEIR for the project is scheduled for submission slightly behind the CDC's Gas to Power project FEIRs. Due to uncertainty regarding authorization of the MPS EIA, alternative options have been provided in the various reports for the CDC's Gas to Power project, to allow for operation of those projects independently of the MPS, should this be required.

Notwithstanding the above, it is our view that this Draft EIR provides a good description of the potential issues associated with the proposed development and mitigation measures proposed to address these issues, and that these assumptions and limitations do not compromise the overall findings of this report.

1.6.2 Specialist Impact Assessments

The assumptions and limitations provided by specialists in their relevant reports are as follows:

Air Quality Impact Assessment

The following assumptions are relevant to the Atmospheric Impact Report (AIR):

- No ambient monitoring is done in this assessment, rather available ambient air quality data is used;

- The Model Plan of Study (uMoya-NILU, 2020) describes the dispersion modelling methodology and has been accepted by the Licensing Authority;
- The potential air quality impacts of the proposed Land-based LNG Terminal and Infrastructure Project is assessed for the plant only and for the plant with existing air pollution sources in the Coega SEZ as well as cumulative impacts of other similar projects in the SEZ; and
- The assessment of potential human health impacts is based on predicted (modelled) ambient concentrations of SO_2, NO_2, CO, PM_{10} and benzene against health-based National Ambient Air Quality Standard (NAAQS).

Quantitative Risk Assessment

The Quantitative Risk Assessment (QRA) was based on the conceptual designs of the LNG importation pipeline routing and gas distribution centre. Furthermore, EIAs are intended to suggest mitigation which may alter the design and layout of the project. It is thus understood that detail designs would be required to complete the project for construction.

RISCOM used the information provided and made engineering assumptions as described in the document. The accuracy of the document would be limited to the available documents presented in the Amendment Report.

The assessment of cumulative risks reported in the QRA is limited to an assessment of the vessels in their moored positions and excludes risks associated with ship movements, which would typically be assessed in a marine transportation study. No claims are made in the QRA regarding the level of risk, and the acceptability of the risk, associated with ship movements within and outside of the Port.

The risk assessment excludes the following:

- Road transportation outside of the facility;
- Natural events such as earthquakes and floods;
- Ecological risk assessment; and
- An emergency plan.

Climate Change Impact Assessment

The Gas Distribution Infrastructure's vulnerability and resilience to climate change is assessed within the Climate Change Impact Assessment (CCIA) through an analysis of available datasets. The limited availability of data results in increased uncertainties regarding the full extent and accuracy of the possible climate change impacts affecting the Gas Distribution Infrastructure's operations, its supply chain, the surrounding communities, and the surrounding environment.

The assessment of the vulnerability of the project to climate change is subject to further limitations, namely:

The Gas Distribution Infrastructure's vulnerability and resilience to climate change is assessed within the Climate Change Impact Assessment (CCIA) through an analysis of available datasets. The limited availability of data results in increased uncertainties regarding the full extent and accuracy of the possible climate change impacts affecting the Gas Distribution Infrastructure's operations, its supply chain, the surrounding communities, and the surrounding environment.

The assessment of the vulnerability of the project to climate change is subject to further limitations, namely:

- The project lifetime is assumed to be 30 years[1].
- The use of natural gas replaces the use of only coal as a fuel source as it would be more readily available to the market. The fuel could be used for various processes; such as boilers, heaters, electricity generation and furnaces.
- Based on past experiences of the Promethium Carbon team, the following were assumed to be immaterial towards the GHG footprint of the Gas Distribution Infrastructure during both construction and operation:
  - Mobile combustion associated with the use of vehicles on the project site;
  - Stationary combustion from backup generators;
  - Employee commuting;
  - Quantity of construction and municipal waste generated, including the distance transported to landfill;
  - Emissions associated to nitrogen and LPG use as blending agents;

The CCIA is also subject to certain limitations listed below:

- This assessment was limited to a desktop study;
- No modelling was done to determine LNG use patterns in South Africa;
- No modelling was done to determine changes in emissions intensity of LNG production;
- No climate change modelling was performed;
- The impact of changing legislation was not considered;
- The impact of a changing economy was not considered;
- Detailed design document for the Gas Distribution Infrastructure were not available;

The CCIA is also subject to certain limitations listed below:

- This assessment was limited to a desktop study;
- No modelling was done to determine LNG use patterns in South Africa;
- No modelling was done to determine changes in emissions intensity of LNG production;
- No climate change modelling was performed;
- The impact of changing legislation was not considered;
- The impact of a changing economy was not considered; and
- Detailed design document for the Gas Distribution Infrastructure were not available;

The assessment of the vulnerability of the project to climate change is subject to further limitations, namely:

- The natural and social environments were limited to the area surrounding the Gas Distribution Infrastructure;
- Only impacts on the direct value chain were assessed;
- No modelling of climate change impacts was conducted; and
- Only impacts occurring during the lifetime of the project were considered.

Noise Impact Assessment

The following assumptions are relevant to the Noise Impact Report:

[1] Power Generation Technology Data for Integrated Resource Plan of South Africa. (2017) Department of Energy

- The gas infrastructure will be operational for 24 hours per day;
- The sound power levels for the operational equipment was chosen from similar plants. The client could not supply enough detailed information in this regard due to the final designs, suppliers and equipment not being finalised. The author therefore chose to use information from similar projects that he had access to. The author is however confident that the results fairly reflect the noise impact;
- The structural details of the infrastructure is not known (building heights, cladding etc);
- A LNG supply vessel will enter the port accompanied by at least two tugs
- It is assumed that the eastern breakwater will not provide any attenuation as the noise sources will be above the top of the breakwater wall;
- An LNG Carrier will dock for delivery every 3 days. These carriers have an assumed capacity of 140 000 m^3; and
- The FSRU's will be operational for 24 hours per day. Each will have a capacity of 170 000 m^3.

Traffic Impact Assessment

The scope of the Traffic Impact Assessment (TIA) only deals with vehicular traffic related impacts and excludes consideration of the following:

- Source of gas;
- The transmission of gas via pipelines other than construction traffic related to implementation of such pipelines; and
- The provision of power to consumers from facilities to which gas is supplied.

The TIA is based on a number of assumptions and is subject to certain limitations. These are as follows:

- That operational trip generation rates are based on information supplied by the prospective plant/facility operator;
- That vehicle occupancy rates for the purposes of determining operational trip generation rates for transport modes are based on average vehicle occupancies used for the NMBM Transport demand model;
- That construction trip generation rates are based on high level assessments of the proposed construction requirements for similar developments;
- That access and road upgrading proposals are conceptual at this stage and subject to detail designs being developed in the event of environmental authorization being granted;
- That the capacity analysis process is based on the highest peak hour traffic volumes of adjacent street traffic based on baseline traffic surveys undertaken for this project;
- That trip distribution is based on the location of the development relative to the surrounding residential areas; and
- That the roads constructed in the SEZ and on which traffic generated by the development travel have been constructed to accommodate traffic volumes over their projected design life and that such roads are operating well below their design traffic class.

Notwithstanding these assumptions it is the specialists view that the TIA provides a good description of the potential traffic issues associated with the proposed development.

Marine Impact Assessment

The assumptions made in the Marine Impact Assessment (MIA) are:

- The MIA is based on the project description made available to the specialists at the time of the commencement of the study (engineering designs, construction approaches, discharge locations, temperatures, volumes, etc.);
- Some important conclusions and associated assessments and recommendations made in the MIA are based on generic descriptions of LNGC and FSRU water requirements, and seawater intake and discharge configurations. Similarly, the thermal footprints associated with discharges from the vessels are based on the results of modelling studies undertaken for similar projects elsewhere in the world. As the extent of such footprints are project-specific and determined by localised oceanographic conditions, field observations and subsequent monitoring would need to be implemented for the current project to determine if predicted discharges at the Ngqura LNG terminal fall within the scale of the predicted footprints . If field observations and monitoring, however, fail to mirror predicted results, the forecasted impacts may need to be re-assessed.
- Potential changes in the marine environment such as sea-level rise and/or increases in the severity and frequency of storms related to climate change are not included in the terms of reference and therefore not dealt with in this report. The climate change assessment has been undertaken by other consultants and is only briefly commented on in this report. Should evidence of such changes become available, the management plans should be re-examined to include the impacts of these anticipated macroscale changes.

2 Governance Framework and Environmental Process

2.1 Legal Requirements Pertaining to the Proposed Project

There are a number of regulatory requirements at local, provincial and national level with which the proposed development will have to conform. Key legal requirements include the following:

- National Environmental Management Act (Act No. 107 of 1998) (NEMA);
- EIA Regulations, 2014, promulgated in terms of NEMA;
- National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM:AQA);
- National Greenhouse Gas Emission Reporting Regulations (GNR 275 of 2017);
- National Environmental Management: Protected Areas Act (31 of 2004);
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004);
- Electricity Regulation Act (Act no. 4 of 2006);
- National Heritage Resources Act (Act No. 25 of 1999) (NHRA); and
- National Water Act (Act No. 36 of 1998) (NWA).

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

2.1.1 National Environmental Management Act (Act No. 107 of 1998) (NEMA)

NEMA provides for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of the State, as well as to provide for matters connected therewith. Section 2 of NEMA establishes a set of principles that apply to the activities of all organs of state that may significantly affect the environment. These include the following:

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

Section 28(1) states that:

"Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring."

If such degradation/pollution cannot be prevented, then appropriate measures must be taken to minimise or rectify such pollution. These measures may include:

- Assessing the impact on the environment;
- Informing and educating employees about the environmental risks of their work and ways of minimising these risks;
- Ceasing, modifying or controlling actions which cause pollution/degradation;

- Containing pollutants or preventing movement of pollutants;
- Eliminating the source of pollution; and
- Remedying the effects of the pollution.

Legal requirements for this project:

The CDC has a responsibility to ensure that the proposed development and the EIA process conform to the principles of NEMA. The proponent is obliged to take action to prevent pollution or degradation of the environment in terms of Section 28 of NEMA.

2.1.2 EIA Regulations, 2014, promulgated in terms of NEMA

Sections 24 and 44 of NEMA make provision for the promulgation of regulations that identify activities which may not commence without an EA issued by the competent authority (DEFF). In this context, the EIA Regulations, 2014[2], promulgated in terms of NEMA, govern the process, methodologies and requirements for the undertaking of EIAs in support of EA applications. Listing Notices 1-3 in terms of NEMA list activities that require EA ("NEMA listed activities").

GN R326 of the EIA Regulations, 2014 lay out two alternative authorisation processes. Depending on the type of activity that is proposed, either a Basic Assessment (BA) process or a S&EIR process is required to obtain EA. Listing Notice 1[3] lists activities that require a BA process, while Listing Notice 2[4] lists activities that require S&EIR. Listing Notice 3[5] lists activities in certain sensitive geographic areas that require a BA process.

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

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

GN R326 sets out the procedures to be followed and content of reports compiled during the BA and S&EIR processes.

The NEMA National Appeal Regulations[6] make provision for appeal against any decision issued by the relevant authorities. In terms of the Regulations, an appeal must be lodged with the relevant authority in writing within 20 days of the date on which notification of the decision (EA) was sent to the applicant or IAP (as applicable). The applicant, the decision-maker, IAPs and organs of state must submit their responding statement, if any, to the appeal authority and the appellant within 20 days from the date of receipt of the appeal submission.

Table 2-1 lists the NEMA lists the NEMA listed activities in terms of the 2014 EIA regulations, as amended, that are triggered by the proposed Gas Infrastructure. As the Coega SEZ is already authorised as an industrial development area and is located within an urban area, as confirmed by the SDF for the NMBM (2015), a number of listed activities are not triggered by the proposed development.

[2] GN R982 of 2014, as amended by GN R326 of 2017
[3] GN R983 of 2014, as amended by GN 327 of 2017
[4] GN R984 of 2014, as amended by GN 325 of 2017
[5] GN R985 of 2014, as amended by GN 324 of 2017
[6] GN R993 of 2014, as amended by GN R205 of 2015.

Where applicable, the relevant similar activities that have been previously authorised via separate EIA processes (and therefore are excluded from this application) are indicated.

Table 2-1: NEMA Listed Activities (2014 EIA regulations, as amended) applicable to the Proposed Gas Infrastructure

No.	Listed activity	
Listing Notice 1 (GN 327)		**Comment**
15	The development of structures in the coastal public property where the development footprint is bigger than 50 square metres, excluding - (i) the development of structures within existing ports or harbours that will not increase the development footprint of the port or harbour;	The cryogenic and natural gas pipelines, as well as the seawater intake and return pipeline, may include footprints exceeding 50 m^2 outside the port and within coastal public property.
17	Development- (v) if no development setback exists, within a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever is the greater; in respect of — (e) infrastructure or structures with a development footprint of 50 square metres or more —	Mooring facilities in the port and infrastructure for intake of seawater and transport of LNG and gas to storage facilities and the power plants are proposed within 100 m of the high water mark of the sea and within the littoral active zone. This includes a new jetty, offloading platform and trestle to support the LNG and gas pipelines within the port, a cryogenic pipeline as well as gas pipelines associated with land-based regasification infrastructure, and a seawater intake pipeline from the port to the zone 10 power plants and onshore regasification areas at the LNG and Gas Hub.
18	The planting of vegetation or placing of any material on dunes or exposed sand surfaces of more than 10 square metres, within the littoral active zone, for the purpose of preventing the free movement of sand, erosion or accretion, excluding where - (i) the planting of vegetation or placement of material relates to restoration and maintenance of indigenous coastal vegetation undertaken in accordance with a maintenance management plan; or (ii) such planting of vegetation or placing of material will occur behind a development setback.	LNG and gas pipelines, seawater intake pipeline, and LNG and gas hub will be constructed within the littoral active zone/dunes and will therefore require stabilisation measures, exceeding 10 m^2. This may include planting of vegetation as part of rehabilitation of the site during construction. The CDC's Standard Vegetation Specification for Construction (dated 2005) will be adhered to, however specific measures to address revegetation of coastal vegetation will be required.
19A	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater but excluding where such infilling, depositing , dredging, excavation, removal or moving- (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.	Excavations, infilling or deposition (in excess of 5 m^3) will be required for the proposed pipelines and infrastructure within zone 8 and 10 of the Coega SEZ, including a new jetty and trestle structure within the port. This will take place within 100 m inland of the high water mark and within the littoral active zone. **Dredging within the port for construction of the jetty and mooring platform will be required, however it is understood that this activity has already been authorised under the existing RoD for the port and therefore is not specifically applied for.**
27	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	The LNG & gas hub will require the clearing of vegetation. It is anticipated that this will be up to approximately 181,000 m2. **The equivalent/similar activity is authorised in the 2007 Rezoning EA for the SEZ, and therefore clearing of vegetation will not be applied for or assessed in this EIA.**
Listing Notice 2 (GN 325)		
4	The development of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.	The proposed gas infrastructure includes both on & off-shore infrastructure for storage of up to approximately 340,000 m^3 of LNG, and other dangerous goods such as chemicals and fuels.
6	The development of facilities or infrastructure for any process or activity which requires a permit or	The development of the gas infrastructure will require licences, including an Atmospheric

No.	Listed activity	
	licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent	Emission Licence in terms of NEM:AQA (Act 39 of 2004) for the storage of fuel and potentially a coastal waters discharge permit may also be required for the discharge of heating water required for regasification..
7	The development and related operation of facilities or infrastructure for the bulk transportation of dangerous goods– (i) in gas form, outside an industrial complex, using pipelines, exceeding 1 000 metres in length, with a throughput capacity of more than 700 tons per day; (ii) in liquid form, outside an industrial complex, using pipelines, exceeding 1 000 metres in length, with a throughput capacity of more than 50 cubic metres per day	All proposed infrastructure for the conveyance of LNG and Natural Gas falls within the Coega SEZ and the Port of Ngqura, and will be in pipelines exceeding 1 km in length, with throughput capacities exceeding the thresholds specified. In the event that either of these activities are deemed to occur outside of an industrial complex, then this activity would be triggered.
14	The development and related operation of- (ii) an anchored platform; or (iii) any other structure or infrastructure on, below or along the sea bed;	The development of an LNG terminal for the FSRU will require the construction of a jetty and mooring structures, as well as a trestle running inside the harbour breakwater to support the gas and LNG pipelines. All of these will require the construction of piling or other structures into the sea bed for support.

Legal requirements for this project:

The proposed development includes the listed activities in terms of GN R 325 and 327, which appear above. As such, the proponent is obliged to conduct an Environmental Impact Assessment for the proposed activity in accordance with the procedure stipulated in GN R 326.

2.1.3 National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM:AQA)

NEM:AQA stipulates that activities listed as having a potential negative impact on air quality require authorisation in the form of an AEL. A S&EIR process, as described in the EIA Regulations made under section 24(5) of the NEMA, is required. The following activities listed are relevant to the proposed activities:

- Engines - liquid and gas fuel stationary engines used for electricity generation; and
- Sub-category 2.4: Storage and Handling of Petroleum Products.

Legal requirements for this project

As the proposed gas infrastructure includes the storage of fuel, CDC is required to obtain an AEL prior to construction of the proposed facility.

2.1.4 National Greenhouse Gas Emission Reporting Regulations (GNR 275 of 2017)

The National Greenhouse Gas Emission Reporting Regulations have been promulgated in terms of NEM:AQA for the purpose of introducing a single national reporting system for the transparent reporting of greenhouse gas emissions. The regulations apply to the categories of emission sources listed in Annexure 1 to the regulations and include electricity production exceeding 10 MW. Tier 1 reporting is required as a minimum, with a five year grace period applicable before reporting of the lower tiers.

Legal requirements for this project:

For the competent authority to make a decision regarding the project, the quantity of greenhouse gases emitted from the proposed development are reported in the EIA. Reporting of actual GHG emissions would be required during the operational phase.

2.1.5 National Environmental Management: Protected Areas Act (31 of 2004)

The purpose of this Act is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes.

The objectives of this Act are-

- To provide, within the framework of national legislation, including the NEMA, for the declaration and management of protected areas;
- To provide for co-operative governance in the declaration and management of protected areas;
- To effect a national system of protected areas in South Africa as part of a strategy to manage and conserve its biodiversity;
- To provide for a representative network of protected areas on state land, private land and communal land;
- To promote sustainable utilisation of protected areas for the benefit of people, in a manner that would preserve the ecological character of such areas;
- To promote participation of local communities in the management of protected areas, where appropriate; and
- To provide for the continued existence of South African National Parks.

Legal requirements for this project

The eastern breakwater of the harbour (where the FSRU is proposed) is within 500 m of Jahleel Island which forms part of the Addo Elephant National Park MPA. SANParks would therefore be a key stakeholder for the project and should be adequately engaged with throughout the process.

2.1.6 National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008)

According to Section 2 of the NEM: ICMA, the objects of this Act are:

- To determine the coastal zone of the Republic;
- To provide, within the framework of the National Environmental Management Act, for the co-ordinated and integrated management of the coastal zone by all spheres of government in accordance with the principles of co-operative governance;
- To preserve, protect, extend and enhance the status of coastal public property as being held in trust by the State on behalf of all South Africans, including future generations;
- To secure equitable access to the opportunities and benefits of coastal public property; and
- To give effect to the Republic's obligations in terms of international law regarding coastal management and the marine environment.

Section 13 of the NEM: ICMA states that any natural person in the Republic:

- Has a right of reasonable access to coastal public property; and

- Is entitled to use and enjoy coastal public property.

Section 69(1) of the Act states that no person may discharge effluent that originates from a source on land into coastal waters except in terms of a general discharge permit or a coastal waters discharge permit issued under this section by the Minister after consultation with the Minister responsible for water affairs in instances of discharge of effluent into an estuary. Effluent is defined as the following in the NEM:ICMA:

"effluent" means -
(a) any liquid discharged into the coastal environment as waste, and includes any substance dissolved or suspended in the liquid; or
(b) liquid which is a different temperature from the body of water into which it is being discharged;

Legal requirements for this project

A coastal discharge permit from the DEFF: Oceans and Coast will be required for the discharge of the cooled heating water generated through regasification into the marine environment. It is understood that the CDC will apply for a discharge permit for the Marine Pipeline Servitude, and additionally the gas infrastructure developer will be required to apply for a permit for the discharge of water from the regasification process, once details thereof are available.

2.1.7 National Environmental Management: Biodiversity Act (Act No. 10 of 2004)

This Act provides for the management and conservation of South Africa's biodiversity within the framework of the NEMA. In terms of the Biodiversity Act, the developer has a responsibility for:

a. The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).
b. Application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all developments within the area are in line with ecological sustainable development and protection of biodiversity.
c. Limit further loss of biodiversity and conserve endangered ecosystems.

The objectives of this Act are:

d. To provide, within the framework of the NEMA, for –

    i The management and conservation of biological diversity within the Republic;
    ii The use of indigenous biological resources in a sustainable manner.

The Act's permit system is further regulated in the Act's Threatened or Protected Species Regulations (GN 255), which were promulgated in March 2015, the National List of threatened ecosystems (GN 1002) promulgated in December 2011 and the Alien Invasive Species regulations (GNR 598) of August 2014.

Legal requirements for this project:

The proposed development must conserve endangered ecosystems and protect and promote biodiversity, it must assess the impacts of the proposed development on endangered ecosystems, no protected species may be removed or damaged without a permit, and the proposed site(s) must be cleared of alien vegetation using appropriate means. While the SEZ does include formally designated Open Space areas for management of biodiversity, which are avoided, protected species may still be impacted on and as such the relevant permits must be in place for prior to construction. It is understood that CDC holds blanket permits for search and rescue of protected species and damage to protected trees in the SEZ, and that these permits will be made available to the developer.

2.1.8 Electricity Regulation Act (Act No. 4 of 2006)

This act provides the national regulatory framework for the electricity supply industry; to make the National Energy Regulator the custodian and enforcer of the national electricity regulatory framework; to provide for licences and registration as the manner in which generation, transmission, distribution, reticulation, trading and the import and export of electricity are regulated; to regulate the reticulation of electricity by municipalities; and to provide for matters connected therewith.

The objectives of this Act are to:

a. achieve the efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure in South Africa;
b. ensure that the interests and needs of present and future electricity customers and end users are safeguarded and met, having regard to the governance, efficiency, effectiveness and long term sustainability of the electricity supply industry within the broader context of economic energy regulation in the Republic;
c. facilitate investment in the electricity supply industry;
d. facilitate universal access to electricity;
e. promote the use of diverse energy sources and energy efficiency;
f. promote competitiveness and customer and end user choice; and
g. facilitate a fair balance between the interests of customers and end users, licensees, investors in the electricity supply industry and the public.

2.1.9 National Heritage Resources Act (Act No. 25 of 1999)

The protection and management of South Africa's heritage resources is controlled by the NHRA. The enforcing authority for this act is the South African Heritage Resources Agency (SAHRA).

In terms of the Act, historically important features such as graves, trees, archaeological artefacts/sites and fossil beds are protected. Similarly, culturally significant symbols, spaces and landscapes are also afforded protection. In terms of Section 38 of the NHRA, SAHRA can call for a Heritage Impact Assessment (HIA) where certain categories of development are proposed. The Act also makes provision for the assessment of heritage impacts as part of an EIA process and indicates that if such an assessment is deemed adequate, a separate HIA is not required.

The Act requires that:

"…*any person who intends to undertake a development categorised as the ... or any development or other activity which will change the character of a site exceeding 5 000 m² in extent or involving three or more existing erven or subdivisions thereof must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development..."*

Legal requirements for this project:

Phase 1 heritage assessment (archaeological and palaeontological) has previously been undertaken for the Coega SEZ and no further heritage studies are therefore proposed. A chance finds procedure is included in the Draft Environmental Management Programme for the development.

2.1.10 National Water Act (Act No 36 of 1998

Water use in South Africa is controlled by the NWA 36 of 1998 (NWA) which provides for the promotion of efficient, sustainable and beneficial use of water in the public interest; for the facilitation of social and economic development; for the protection of aquatic and associated ecosystems and their

biological diversity; and for the reduction and prevention of pollution and degradation of water resources. The Act also provides for emergency situations where pollution of water resources occurs.

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

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

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

(a) taking water from a water resource;

(b) storing water;

(c) impeding or diverting the flow of water in a watercourse;

(d) engaging in a stream flow reduction activity contemplated in section 36;

(e) engaging in a controlled activity identified as such in section 37 (1) or declared under section 38 (1);

(f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;

(g) disposing of waste in a manner which may detrimentally impact on a water resource;

(h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;

(i) altering the bed, banks, course or characteristics of a watercourse; and

(k) using water for recreational purposes.

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

Legal requirements for this project:

The development as described does not include activities that are listed under section 21 of the NWA, meaning that Water Use Licence Applications (WULAs) are not required.

2.2 Planning Policy Framework

This section discusses a number of key formal planning policies relevant to the project. As Tronox operations are of regional socio-economic significance, provincial plans are considered in this section, in addition to regional and local policies. The policies and plans briefly discussed below include regional and local development and spatial plans, such as the:

- Integrated Energy Plan 2016;
- Integrated Resources Plan 2010-2030

- National Climate Change Adaptation Strategy, 2019

2.2.1 Integrated Energy Plan 2016

The development of a National Integrated Energy Plan (IEP) was envisaged in the White Paper on the Energy Policy of the Republic of South Africa of 1998 and, in terms of the National Energy Act, 2008 (Act No. 34 of 2008), the Minister of Energy is mandated to develop and, on an annual basis, review and publish the IEP in the Government Gazette.

The purpose of the IEP is to provide a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development. The IEP considers the national supply and demand balance and proposes alternative capacity expansion plans based on varying sets of assumptions and constraints. While infrastructural matters are briefly discussed, the IEP does not explicitly consider supply and demand at specific geographical locations within the country, nor does it take into account infrastructure bottlenecks at specific locations. These are covered in detail in the Integrated Resources Plan (IRP) and the Gas Utilisation Master Plan (GUMP).

Natural Gas is identified in the IEP as presenting the most significant potential in the energy mix, particularly the use of natural gas in CCGTs in the electricity sector, Gas-to-Liquid (GTL) plants in the liquid fuel sector and for direct thermal applications in the industrial and residential sectors.

2.2.2 Integrated Resources Plan 2010-2030

The Integrated Resource Plan (IRP) 2010-30 was first promulgated in March 2011. It was indicated at the time that the IRP should be a “living plan”. The Department of Energy has since updated the IRP and published the IRP 2019.

The primary objective of the IRP 2010 is to determine the long-term electricity demand and detail how this demand should be met in terms of generating capacity, type, timing and cost. The accuracy of the IRP is improved by regular reviews and updates as and when things change or new information becomes available as with the current 2019 version.

Following the promulgation of the IRP 2010–2030, the DoE implemented the IRP by issuing Ministerial Determinations in line with Section 34 of the Electricity Regulation Act No. 4 of 2006. These Ministerial Determinations give effect to the planned infrastructure by facilitating the procurement of the required electricity capacity.

A determination dated 18 August 2015 (GN 732) was issued for the development of 3,126 MW of Gas (including CCGT/natural gas) and OCGT/diesel. A further determination dated 27 May 2016 was issued for an additional 600 MW.

The key amendments or additions as relating to gas power in the IRP (2019) are as follows:

1. IPPs have commissioned 1 005 MW from two OCGT peaking plants
2. The Electricity demand as projected in the promulgated IRP 2010–2030 did not materialise due to a number of factors which resulted in lower demand. The electricity demand figures have thus been updated; and
3. The decision was taken to support the development of gas infrastructure and in addition to the new gas to power capacity (Additional 3000 MW), to convert existing diesel-fired power plants (Peakers) to gas.

2.2.3 Risk Mitigation IPP Procurement Programme

The DMRE has issued a determination aimed at ensuring energy security for the generation of approximately 2000 MW from a range of energy source technologies in accordance with the short-term risk mitigation capacity allocated under the heading 'Others', for the years 2019 to 2022 of the Integrated Resource Plan for Electricity 2019 to 2030 (published as GN 1360 of 18 October 2019 in Government Gazette No. 42784 ('IRP 2019'). The procurement programme aims to haver new generation capacity linked to the grid by no later than 30 June 2022 (DMRE, 2020).

The RMIPPPP notes the following:

- The RMIPPPP has been designed to procure the target of 2000 MW of new generation capacity to be derived from different types of dispatchable power generation Projects
- The dispatchable power generation projects may utilise fuel to produce the energy output;
- The capacity and energy output will be procured from a range of energy source technologies;

The selected projects will contribute towards socio-economic development and sustainable economic growth, while enabling and stimulating the participation of independent power

2.2.4 National Climate Change Adaptation Strategy, 2019

The National Climate Change Adaptation Strategy (DEFF, 13 November 2019) (NCCAS) provides a common vision of climate change adaptation and climate resilience for the country, and outlines priority areas for achieving this vision. Since the NCCAS is specifically focussed on adaptation to climate change, mitigation of greenhouse gas emissions is dealt with in other policy documents. The NCCAS however acknowledges that adaptation action and mitigation action impact on one another.

The NCCAS is an important step forward for South Africa, as it (DEFF, 13 November 2019):

- Acts as a common reference point for climate change adaptation efforts in South Africa over the next 1 to 10 years, providing guidance across all levels of government, sectors, and stakeholders affected by climate variability and change.
- Provides a policy instrument in which national climate change adaptation objectives for the country can be articulated to provide overarching guidance to all sectors of the economy.
- Facilitates the degree to which development initiatives at different levels of government and business integrate and reflect critical climate change adaptation priorities, and thus inform resource allocation by the various stakeholders towards climate change resilience.
- Guides stronger coherence and coordination on climate change adaptation activities between different institutions and levels of government.
- Supports South Africa in meeting its international obligations by defining the country’s vulnerabilities, plans to reduce such vulnerabilities and leverage opportunities, outlining the required resources for such action, whilst demonstrating progress on climate change adaptation.

The NCCAS is divided into sets of strategic objectives, strategic interventions and strategic outcomes with associated actions. The document is directed not only at national government departments, but speaks to South African society as a whole, including the key relevant sectoral institutions, provincial governments and municipalities, and non-governmental entities including the private sector, the research community and civil society.

The vision of the NCCAS is:

> *To transition to a climate resilient South Africa, which will follow a sustainable development path, guided by anticipation, adaptation and recovery from a changing climate and environment to achieve our development aspirations.*

Although predominantly aimed at government, the strategic objectives, strategic interventions, and strategic outcomes with associated actions outlined in the NCCAS provide a host of opportunities for corporate social investment. The following actions are more directly relevant to gas to power projects within the Coega SEZ:

- 1.1.30: Encourage the private sector to build in low climate risk areas, using resilient materials, through incentives and tax rebates. This will involve the public sector developing guidelines and incentives for building infrastructure in low risk areas and using climate resilient materials.
- 1.1.31: Create a more adaptive energy system to reduce dependence on a centralised system and increase distributed generation, especially in rural areas. This will involve encouraging the development of an adaptive and decentralised energy system so that the system is more resilient to climate disruptions.

2.3 Environmental Process

The approach taken in this study is guided by the principles of Integrated Environmental Management (IEM) as described in the IEM guidelines published by the Department of Environmental Affairs and Tourism in 1992 (now known as the DEFF). The approach is therefore guided by the principles of transparency, which are aimed at encouraging decision-making. The underpinning principles of IEM are:

- Informed decision making;
- Accountability for information on which decisions are made;
- A broad interpretation of the term “environment”;
- Consultation with IAPs;
- Due consideration of feasible alternatives;
- An attempt to mitigate negative impacts and enhance positive impacts associated with the proposed project;
- An attempt to ensure that the social costs of the development proposals are outweighed by the social benefits;
- Regard for individual rights and obligations;
- Compliance with these principles during all stages of the planning, implementation, and decommissioning of the proposed development or activity; and
- Opportunities for public and specialist input in the decision-making process.

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

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

- DEA&DP’s EIA Guideline and Information Document Series (DEA&DP, 2013), which includes guidelines on Generic ToR for EAPs and Project Schedules, Public Participation, Alternatives, Need and Desirability, Exemption Applications and Appeals, an information;

- DEA's Public Participation Guideline in terms of NEMA EIA Regulations (DEA, 2017); and
- DEA's Guideline on Need and Desirability (DEA, 2017a).

The EIA process followed is depicted Figure 2-1.

SRK was originally appointed by the CDC and conducted an initial round of pre-application public participation activities for the consolidated gas to power project in 2016, details of which are included below. Subsequent changes in the project description, approach to the EIA process (most notably the splitting into four separate applications), lapsing of SRK's appointment, and additional technical studies undertaken, resulted in delays in commencement of the formal EIA process. Comments received during the 2016 public participation activities, as relevant to the Gas Infrastructure, have been recorded and responded to in Appendix H, and comments are provided in Appendix G3. To ensure compliance with the EIA regulations, legally required public participation activities are being repeated as part of the current application.

The activities that were carried out as part of the Scoping Study included:

- Distribution of the Background Information Document (BID) from 22nd January 2016 to identified Interested and Affected Parties (IAPs), stakeholders and neighbouring residents. A copy of the BID is attached in Appendix E, and the list of notified IAPs and commenting institutions is given in Appendix H;
- Recording of all issues raised in response to the BID (See summary of issues raised and responses to these in Appendix H);
- Preparation of a Draft Scoping Report (DSR), including comments from IAPs and release for public comment;
- On-site notices erected at each site, notifying the public of the project, on 2nd June 2020 (see Appendix C);
- Presentation of the project to the Coega ELC on 20th August (see Appendix F1) and 19th November 2020 (see Appendix F2), and inclusion of queries raised and responses to them in the DSR (queries raised during the 19th November meeting have been recorded and responded to in the Draft EIR);
- Advertisements of the development as an e-notice on the CDC notice board on 8 October 2020 (Appendix C);
- Submission of an application for environmental authorisation to DEFF on 9th October 2020, signalling the start of the regulated EIA process (see Appendix B);
- Distribution of the Executive Summary of the DSR to all IAPs registered for this process;
- Uploading the DSR for download via the public documents link on SRK consulting's website, for review by IAPs for a 30 day comment period, and submissions to relevant competent authorities;
- Collation of authority and IAP comments on the DSR, and incorporation of these into the Final Scoping Report;
- Placement of Newspaper advertisement in the Herald on 9th October 2020, notifying the public of the project, as per the legal requirements;
- Submission of the FSR, including comments and responses report, to DEFF on 22nd November 2020 for approval to proceed to the Environmental Impact Reporting phase of the EIA;
- Notifying IAPs of submission of the FSR, distribution of the Executive Summary to all IAPs, and making the full FSR for download via the public documents link on SRK consulting's website; and

- Receipt of the letter of approval of the FSR and Plan of Study for the EIA from DEFF dated 6 January 2021 (see Appendix G6)

Activities that have been carried out in preparation of the Environmental Impact Report included the following:

- Appointment of specialist and completion of specialist impact assessment reports (included as Appendix K), as per the terms of reference included in the Plan of Study for EIA in the FSR, as well as additional requirements as specified by DEFF in their approval of the FSR, and relevant comments received from IAPs;
- Preparation of the Draft Environmental Impact Report (EIR) (this report);
- Inclusion in the Draft EIR of issues that were raised during scoping (Section H);
- Presentation of the preliminary findings of the DEIR to the Coega ELC on 18 February 2021 (see Appendix F3). Queries raised during the meeting have been recorded and the responses provided will be recorded in the Final EIR);
- Distribution of the Draft EIR on 15 March 2021 to the relevant Authorities;
- Making the Draft EIR available for download on the SRK 'Public Documents' webpage, for review by IAPs;
- Distribution of the executive summary of the Draft EIR to registered IAPs; and
- Provision of a 30 day comment period on the Draft EIR (16 March – 18 April 2021).

2.3.1 Submission of Applications

An Environmental Authorisation and Provisional AEL are required before the proposed project may proceed. Application forms must generally be submitted at the outset of the S&EIR process. The required authorisations and their status are listed in Table 2-2.

Table 2-2: Environmental Authorisations, permits and licences required for the Project

Application	Authority	Status
EA	DEFF	An application for EA was submitted to DEFF on 9th October 2020 in compliance with Section 16 of the EIA Regulations, 2014.
AEL	DEFF	Application for Provisional AEL will be submitted to DEFF for approval prior to submission of the commencement of construction.

2.3.2 S&EIR Process and Phasing

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

The objectives of the Pre-Application Phase are to:

- Identify appropriate specialist studies using the national screening tool prescribed by Regulation 16(1)(b)(v) of the NEMA EIA Regulation, 2014, as prescribed;
- Identify stakeholders, including neighbouring landowners/ residents and authorities;
- Compile draft Scoping Report describing the affected environment and present an analysis of the potential environmental issues and benefits arising from the proposed project that may require further investigation in the Impact Assessment Phase; and
- Develop ToR for specialist studies to be undertaken in the Impact Assessment Phase.

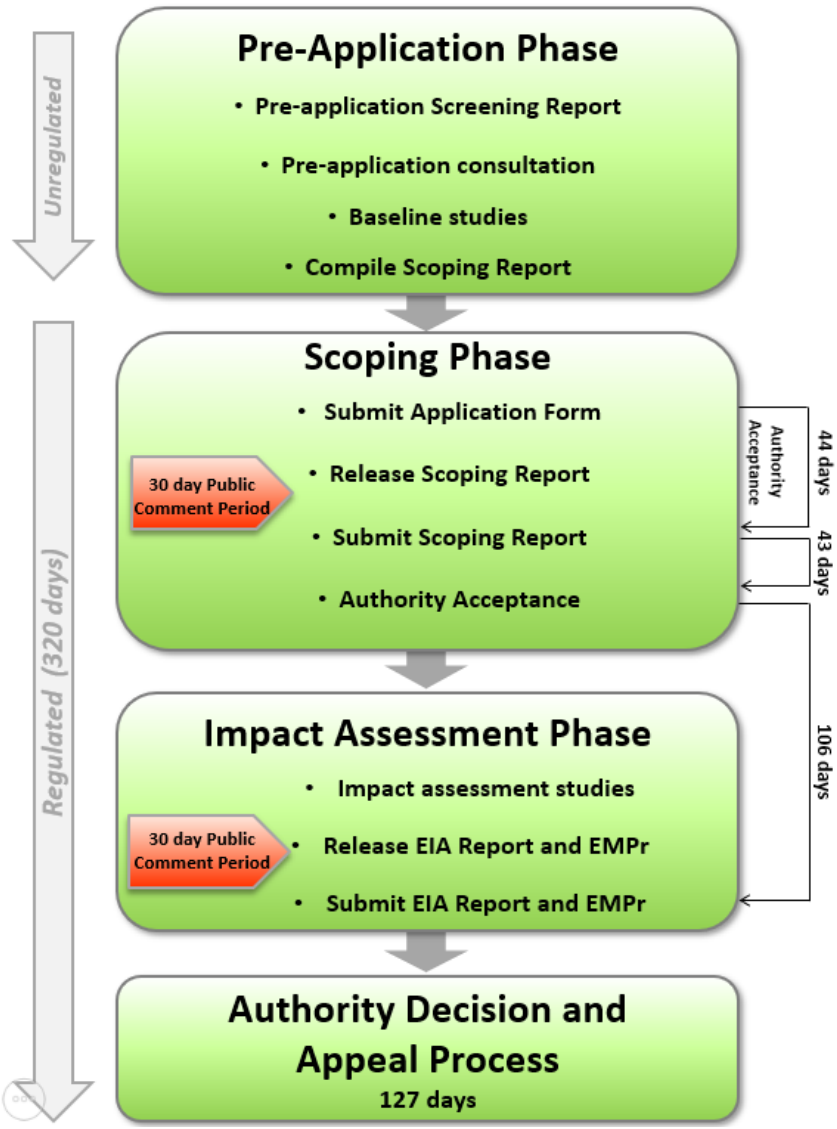


Figure 2-1: S&EIR process

The objectives of the Scoping Phase are to:

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

The objectives of the Impact Assessment Phase are to:

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

- Develop and/or amend environmental and social management plans based on the mitigation measures developed in the EIA Report and EMPr.

Further detail about activities undertaken or planned during the S&EIR process is presented in Section 5.

3 Description of Development Proposal

This chapter describes the key characteristics of the proposed gas infrastructure involved in establishing a gas to power project, within the Coega SEZ. The project design information in this chapter reflects the information available at the time of the compilation of the EIA Report. Since the design and EIA are being undertaken concurrently, the project description will evolve and be refined during detailed design.

3.1 Introduction

At the outset, it is important to note that this description is deliberately non-specific in terms of the proprietary technologies that would be required for the overall site development. As the specific technology providers have not yet been selected, the approach in this report is to describe each of the components of the development using typical/standard Gas to Power plant design information.

Where the different technologies that reasonably might be procured for this project have differing potential impacts, the worst case scenario was assessed. The basis of the design for the power plants, and the associated infrastructure, is that the power plants would operate at 100% capacity 80% of the time and the assessment of environmental impacts is based on the quantities associated with this design basis.

The project description is sequenced to “follow” the delivery of the LNG at the power plant to the evacuation of power to the previously authorised, but not yet constructed. 400 kV lines in the Coega SEZ, as depicted in the generic schematic (of the overall project) shown in Figure 3-1. Several key terms are described below (Section 0) as an introduction to the gas to power process.

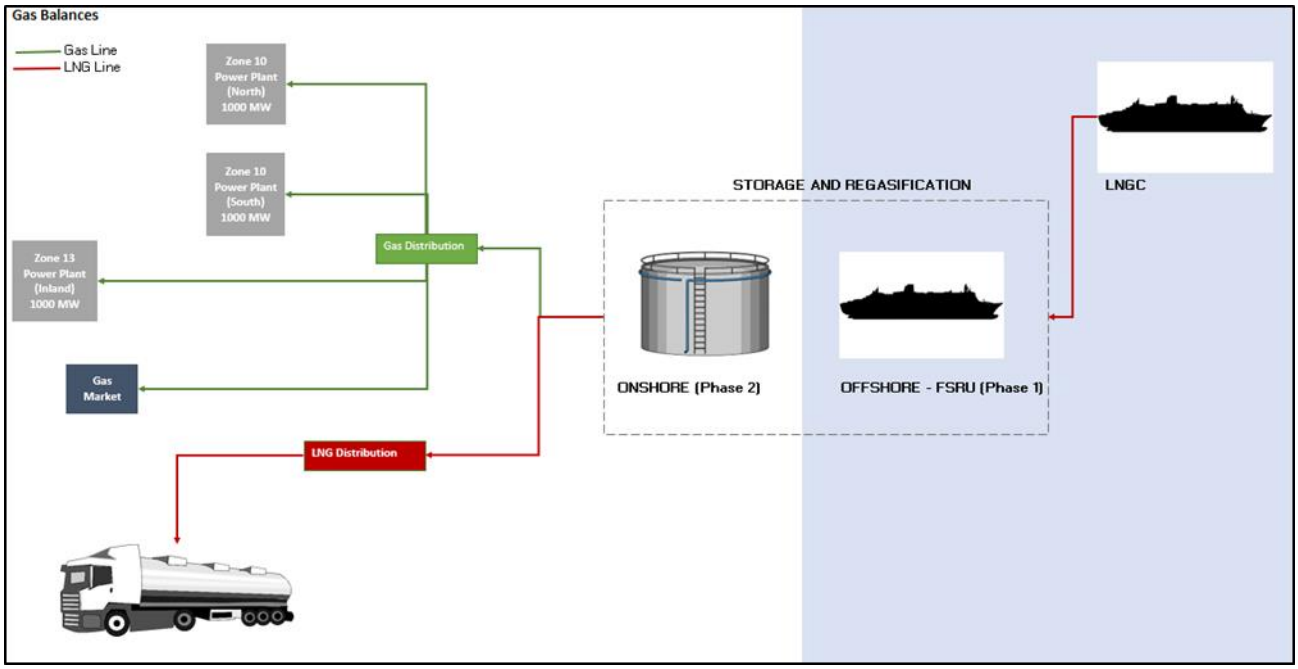


Figure 3-1: Schematic of scope of the gas to power project EIAs (Carnegie Energie, 2019)

3.2 Context

A number of national policy documents present the case for natural gas as a significant contributor to South Africa's energy mix (see Section 2).

In support of the vision for the South African gas programme, the DMRE is developing an LNG to Power Independent Power Producer Procurement Programme (IPPPP). The LNG to Power IPPPP

aims to identify and select successful bidders and enable them to develop, finance, construct and operate a gas-fired power generation plant at each of the two ports, Ngqura and Richards Bay. The LNG to Power IPPPP will provide the anchor gas demand on which LNG import and regasification facilities can be established at the Ports of Ngqura and Richards Bay. This will provide the basis for LNG import, storage and regasification facilities to be put in place that can be available for use by other parties for LNG import and gas utilisation development. Therefore, Third Party Access will be a fundamental aspect of the LNG to Power IPP Programme. This will enable the development of gas demand by third parties and the associated economic development. The DoE released a Preliminary Information Memorandum (PIM) in early October 2015, outlining the scope of the LNG to power projects.

In alignment with the future LNG IPPPP, the DMRE have recently released a 'Medium Term RMIPPPP which seeks 2GW of flexible power capacity to be online by June 2022. Projects awarded under this programme will also be required to align with a future LNG to power programme initiative. It is therefore envisaged that power projects can be developed to operate on an interim liquid fuel such as Diesel and Fuel Oil until LNG becomes available. Such projects would need to be of a smaller nature due to the construction time constraints and bid size limit of 50-450MW per project.

The following studies were undertaken/considered for the development of a Gas to Power project in Coega:

1. CCGT Plant identified during the EIA for the Aluminium smelter;
2. Power lines from the proposed CCGT site locality to Dedisa and Grassridge substations authorised in 2006 (Ref: 12/12/20/781);
3. 2004 – CSIR EIA started for a 1600 MW LNG Terminal and CCGT plant. Process stopped at Scoping stage;
4. 2009 – Worley Parsons PFS for 3200 MW CCGT power plant in Coega IDZ linked to LNG terminal;
5. 2016 – PRDW Pre-feasibility Report (FEL2) (DoE and TNPA): Importing of up to 3.96 mtpa into the Port of Ngqura;
6. 2016 – Mott-MacDonald IPP LNG-to-Power project (DoE), for 2000 MW at Richards Bay and 999 MW at Coega; and
7. 2020 – WSP Techno-Economic Assessment Report Cooling Concept for 3x1000MW Gas Fired Power Plant

Following various pre-feasibility studies, the CDC initiated an expression of interest (EOI) process, inviting responses from interested parties with the requisite experience to deliver the project including:

- Receiving, storing and re-gasifying LNG;
- Delivering LNG to a modular power plant;
- Design, procurement, construction and operation of the power plant;
- Power transmission at 400kV to the main SEZ sub-station; and
- The option of sourcing and transporting the LNG.

The gas to power project site selection process considered the following criteria (CDC, 23 September 2015):

- The availability of fuel for the operational life of a power plant of at least 20 years. The level of confidence for these fuel reserves needs to be high and it must be feasible to transport the fuel to the proposed power plant in a reliable and cost effective manner. The quality parameters of the gas must be acceptable and fairly constant over the life of the proposed

power plant. If power plant is not located at the source of the gas, then infrastructure to transport gas to the site must be available.

- Sufficient quantities of water must be available at the site, or it must be relatively straightforward to transfer to the site. The cost of the water must not be prohibitive. In most instances gas to power plants are built next to the sea. The availability of seawater is also required for regasification of the LNG (at the FSRU and later at the LNG & gas hub);
- Suitable and sufficient land on which to build the proposed power plant must be available as close as possible to the fuel source and to the users of electricity and should be able to help anchor the grid and reduce transmission losses where necessary;
- The distance to the national transmission system has to be evaluated. The cost of integrating into the existing network, the strengthening of that network and whether the upgrading of this network is compatible with the regional transmission system expansion plans; and
- The area where the proposed power plant is to be located must preferably be an area where the air quality is not already degraded. Whilst it is possible to mitigate atmospheric pollution, it is still preferable to avoid already highly stressed locations.

The advantages of the Coega SEZ as a location for the proposed development, according to the CDC, are summarised in Table 3-1.

Table 3-1: The Case for Coega's Gas Readiness - Fast Facts (CDC, 20 July 2015)

Alignment to National Strategic Drivers	The National Development Plan (NDP) envisages a South African energy sector that promotes economic growth, social equality and environmental sustainability by 2030. The Department of Energy's Integrated Resource Plan outlines gas-driven projects, which was further asserted by the 2012 Ministerial Determination allocation of 2,652 MW to be generated from Natural Gas between 2021 and 2025. This also supports the objectives of the Integrated Energy Plan, namely to: ensure the security of supply; minimise the cost of energy; increase access to energy; diversify supply sources and the primary sources of energy; minimise emissions from the energy sector; promote localisation and technology transfer and the creation of jobs.
World Class Site Location	• Coega SEZ consist of 14 zones with the total of 9,000 ha; • The proposed site for the two Zone 10 power plants (1,000 MW each) is in Zone 10 of the Coega SEZ, ±2 km from the deepwater Port of Ngqura and ±4 km from Eskom's Dedisa Substation; • The proposed site for the Power Plant (1,000 MW) is in Zone 13 of the Coega SEZ is, ±5 km from the deepwater Port of Ngqura and adjacent to Eskom's Dedisa Substation; • In 2009 Coega conducted a 2,500 MW CCGT Pre-feasibility study as preliminary analysis of the suitability and viability (strategic, technical, financial, regulatory, legal and commercial), linked to LNG terminal; • This is in addition to the 342 MW Dedisa Peaking Power Project which can be converted into a gas-driven power station; and • Close proximity to Shale Gas Prospects in the Eastern Cape offer opportunities for long term integration.
Progress on Environmental Authorizations (EA)	• EA for the rezoning of the Core Development Area of the Coega SEZ; • Existing EA for 400 kV Transmission Line between Gas-to-Power Project site in Zone 10 and the Dedisa Substation; • LNG-to- Power Project -Draft Scoping report (2006); • EIA underway for a marine pipeline servitude/ sea water intake for cooling; • EIA completed for the Dedisa Peaking Power plant; • EIA conducted for the proposed establishment of nine 132 kV power lines between Grassridge Substation (Eskom) & Coega SEZ

Infrastructure Outlay	• Availability of land on rezoned SEZ; • Approved Coega Infrastructure Master Plan – defined services corridor from Project site to Dedisa Substation; • Good access to site via National Road (N2) and ancillary road network.
Grid Connectivity	• Connection of the Gas-to-Power plant to the Dedisa sub-station via 400 kV lines into the national grid and at 765 kV, in future.
Gas Pipeline Infrastructure	• Approved Coega Infrastructure Master Plan; • Planned Gas servitudes in defined Services corridor – 4 km from Coast to Dedisa Peaking Power Plant; • Integration to the Operation Phakisa Gas Infrastructure Planning
LNG Berth at Port of Ngqura	• Transnet National Ports Authority to conduct a feasibility study on the LNG terminal (receiving, storage & regasification) to be built, operated and managed by a licenced operator; • At least two LNG berth options identified in conceptual studies; • Strong linkages between the Shale Gas prospects, LNG terminal and Gas infrastructure; • Potential to host Power Barges.
Socio-Economic Aspects for EC (Jobs & Skills)	• Increased Electricity generation in the Province & Balancing the Renewable Energy load - Stability of Electrical grid (Leading to confidence in province, thus stimulate economic growth); • Reduced energy constraint as gas can be used directly in industrial complexes - Gas can be used for chemical products manufacturing (Job Creation & Skills Development)

In addition to the advantages of the Coega SEZ as the project location, as summarised by the CDC, the DoE has noted the following reasons:

- The project is in line with a 2005 cabinet resolution;
- There is potential opportunity for other related projects;
- Sea water for cooling is readily available in proximity to the Power Station site;
- Reduction in transmission losses to the Eastern Cape;
- A large amount of preparatory work had already done by CEF/iGas;
- Increased economic activity and employment creation that would lead to socio-economic development in the region;
- Attract new industries on the back of power availability;
- Within a 26 km radius of a wide variety of specialist component suppliers;
- Manufacturing clusters that facilitate backward and forward integration of supply chains

3.3 Location and site description of the proposed project

The proposed gas infrastructure is located in the Port of Ngqura, as well as Zones 10 and 13 of the Coega SEZ, with pipelines crossing zones 8, 7, 6 and 11 as well (Figure 1-2). A map showing the various zones of the Coega SEZ relative to the proposed development sites is provided in Figure 3-2 for reference. The specific property portions which are listed in Table 3-2.

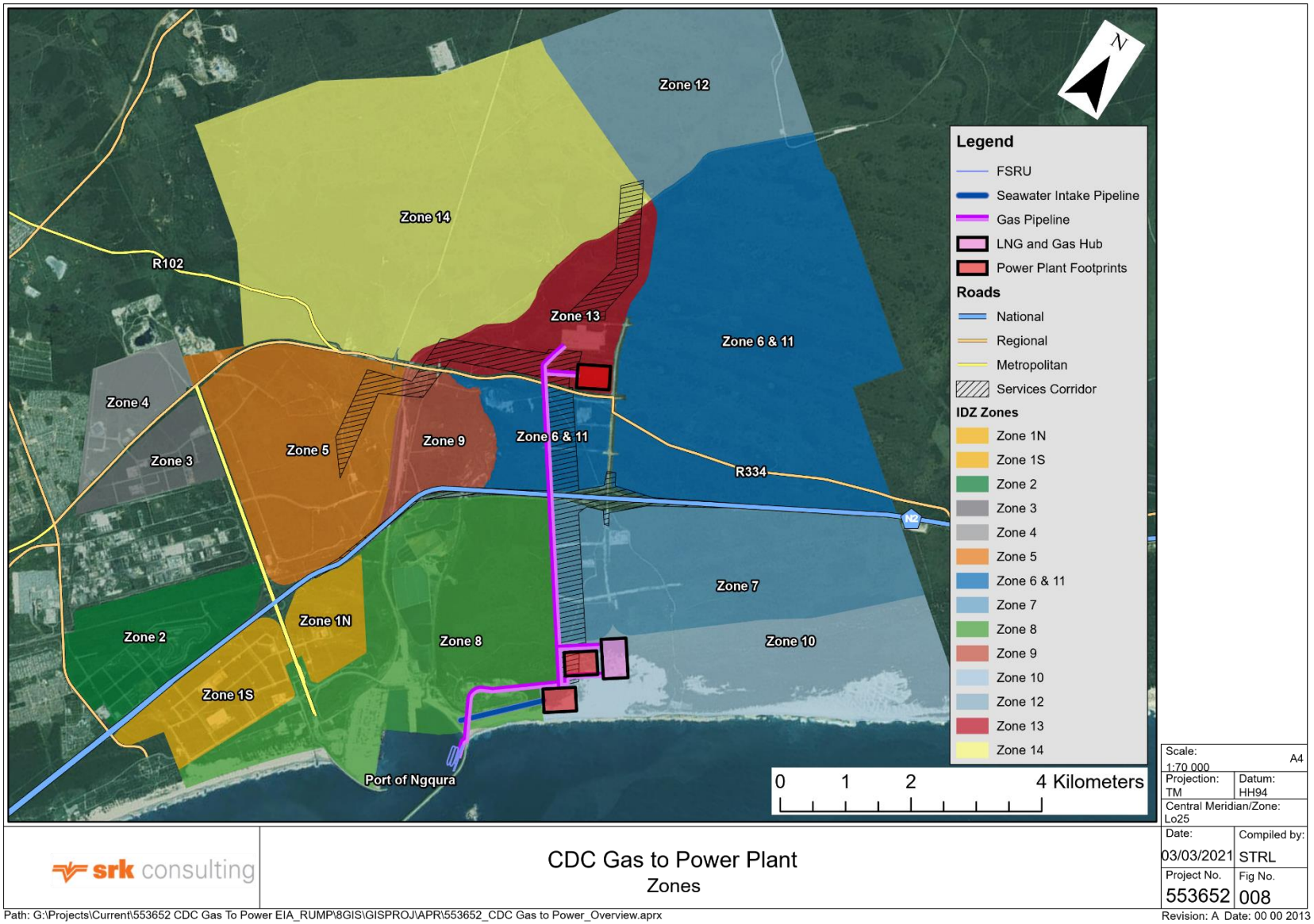


Figure 3-2: Coega SEZ zone layout

Table 3-2: Property details

LNG & Gas hub	**Farm Name/ Erf Number**	Erf 220, Erf 252
	SG 21 Digit Code	C07600230000022000000 C07600230000025200000
	Physical Address	Coega
Cryogenic & NG Pipelines	**Farm Name/ Erf Number**	Erf 255, 329, 220, 252, 281, 275, 312 and Erf 329
	SG 21 Digit Code	C07600230000025500000 C07600230000032900000 C07600230000022000000 C07600230000025200000 C07600230000028100000 C07600230000027500000 C07600230000032900000 C07600230000031200000
	Physical Address	Coega
Seawater intake pipeline, FSRU and jetty	**Farm Name/ Erf Number**	Erf 251, Erf 255, Erf 355
	SG 21 Digit Code	C07600230000025100000 C07600230000025500000 C07600230000035500000
	Physical Address	Coega

3.4 Key Terminology

As gas to power projects are relatively unknown in South Africa, this section presents a short non-technical description of key terms and acronyms used throughout this report. Images of typical examples of the equipment and facilities for LNG offloading and regasification are provided in Figure 3-3.

3.4.1 Liquefied Natural Gas (LNG)

Natural gas used for energy generation is primarily methane, with low concentrations of other hydrocarbons, water, carbon dioxide, nitrogen, oxygen and some sulphur compounds. LNG is natural gas which has been cooled below its boiling point (-161°C) in a process known as liquefaction. The process of liquefaction involves extracting most of the impurities in raw natural gas. The remaining natural gas is primarily methane with only small amounts of other hydrocarbons and consequently is widely considered a clean fossil fuel.

The quality of LNG is determined by means of gas specifications, and in particular the Wobbe Index (WI)(an indicator of the interchangeability of fuel gases). Imported gas, particularly from different sources, may need to be treated to achieve the same quality. Blending with nitrogen would make the LNG leaner, or alternatively if already too lean, the gas would need to be blended with liquid petroleum gas (LPG). Assuming all imported LNG falls within the range of allowable WI for Gas Turbines, conditioning via Nitrogen or LPG would be required to control the rate of change of WI when swapping between LNG sources. Gas Turbines typically allow a relatively wide WI band, however approx. 0,5% WI change per second. To achieve this rate of change, approx. 1.7 tonnes of LPG and 1.3 tonnes of Nitrogen (worst case + buffer capacity) would be required to change over between fuel specs. This conditioning of the LNG would take place at the FSRU (phase 1 of gas infrastructure development) or the LNG and gas hub (phase 2 of gas infrastructure development), prior to the gas being transmitted to each power plant.

Regasification is the opposite of liquefaction and involves the warming of LNG to the point where it becomes a gas. This process occurs naturally at ambient air temperatures (known as “boil off”), and is expedited by passing LNG through warmer media

3.4.2 Liquefied Natural Gas Carrier (LNGC)

Liquefied Natural Gas Carriers (LNGC) are ships designed for the transportation of LNG. The LNG is stored in specially insulated tanks (to maintain temperature below -162°C) inside the double hull of the ship to protect the cargo systems from damage or leaks.

The size and type of LNGC is dependent of the supplier of LNG (and ships are excluded from the scope of the EIA process). Mott MacDonald conducted ship modelling studies assuming vessels of 140,000 m³ and determined that for a 999 MW CCGT power plant 10.3 ships per annum would be required. It is estimated (Carnegie Energie, 2019) that, for 3,000 MW of generating capacity 80% of the time, and making an allowance for third party off take and supply to Dedisa (i.e.: the “maximum case” scenario), that one LNGC delivery every three days would be required (or ±95 deliveries per annum).

Figure 3-3: Selected images of LNGC & FSRU and berthing facility with land-based storage (capacities unknown)

3.4.3 Floating Storage Regasification Unit (FSRU)

An LNG Floating Storage and Regasification Unit (FSRU) is a specialised ship that is able to store and regasify LNG on board. Floating regasification requires either an offshore terminal, which typically includes a buoy and connecting undersea pipelines to transport regasified LNG to shore, or an onshore dockside receiving terminal (Zaretskaya, 2015). The FSRU remains permanently moored at a jetty or via single point mooring and is refuelled by a LNGC. LNG transfer from a LNGC to the FSRU can take place either side by side, through a jetty, or in tandem. The transfer system can either be through loading arms or flexible hoses. The FSRU is generally considered to be quicker to develop and require less capex but more opex than onshore regasification facilities. However, as the project

develops and increased volumes of gas are required for the power plants it is expected that land-based storage and regasification will become more economical and that the FSRU will in time be replaced by land-based infrastructure.

3.4.4 Cryogenic Pipeline

For ease of transport, NG is stored and transported in tanks as a cryogenic liquid (LNG), i.e. as a liquid at a temperature below its boiling point (-162°C) at close to atmospheric pressure. The transportation of LNG by pipeline (e.g. from a LNGC to a land-based storage and regasification plant or third party offtakers) requires insulated pipelines to minimise and capture Boil-Off Gases (BOG). Cryogenic pipelines are significantly more expensive than natural gas pipelines.

3.4.5 Buffer Volume and Buffer Time

Buffer volume is the stored volume of LNG (e.g. in the FSRU and/or in land-based storage) required for continuous supply of LNG to the power plant and below which an LNGC is required to berth. Buffer time is the duration between the stored volume of LNG falling below the buffer volume and the depletion of stored LNG. The buffer volume provides a safety margin should berthing of the LNGC be delayed, e.g. due to exceedance of berthing and/or offloading operational limits.

3.4.6 Boil Off Gas (BOG)

LNG is stored and transported in tanks as a cryogenic liquid, but even with effective insulation, part of the LNG reaches its boiling point and begins to evaporate creating BOG comprised largely of methane.

In the complete LNG cycle for marine bunkering, the amount of BOG created is a function of how long the LNG is held in the supply chain, the size and specification of the containers used, and the number and methods of transfers of LNG from one storage container to another. The longer LNG is stored before being used, and the more times it is transferred from one storage vessel to another, the more BOG is created. There are four main methods for dealing with the BOG created during LNG storage and handling: (1) releasing it to the atmosphere (also known as venting); (2) flaring; (3) capturing it for use as gaseous fuel, or (4) capturing and re-liquefying it.

3.5 Detailed Project Description

A generic process flow diagram showing the two phases of gas infrastructure establishment (initially, with off-shore storage and regasification of LNG in a FSRU (Phase 1) followed by development of an onshore storage and regasification facility at the LNG & gas hub (phase 2), is provided in Figure 3-4.

3.5.1 LNG Terminal

An LNG terminal will need to be constructed at the Port of Ngqura to accommodate the LNG transport/storage vessels and offloading operations. The marine components of the development are further discussed in the sections below.

The proposed site for the LNG terminal is located within and at the base of the eastern breakwater, seaward of the Admin Craft Basin (ACB) in the port.

LNG terminals are predominantly constructed as piled structures. This standard design was used as a baseline for the development of the proposed terminal.

A review was undertaken by PRDW in 2016, which determined that a piled jetty structure design was the most feasible, and which recommended the following (Figure 3-5):

- An access trestle with road and provision for pipelines and services: approximately 283 m long by 5 m wide deck on piled access trestle;

- A platform with provision for distribution of natural gas and future conversion to distribution of cryogenic LNG; and
- Mooring and berthing dolphins, to protect the berth infrastructure from impact.

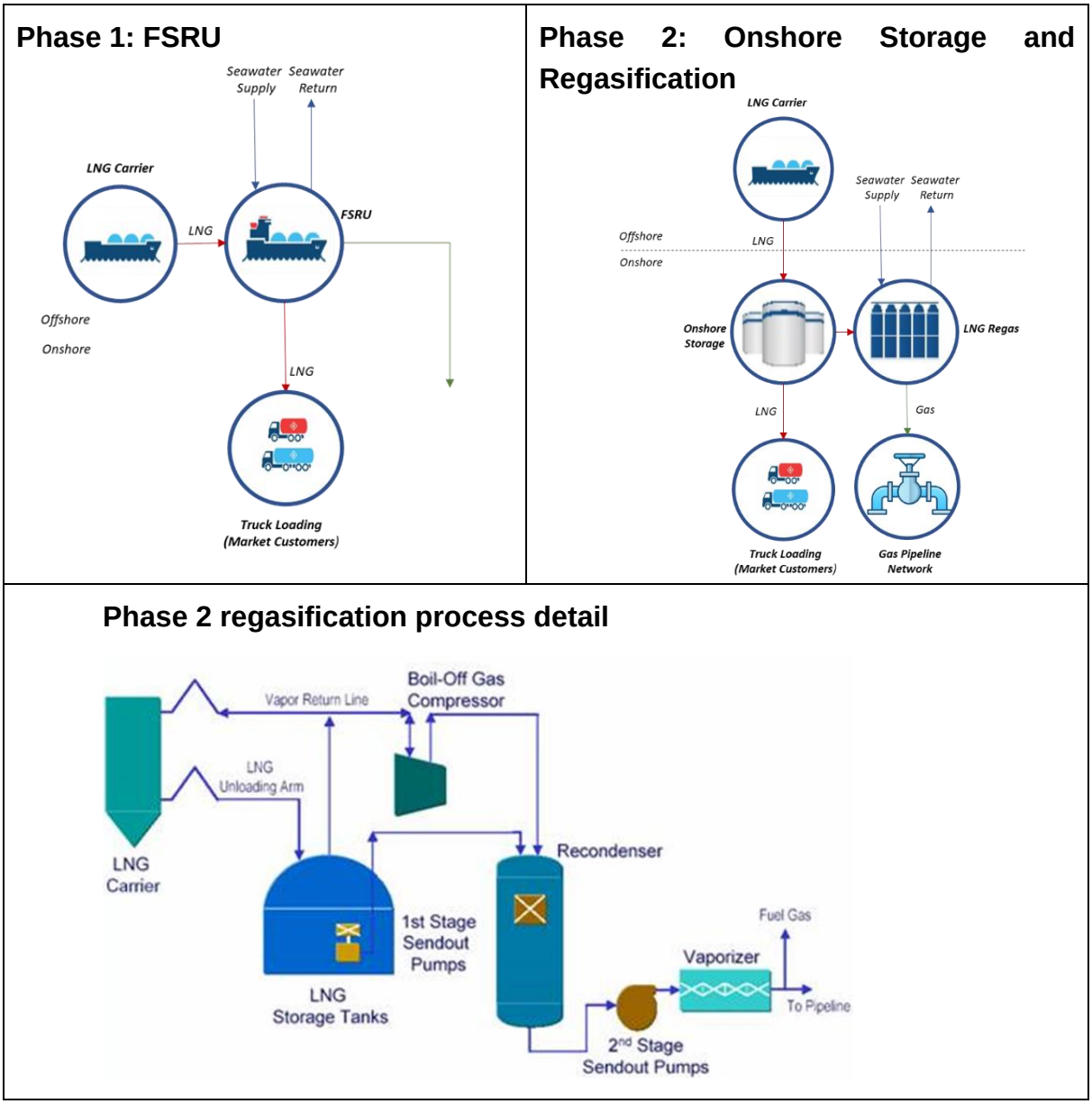


Figure 3-4: Example Process Flow Diagram of onshore and Regasification (Source: Marine Insights)

A separate platform area will be required when converting the FSRU terminal to a LNGC terminal, as the manifold positions on FSRU and LNGC vessels differ. A platform area of 20 m by 30 m was allocated for the distribution of gas and was based on the space requirements for the plant and equipment.

A large amount of plant and equipment will be needed for the distribution of cryogenic LNG, and will require a substantial area of platform space. A separate platform of 40 m by 30 m, constructed for the distribution of gas, was allocated for typical plant and equipment required on the LNG platform.

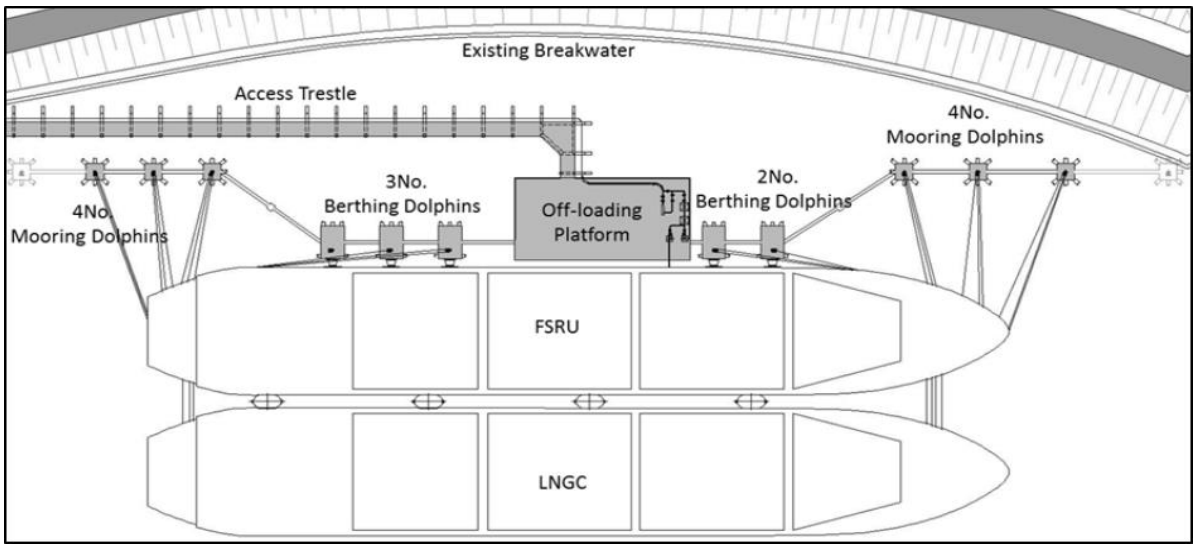


Figure 3-5: Layout 1 –Piled jetty structure (Source: (PRDW, 2016))

Typical plant and equipment to be accommodated includes:

- LNG unloading arms
- Vapour return
- Electric power generator
- Power generator (standby)
- Air compressor
- Fire hazard support systems
- Nitrogen system
- Foam system
- HP firewater pump
- Potable water pump
- Potable water tank
- Process and distribution piping
- Drainage and spill containment systems and facilities
- Storage areas for maintenance and safety equipment; and
- Process control and storage buildings required for land-based regasification.

The PRDW study found that Firewater Pump Packages would be required at the Jetty, mounted in dedicated Firewater Pump Rooms designed to be fully self-sufficient in terms of power, control and cooling. The pumps will draw seawater from the harbour.

Dredging

A dredging assessment (PRDW, 10 June 2016) was compiled based on a review of previous geotechnical surveys, and found that localised dredging is required in order to allow for an adequately sized dredge pocket and to reduce the encroachment of the new berth into the port manoeuvring area.

Two options are available for the disposal of the dredged spoil, namely onshore disposal for reclamation purposes and offshore disposal. Due to uncertainty with regards to the suitability of the material for re-use, offshore disposal has been selected as the preferred method.

A 2001 EIA for the Port of Ngqura identified a preferred site for offshore disposal of dredged spoil for port construction activities. The, site shown in Figure 3-6 and lies approximately 8 km offshore from the Coega River mouth with a depth of 29 m to 37 m. It is assumed that any further dredging (and disposal) activities required would fall under this existing authorisation, and that the same methodology and environmental management requirements would apply.

Preliminary calculations of anticipated dredge volumes as presented in Table 3-3 indicate that there is sufficient capacity for the anticipated volume of dredge spoil from terminal excavations to be spoiled at the location depicted in Figure 3-6.

Dredging is expected to involve loading of dredged material directly into a series of sailing hopper barges, which transport the material to the disposal area. Dedicated disposal locations within the site will need to be confirmed, with an attempt to locate a dump site as close as possible to the dredging works. Environmental monitoring of turbidity and water quality would be required at dredging areas and dump sites. It is anticipated that dredging activities will take approximately 22 weeks to complete.

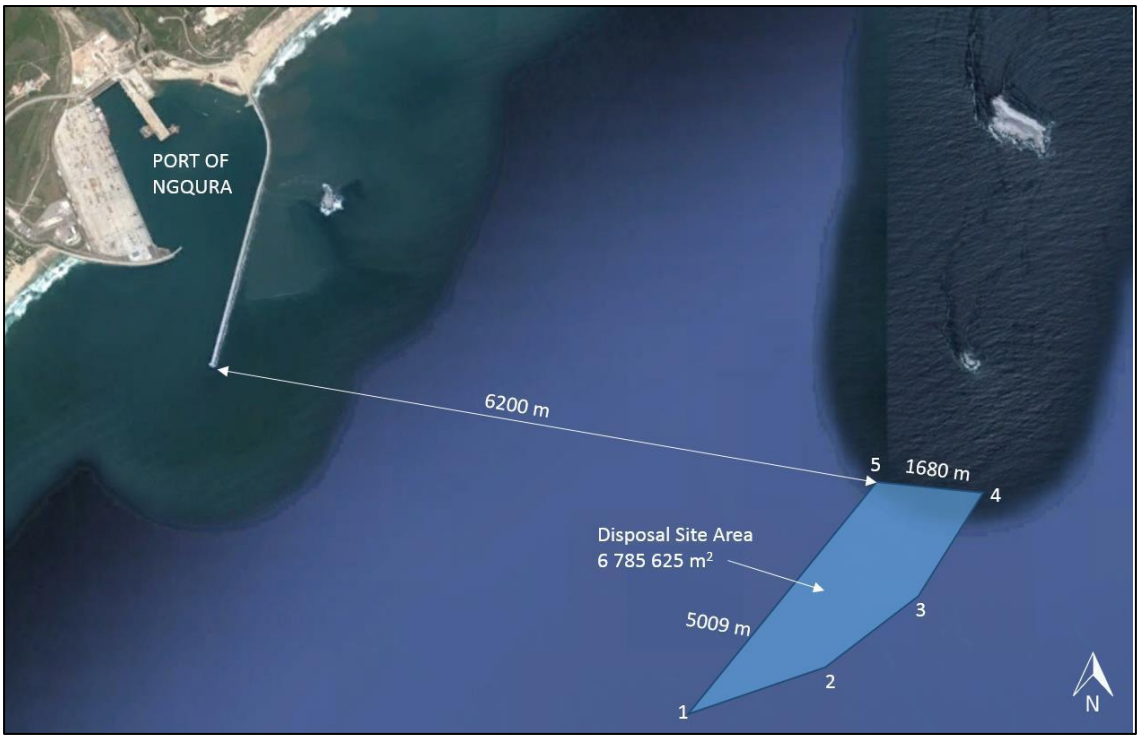


Figure 3-6: Location of proposed offshore disposal site (Source: (PRDW, 2016)).

Table 3-3: Calculated dredged volumes for the two LNG terminal layouts considered (Source: (PRDW, 2016)

Soil type	Layout 1 – Eastern Breakwater dredging volume (m^3)	Layout 2 – Dig-out option dredging volume (m^3)
Fill material and marine deposits	48,500	67,000
Gravel Lag Deposits (Cobbles and Gravels)	16,200	67,000
Soft Rock (Mudstone: 0 to 12.5 MPa)	-	903,000
Medium to Hard Rock (Mudstone: 12.5 to 30 MPa)	3,300	370,000
Hard Rock (Siltstone: 30 to 50 MPa)	-	74,000
TOTAL	**68,000**	**1,480,000**

3.5.2 LNG Carrier (LNGC)

LNG will be delivered to the Port of Ngqura via LNGC vessels. The LNGC would berth alongside the moored FSRU and transfer the LNG across to the FSRU storage tanks.

It is expected that LNG will initially be offloaded via a short cryogenic pipeline from the LNGC to the FSRU. However, once land-based storage is constructed, and the FSRU departs, LNG will then be pumped from the LNGC to onshore storage tanks via cryogenic LNG unloading arms and a cryogenic pipeline. The unloading process takes approximately 12 to 24 hours.

Boil off Gas is expected from the storage and transportation of LNG and measures to contain, capture, re-use and recover BOG are incorporated in the design of the LNGC and cryogenic pipelines. During the unloading of an LNGC, BOG reports back to the LNG tanker's cargo system by a separate vapour return line(s) to ensure that the pressure in both the FSRU or land-based storage tanks and the LNGC storage tanks is maintained within their design operating parameters.

3.5.3 Floating Storage and Regasification Unit (FSRU)

The main components of an FSRU include:

- LNG transfer system (offloading system),
- Storage tanks (in ship);
- Boil-Off Gas handling system,
- LNG pumping system,
- Vaporisation equipment, and
- Heat source (in this case seawater)

It is envisaged (Carnegie Energie, 2019) that up to two FSRU's, each with a storage capacity of 170,000 m³ (i.e. a total storage capacity of 340,000 m³) would be required for the project, although land-based storage is likely to be implemented before the second FSRU becomes a requirement. The FSRU, and potentially the second FSRU, will be berthed permanently at the FSRU terminal.

The FSRU houses onboard LNG regasification facilities for the re-warming of the liquefied gas back to natural gas at ambient air temperature via vaporisers. Various re-warming options are available, however the most likely option will be the extraction of relatively warm seawater and the subsequent discharge of the cooled seawater once it has heated the LNG. The estimated maximum quantity of seawater needed for heating LNG is at 20,840 m³/hour; discharged seawater would be 8º C cooler than the intake water (Carnegie Energie, 2019).

The FSRU will also be required to provide an LNG supply for local truck loading operations (described in Section 3.5.9). Therefore, even though the bulk of the delivery from the FSRU will be via a Natural Gas pipeline, there will be a requirement for a smaller cryogenic pipeline for the FSRU stage of the development. A Liquid LNG Unloading Arm System will be required to provide safe unloading of the liquid LNG from the FSRU for onward conveyance to the LNG Truck Loading Facility. The system will consist of two loading arms, with flow and return lines to enable cooldown and recirculation systems for BOG (Mott Macdonald 2016).

While an FSRU may be economically more viable while the rate of gas consumption is relatively low, it is expected to be more economical to develop land-based storage and regasification once as the demand for Natural Gas increases.

3.5.4 Gas Transmission pipelines

Two types of gas pipelines are required to transmit both LNG and natural gas from the LNG terminal to the three power plants and the boundary of the Dedisa peaking power plant (if required) and LNG and gas hub in Zone 10. All gas transmission pipelines will be installed underground and will require servitude widths of 20 m for the double cryogenic pipeline (for LNG) and 10 m for the gas pipeline (for natural gas). TNPA's preference for liquid product pipelines to be supported above ground to facilitate leak detection and maintenance is not applicable to gas pipelines, for which the safety benefits of burying the pipeline are decisive.

The pipelines will be approximately 1 km long and will run parallel from the FSRU, supported by a trestle structure running on the inside of the eastern breakwater until it reaches the landward end of the breakwater near the ACB, and subsequently further onshore to a turning / intersection point where they will be routed north and run along the coast to the zone 10 power plants and LNG and gas hub, as indicated on Figure 1-2 and the layout drawings in Appendix I. The pipeline route and road access avoid using the breakwater in accordance with the condition of the environmental Record of Decision stating that no infrastructure may be constructed along the eastern breakwater.

A single natural gas pipeline approximately 6 km long will then run in the services corridor from there to the zone 13 power plant and boundary of the Dedisa power station site. The diameters of the LNG and gas pipelines are currently unknown. Potential interference between the powerlines and gas pipelines (running parallel to each other in the services corridor) resulting from voltages and currents, will be taken into account in the final pipeline design and protection measures against corrosion and induced voltages, including cathodic protection.

Natural Gas Pipeline

During the period when the FSRU is in operation (Phase 1 of the LNG terminal), a pipeline will transfer natural gas from the Port to the power plants in Zone 10, and/or connect to the 4 km long gas pipeline from Zone 10 to Zone 13. The gas pipelines and associated servitudes will be accommodated within the services corridor depicted on Figure 1-2. It is expected that the pipeline will be extended up to the existing Dedisa peaking power plant, should this plant convert to gas.

The gas pipeline will also feed into the truck loading facility in the LNG and gas hub for third party offtakers.

Cryogenic Pipelines

LNG cryogenic pipelines will be installed to distribute LNG to third party offtakers (via the truck distribution centre located in the LNG and gas hub in zone 10). The pipeline will convey the LNG from the FSRU via the trestle and along the coastline, following the alignment of the gas pipeline, to the proposed LNG & gas hub, and will include a return pipeline (i.e. a double cryogenic pipeline, with a combined servitude of 20 m is proposed).

Phase 2 of the proposed LNG terminal development will entail onshore storage and regasification. This will include cryogenic pipelines to feed LNG from the LNG carrier to the land-based storage and regasification terminal located at the LNG and gas hub in Zone 10. The cryogenic pipelines will be routed underground on the landward side of the main breakwater as there is insufficient space between the ACB and breakwater to accommodate the above-ground cryogenic pipelines (Figure 1-2). Following this they will be routed parallel to the coast in a north easterly direction towards the LNG and gas hub and power stations.

3.5.5 LNG and Gas Hub

The LNG and gas hub will be located adjacent to the Zone 10 North power plant as indicated on Figure 1-2 and will include facilities for land-based LNG storage and regasification, as well as the truck distribution centre (for third party supply of LNG and gas). The hub will occupy a footprint of up to 23.1 ha, and will be fenced, with an access controlled entrance point. Facilities within the storage and regasification area include admin offices, a utility station and control room, maintenance and repairs workshop and store, a cold vent system, metering package and pig launcher. The truck distribution centre will include a weighbridge, control cabin and loading facilities. A conceptual drawing of what the layout of the facility may look like, including an 85 m sterile radius around the cold vent for safety, is provided in Figure 3-7. The hub will be connected to fire water pipelines (running from the LNG terminal in the port), gas and LNG transmission pipelines.

3.5.6 LNG storage

It is proposed that during Phase 2 of the gas infrastructure development, the FSRU will no longer be the most feasible option and land-based storage and regasification will become economically more feasible. The cryogenic pipelines (already constructed in Phase 1) will feed LNG directly from the LNG terminal to a new land-based storage and regasification terminal, at the LNG and gas hub. LNG storage tanks are designed to withstand cold temperatures, maintain the liquid at low temperature, and minimise the amount of evaporation. The BOG is usually captured and recondensed to be sent to the vaporiser with LNG or compressed and sent via the return cryogenic pipeline back to the storage and regasification unit.

It is estimated that up to a maximum of two FSRUs of 170 000 m³ LNG storage capacity each would be required for Phase 1 and up to two tanks of 160,000 m³ each for onshore regasification during Phase 2 (i.e. total LNG storage of 320,000 m³ to 340,000 m³) will be required (Carnegie Energie, 2019). No storage of natural gas is proposed.

The storage facility will require a venting system as protection against the risk of overpressure due to “roll-over” in the LNG tank. LNG “rollover” refers to the rapid release of LNG vapours from a storage tank, resulting from stratification.

3.5.7 LNG Regasification

The main component in the regasification process is the vaporiser, i.e. heat exchangers used to return the LNG to its regular vapour phase. Due to the proximity of the sea it is expected that the technically preferred vaporisers would be Open Rack Vaporisers (ORV). ORVs take seawater and stream it over the vertical tubes of the vaporisers in order to warm up the LNG. This is the most common type and generally is the preferred choice where warm seawater is available. The estimated maximum quantity of seawater needed for heating LNG is 20,840 m³/hour for a typical seawater delta T of 8º C across the vaporiser. (Carnegie Energie, 2019).

Infrastructure for the intake and discharge of seawater for heating purposes is excluded from the scope of this EIA process and will be addressed by the CDC’s Marine Pipeline Servitude EIA process that is currently underway. The seawater abstraction point is anticipated to be within the port as indicated in Figure 1-2 and cooling water intake and discharge pipelines are estimated to be 2.5 m in diameter and run underground, parallel to the coast on the seaward side of the gas pipelines, connecting to the zone 10 power plants and to the LNG and gas hub (for supply of heating water for regasification).

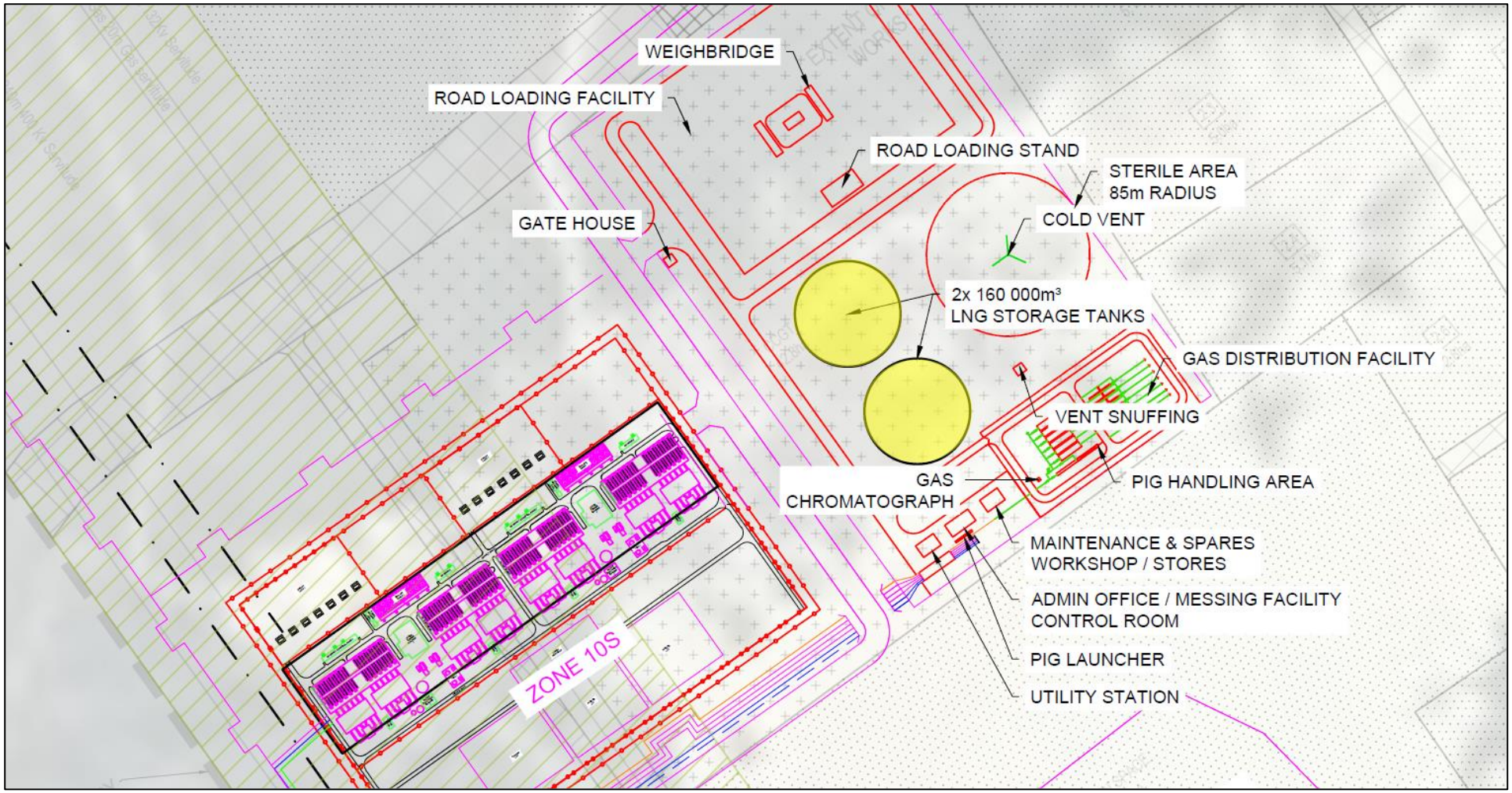


Figure 3-7: Conceptual layout of infrastructure included in the LNG and gas hub (Drawing provided by CDC)

Cold vent system

The regasification and storage facility (both onshore and offshore) will have its own independent overpressure protection and venting systems and fire and gas and depressurisation regimes. The design of the project is expected to be in accordance with a philosophy of minimum venting in order to protect the environment without compromising safety. During normal operation, there will be no flow of vapour from the facilities into the vent system.

Relief and vent streams from the FSRU are expected to be handled by the FSRU. Operational and minor upsets in the LNG Truck Loading Facility are also assumed to return to the FSRU (or onshore regasification unit once this is operational) through the cryogenic recirculation pipeline.

The vent system will need to be sized to handle vapour resulting from depressurisation of the gas pipeline between the jetty and the Emergency Shut Down Valve at the gas distribution facility, and any other coincident relief scenarios.

It is anticipated that there will be a requirement to depressurise the above ground section of the gas pipeline between the FSRU and the underground section of pipeline. It is not anticipated that it will be necessary to blowdown the underground section of gas pipeline.

An emergency Cold Vent system will be required to provide safe release of gas and depressurisation of the gas containing facilities up to the Emergency Shut Down Valve at the Gas Distribution Facility, in the event of an emergency upset or start-up/run-down conditions. The Cold Vent System is expected to terminate in a pipe vent supported by a structural steel stack of a height and location designed to ensure suitable dispersion of the gas. The Cold Vent System is expected to be provided with a Snuffing Package for manual use in the event of ignition.

3.5.8 Gas Distribution

The gas exported from the regasification unit will be transported to a gas distribution centre at the LNG and gas hub. The facility will have its own access point with a gate, and will include facilities for gas chromatography as well as pig handling and receiving.

Gas will be regulated at the facility to meet the export gas pressure and flow requirements based on the client's specific purposes. It is envisaged that the distribution facility will serve the power plants and third party users, including a truck loading facility. The gas may also be conditioned to correct for Wobbe Index using LPG and/or Nitrogen.

Each individual customer stream will be regulated to provide customer-specific pressure and flow rate requirements, and to allow metering of the gas. Once the gas passes the custody point, the gas is considered sold, and all facilities downstream of that point would be the responsibility of the customer.

Facilities for online operational pigging are included at each end to allow for pipeline inspection and integrity management. The receiving facilities at the distribution centre include a gas filter to allow any impurities in the pipeline after construction to be removed prior to export to clients. Long term use of the gas filter may not be required, depending on the pipeline and upstream facility cleanliness.

In addition to the above-mentioned items, the gas distribution facilities typically include:

- Emergency shutdown valves to automatically isolate the pipeline on the activation of a shutdown event;
- Valves on each customer stream to allow for the isolation of the particular stream for performance of maintenance on any of the equipment;
- Control room for local operation of the system;

- A cold vent to allow for de-pressurisation of any part of the facility as required in an emergency or during routine maintenance;
- Gas conditioning, which typically includes a gas mixing vessel and LPG and / or Nitrogen supply; and
- Firefighting facilities for emergency response in the event of fire.

3.5.9 Truck loading facility

A Truck Loading Facility will be provided within the LNG and gas hub for third party offtake. This will be complete with recirculation systems for BOG and LNG. The Truck Loading Facility will typically comprise a weighbridge and associated loading arms. Initially it is assumed that parallel loading of two road tankers should be provided for. The estimated offtake of LNG is approximately of 787 tpd, providing offtake by 40 x 20 ton LNG trucks per day.

3.5.10 Waste generation and management

During construction, waste types typically associated with large infrastructure will be generated, and disposed of at a landfill site in terms of the legal requirements. During operation, the following waste streams are expected:

- Used generator and turbine lubricant oil, which will be collected on site and removed in drums by a specialist contractor for appropriate disposal;
- Small volumes of oily sludge recovered from on-site surface water treatment;
- Spent gas turbine fabric air filter and lube oil filter cartridges;
- Dried powder / sludge and spent resins from on-site effluent treatment / demineralisation;
- Solid domestic waste (office consumables etc.);
- Scrap metals, plastic and packaging, which will be recycled where possible;
- Waste solvents and grease from cleaning of workshop equipment; and
- Spent laboratory chemicals from water testing and treatment.

Solid waste will be collected and stored on site at the LNG and gas hub in a properly designed facility, prior to regular collection and disposal by a registered contractor. Registration of the storage facility in terms of Category C of the Waste Management Activities may be required, should anticipated storage capacity exceed 100 m^3 of general waste or 80 m^3 of hazardous waste. This will be done post-authorisation once the relevant design details for the waste storage facility are known.

3.5.11 Sewage and stormwater management

Sewage, effluent and stormwater will be treated on -site to meet the required standards prior to discharge to CDC's bulk services infrastructure. Domestic sewage will need to be pumped to a sewage treatment plant. Depending on timing this would either be the proposed Coega WWTW or the existing Fishwater Flats WWTW.

Stormwater treatment on site will include oil and grease traps and separation of clean and dirty stormwater, details of which will be provided in a site specific stormwater management plan. Stormwater exiting the site will undergo quality monitoring at the discharge point, in addition to CDC's overall stormwater monitoring programme for the SEZ, and will need to comply with the CDC's overall stormwater master plan for the SEZ, which includes attenuation ponds and other bulk stormwater infrastructure.

3.5.12 Emergency Response

The CDC has an Emergency Response Plan to deal with emergency situations arising from operations in the SEZ and should aspects of the gas infrastructure (such as the LNG and gas hub and FSRU) qualify as a Major Hazard Installation (MHI), a detailed site specific Emergency Response Plan will be required. The Plan would incorporate emergency scenarios such as explosions, fire, structural failure and hazardous spills, and outline response procedures. The Emergency Response Plan is implemented in collaboration with emergency response organisations including National and Regional disaster management, emergency medical services.

3.5.13 Labour and Employment

Employment opportunities during construction are estimated to amount to 2030 jobs while it is anticipated that approximately 200 jobs would be created during operation. Thirty percent of these positions (for both construction and operation) would be allocated to local unskilled labourers and 70% by skilled workers. Additional socio-economic benefits resulting from indirect employment (provision of services and goods), stimulation of the local economy, and government levies and taxes paid would also result from the development.

3.6 Project Motivation/Need and desirability

3.6.1 Analysis of Need and Desirability of the Project

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

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

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

The consideration of need and desirability in EIA decision-making therefore requires the consideration of the strategic context of the project along with broader societal needs and the public interest (DEA, 2014). However, it is important to note that projects which deviate from strategic plans are not necessarily undesirable. The DEA notes that more important are the social, economic and ecological impacts of the deviation, and "the burden of proof falls on the applicant (and the EAP) to show why the impacts…might be justifiable" (DEA, 2017).

The *social* component of need and desirability can be assessed using *regional* planning documents such as SDFs, IDPs and EMFs to assess the project's social compatibility with plans. These documents incorporate specific social objectives and emphasise the need to promote the social well-being, health, safety and security of communities, especially underprivileged and/or vulnerable communities.

The proposed gas to power plant will create employment opportunities during the construction and operation phases and provide power to the national energy grid during the operation phase, improving energy security at a national level and indirectly facilitating further development opportunities in the area. The project would therefore constitute a strategic investment that will generate benefits through the provision of power, in a more environmentally sustainable manner than coal fired power generation. The project will also potentially allow for increased power supply from renewable energy sources over the longer term, thereby mitigating intermittency of supply to facilitate a more assured, dispatchable power supply.

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

- Improve job creation opportunities;
- Ensure appropriate economic growth;
- Concentrate on sustainable job creation, using existing economic strategies as a basis, particularly business and infrastructure development;
- Encourage trade and investment through improved energy availability and security; and
- Provide adequate and appropriate infrastructure to stimulate economic growth.

The proposed project is aligned with the above objectives, which effectively support the development of the gas to power plant as a means to ensure economic growth and energy provision.

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

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

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

In support of this, the applicant's motivation for the project is presented in Table 3-1. In essence, the power plant is needed to address current and projected energy shortfall at a national level, as well as stimulate local employment and the economy.

Gas fired power generation is among the current alternative sources of energy which has been shown to be an efficient and, in comparison with coal fired power plants, a relatively clean method of thermal power generation. The primary fuel type being considered is natural gas, although provision is also

made for the storage and use of other fuel types (i.e. diesel and fuel oil), as a backup fuel, and possibly for initial periods, should gas supply be delayed for any reason (CDC, 23 September 2015).

A study comparing the life cycle emissions of natural gas and coal used for the generation of electricity in the United States of America revealed that, using existing power generation technology, natural gas is a cleaner energy source (Jamarillo, et al., 2007). This is illustrated in Figure 3-8, where the ranges of GHG emissions for coal, natural gas and LNG are compared.

GHG emissions from the combustion of natural gas range from 340 – 590 kg CO_2 equivalent/MWh. This is much lower than that of coal which ranges from 900 – 1180 kg CO_2 equivalent/MWh. This differential persists when the entire life cycle is taken into account. Furthermore, when the liquefaction, shipping and regasification processes involved with LNG are included, on average natural gas still remains cleaner than a coal alternative.

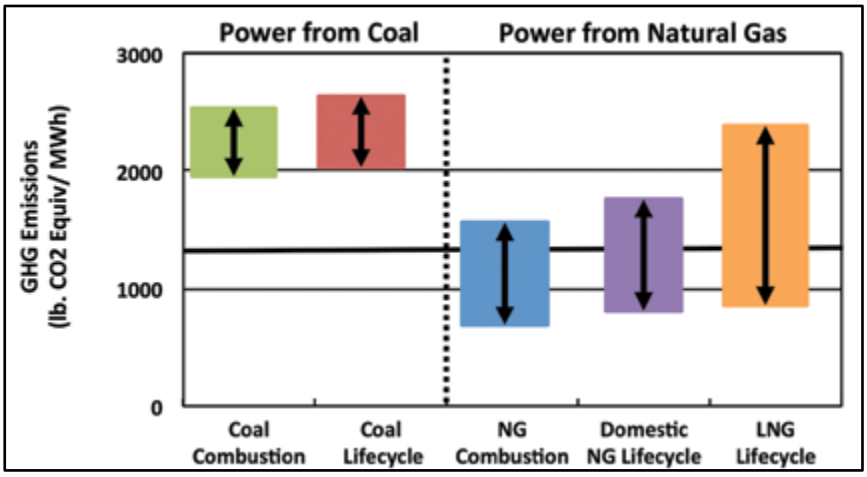


Figure 3-8: Fuel combustion and Life-cycle GHG Emissions for Existing Power plant technology (Source: (Transnet SOC Ltd, 2015))

The development of natural gas infrastructure also has the potential to enable other uses of natural gas, including direct heat and chemical feedstock for industrial processes, commercial and residential cooking and heating applications, as well as an alternative fuel source for transport.

3.6.2 Alignment with Energy Initiatives

The Gas to Power project is consistent with energy initiatives, and specifically the objectives of (CDC, 20 July 2015):

- Research & Knowledge Building;
- Public Awareness;
- Triggering the gas sector in the Eastern Cape; and
- Identification of Local industry participation & development

Furthermore, the current predicted spread of shale gas is predominantly in the Eastern Cape and the Northern Cape and if shale gas is to be developed then the Eastern Cape would be at the forefront of this (CDC, 23 September 2015) with resulting opportunities for long term integration.

3.6.3 Land Use Planning Policy Framework

The proposed development is situated within the Coega SEZ and the Port of Ngqura and is consistent with land use planning objectives that the Coega Development Corporation has defined for the SEZ.

3.7 Phasing

Implementation timeframes for the gas infrastructure would be dependent on demand (primarily by the CDC's proposed gas to power plants), and a developer being secured. Depending on when generating licences are obtained for the power plants, development of the gas infrastructure could occur simultaneously or prior to the power plants. Although there is the possibility that one or more of the power plants do not obtain generating licences for gas fuelled power generation, for the purposes of assessing cumulative impacts, it is assumed that the Dedisa power plant (proposed as a possible third party off-taker), together with all three proposed power plants, will.

A phased approach to the development of the gas infrastructure is proposed, whereby LNG storage and regasification will initially take place at up to two FSRUs moored in the port, from where natural gas will be piped to the gas distribution centre at the LNG and Gas hub in Zone 10. When gas demand has increased to a level at which the development of an on-shore storage and regasification unit is economically feasible, the FSRUs will be released and the LNG will be piped from the mooring jetty in the port to the LNG and Gas Hub, where it will be stored and regasified for distribution to the various power plants and other offtakers. The timing of the changeover from offshore to onshore storage and regasification is not currently known and will depend on gas demand in the area.

4 Description of the Affected Environment

The study area has been described in great detail in the various studies already undertaken for the Coega SEZ and the Port of Ngqura. A map showing the various zones of the Coega SEZ relative to the proposed development sites is provided in Figure 3-2 for reference.

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

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

It is important to note that the affected environment description focuses more on a general overview of the surrounding baseline environment, with some specific focus on those aspects that could be affected by the project.

The baseline is based on literature review and previous studies undertaken in the study area. Where appropriate, baseline information has been supplemented or generated by specialists appointed to undertake baseline and impact assessments for the proposed project.

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

Table 4-1: Specialist studies undertaken for the EIA

Specialist Study	Specialists	Organisation
Air Quality Impact Assessment	M. Zunckel A. Raghunandan Y.Moodley.	uMoya-NILU Consulting (Pty) Ltd
Quantitative Risk Assessment	M. P. Oberholzer	RISCOM (Pty) Ltd
Climate Change Assessment	R. Louw K. Erasmus J. Naidoo M. Rommelspacher	Promethium (Pty) Ltd
Noise Impact Assessment	B. Williams	Safetech
Traffic Impact Assessment	C. Hastie	Engineering Advice and Services (Pty) Ltd
Marine Impact Assessment	A. Pulfrich	Pisces Environmental Services (Pty) Ltd

Final specialist baseline and impact assessment reports are attached as Appendices K1 to K6

4.1 Biophysical Environment

4.1.1 Climate

The Eastern Cape Province has a complex climate. There are broad variations in temperature, rainfall and wind patterns, mainly as a result of movements of air masses, altitude, mountain orientation and the proximity of the Indian Ocean.

The Port Elizabeth (as of February 2021, renamed Gqeberha) region has a warm temperate climate and the temperature range is not extreme, although high temperatures can occur during summer. Averages of daily minimum, maximum and mean temperatures for the period 1961 – 1990 are

presented in Figure 4-1 with accompanying wind. Very high temperatures may be experienced during berg wind conditions when maximum temperatures my exceed 30°C.

Rain occurs throughout the year, brought about by convective summer rain and winter rain associated with the passage of frontal systems. The area receives an annual average rainfall of 624 mm. Monthly average rainfall data for Port Elizabeth Airport for the period 1961 – 1990 is presented in Figure 4-1

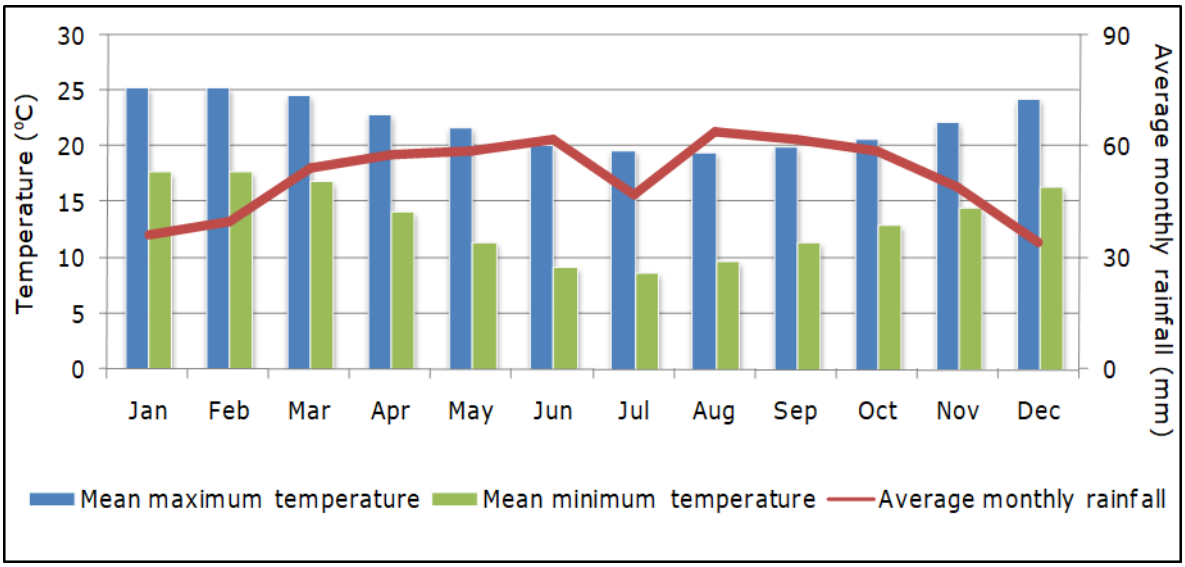


Figure 4-1: Average of daily minimum, maximum and mean temperatures (°C) and average monthly precipitation (mm) at Port Elizabeth Airport for the period 1961 – 1990

Prevailing wind tends to follow the coastline and the prevailing winds in the Port Elizabeth area are west-southwesterlies and east-northeasterlies. Wind roses are presented for Port Elizabeth Airport, Amsterdamplein (in the Coega SEZ), Motherwell and Saltworks in Figure 4-2.

The airport at Port Elizabeth is the most climatologically representative of the sites and is well exposed to the prevailing synoptic-scale winds, showing a high frequency of winds from the sector west to southwest (more than 50% of all winds). These are also the strongest winds. There is some occurrence of wind from the northeast and east at this site. The annual average wind speed here is 5.7 m/s.

The winds at Amsterdamplein, Motherwell and Saltworks (all in the Coega area) also indicate the occurrence of reasonably strong west to southwesterly synoptic scale winds. At Amsterdamplein, winds are fairly, equally spread from the southwest, southeast, northwest, north and north-northeast, with an average wind speed of 4 m/s. At Motherwell, winds are predominantly from the northwest to southwest and east-southeast, with an average wind speed of 3.4 m/s. At Saltworks, winds are mainly from the west-northwest to southwest, north and east, also with an average wind speed of 3.4 m/s.

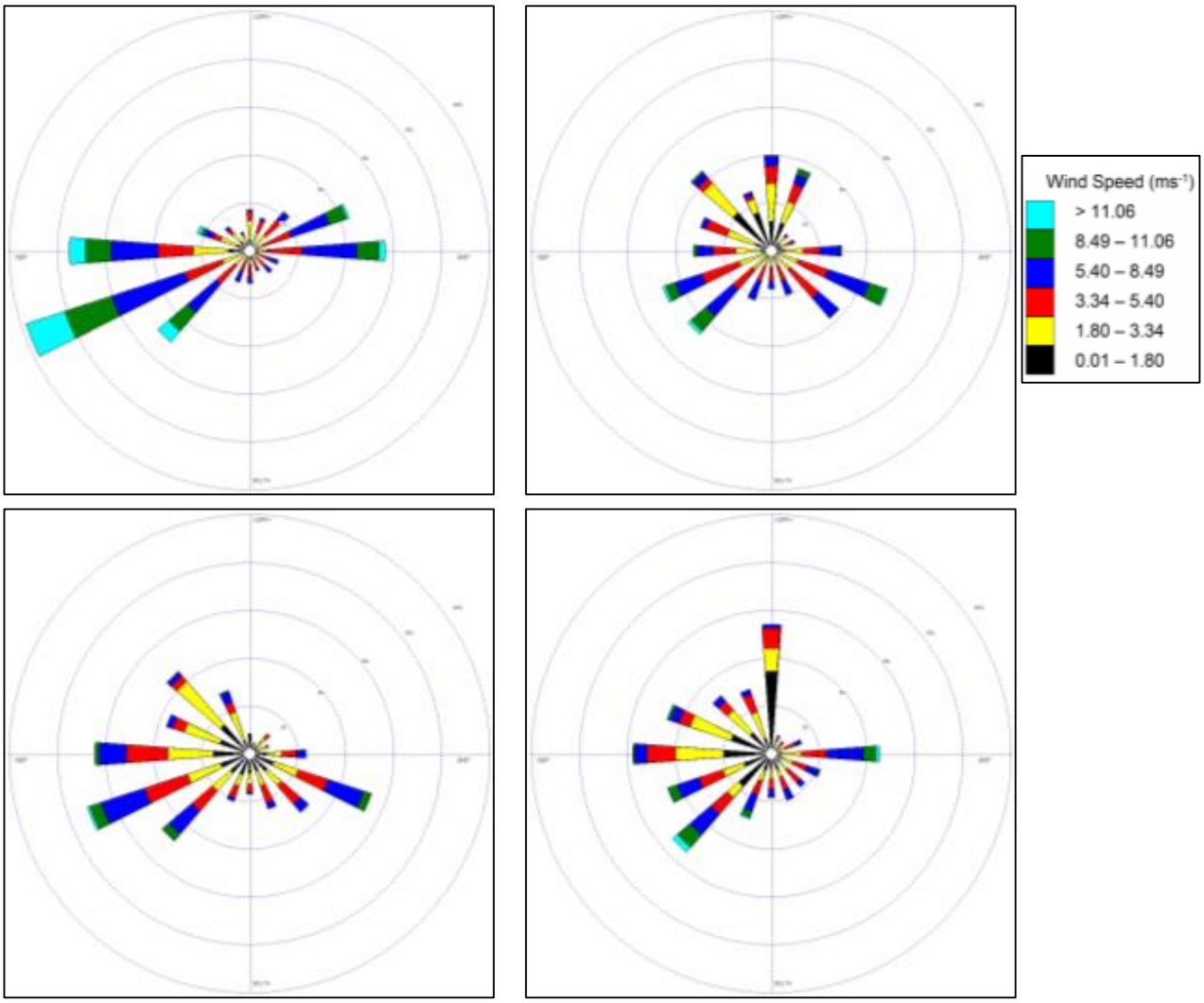


Figure 4-2: Annual wind roses for Port Elizabeth Airport, Amsterdamplein, Motherwell and Saltworks for 2009-2011

4.1.2 Geology

The bedrock around Port Elizabeth is characterised by the Peninsula Formation sandstones of the Table Mountain Group. This formation consists of coarse-grained super-mature quartzitic sandstone and is relatively resistant to erosion. It forms the bedrock of Algoa Bay and emerges as outcrops in the bay as the islands of St Croix, Jahleel, Bird and Brenton. The areas between these islands are filled with recent marine deposits (Alexandria Formation), which directly overlie the mudstones of the Kirkwood Formation. The geology of the Coega SEZ is characterised by coastal limestone, overlaid by calcareous sands blown onshore.

The Coega SEZ is underlain by a wide spectrum of sedimentary rocks spanning an age range of some 470 million years. These sediments are assigned to the Palaeoozic Table Mountain Group, the Mesozoic Uitenhage Group and the Caenozoic Algoa Group. Levels of bedrock exposure within the Coega SEZ are generally very low due to extensive cover by superficial drift (e.g. soil, alluvium, in situ weathering products) as well as by surface calcrete (pedogenic limestone) (Almond 2010).

The Coega Fault extends west of the Groendal Dam eastwards towards the coast, dipping at between 30° and 60° for about 120 km. It is a normal tensional fault with a vertical southward throw of 500 m to 100 m. A map showing the geology of the area is provided in Figure 4-3.

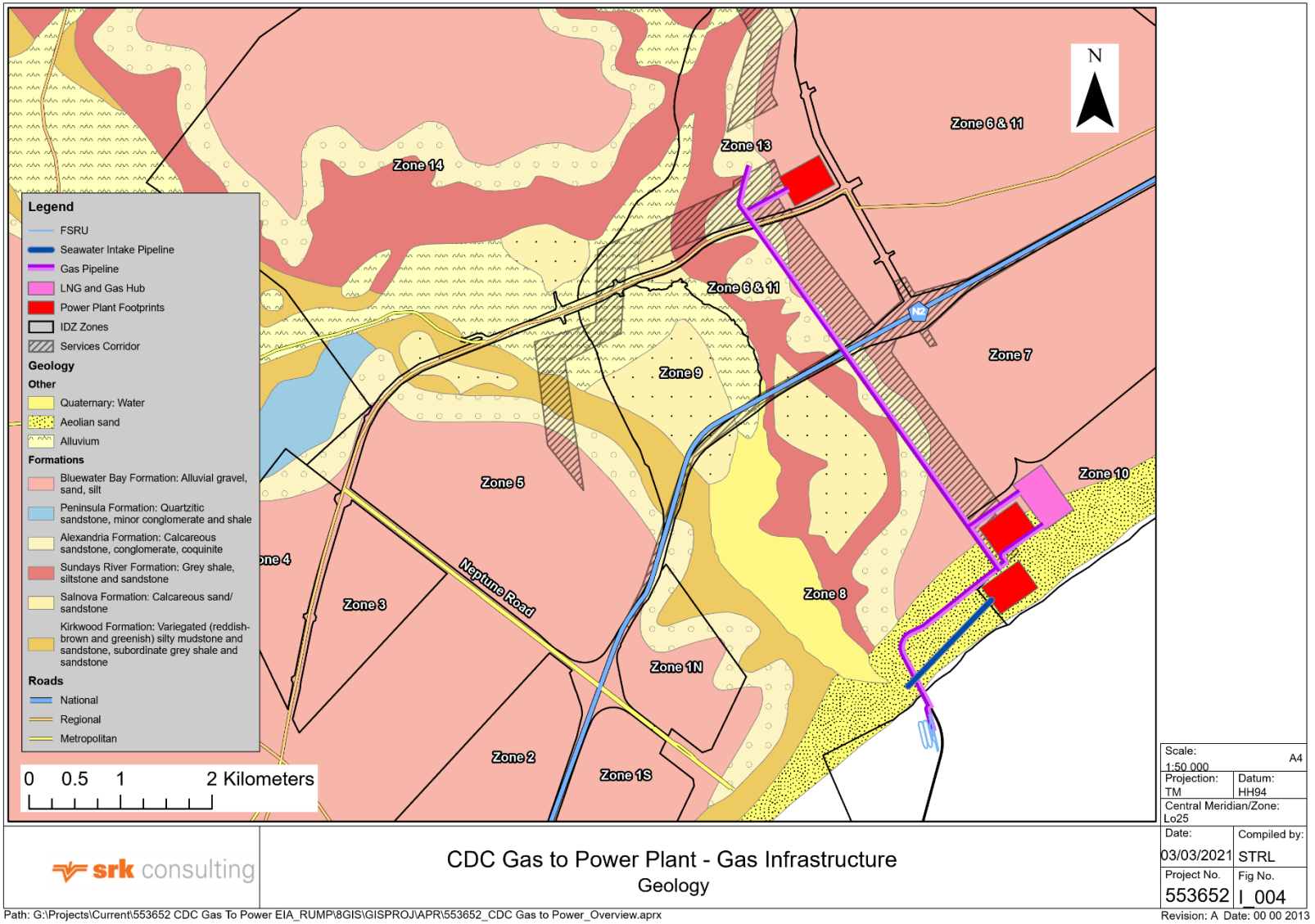


Figure 4-3: Geology of the proposed Gas Infrastructure site area

4.1.3 Topography

The SEZ is situated on a coastal platform that descends towards the sea in a series of gentle steps parallel to the existing coastline. This platform has been incised by the Coega River, which flows towards the sea across the western and south-western parts of the SEZ. The site in Zone 10 is largely covered by dunes and rises to approximately 60 m above sea level.

4.1.4 Land Use

The Coega SEZ consists of approximately 11,000 hectares of sector specific zoned land with purpose built infrastructure and is earmarked for industrial development. Land uses in the Coega SEZ presently consist of infrastructure, harbour facilities, industrial & commercially developed land, and vacant land. Vacant land is destined for a combination of future industrial land and open spaces, as per the CDC's Open Space Management Plan (OSMP). The OSMP has identified environmental no-go areas that are to be protected from development. These no-go areas have varying functions from natural areas, where emphasis is on conservation of areas to protect special vegetation types and preserve ecological processes, to recreational and visually attractive open space areas for relief in the built environment, screening off industrial buildings and softening the development.

The sites identified for the proposed gas infrastructure predominantly lie within Zone 8 (port), and Zone 10 of the Coega SEZ (see Figure 3-2). The Coega OSMP (2014) has identified Zone 10 for the use of the mariculture and aquaculture industries, as well as gas to power plants.

The proposed location for the FSRU is in the Port of Ngqura, the area of influence also extends to the marine environment which includes Algoa Bay and the islands of St Croix, Brenton, Jahleel (offshore of the port) and Bird Island, Seal Island and Stag Island (offshore of Woody Cape). Jahleel Island is located less than 1 km from the eastern breakwater of the Port of Ngqura and falls under the Greater Addo Elephant National Park as do Bird and St. Croix Islands. The Addo Elephant National Park Marine Protected Area (MPA) has recently been gazetted and incorporates approximately 120 000 ha from the eastern breakwater of the port to Cape Padrone to the east, as shown in Figure 4-6.

A small controlled use MPA exists around each of the islands, to protect important marine wildlife, while the remaining area of the MPA is designated as restricted use

4.1.5 Surface and Ground Water

The Coega River, which is a relatively small sand-bed river, is the most significant surface water feature associated with the Coega SEZ and flows to the west of the project site. The Coega catchment area is approximately 45 km long, 15 km wide and has a total area of about 550 km^2. The Coega River classification, based on preliminary river classification guidelines, ranges from moderately modified (i.e. C classification) in the upper reaches to critically modified (i.e. F classification) in the lower reaches at the Saltworks facility.

The SEZ is underlain by calcrete, sand and gravel deposits that overlie low permeability clays. These clays limit the vertical infiltration of rainwater and induce a horizontal groundwater flow towards the Coega River channel. Consequently, rapid run-off takes place following precipitation. Due to the limited infiltration of rainfall, a significant fluctuation in groundwater level does not occur, although groundwater levels can fluctuate by 3-4 metres with rainfall. Any contaminants originating from the power plant could infiltrate the sandy subsurface but would eventually emanate in seepage in the Coega River and beach environments.

According to NFEPA no natural wetlands are present within 500 m of any of the proposed gas infrastructure (Figure 4-6).

4.2 Biodiversity

4.2.1 Vegetation

Mucina and Rutherford (2006) developed the National Vegetation map (2012) as part of a South African National Biodiversity Institute (SANBI) funded project: According to Mucina and Rutherford, , Coega falls within the Albany Thicket Biome with the vegetation type of the area consisting largely of Coega Bontveld which is also known as Grass Ridge Bontveld (Vlok & Euston-Brown, 2002).

The vegetation units along the gas infrastructure route include Coega Bontveld, Algoa Dune Strandveld, Cape S according to the 2012 version of the vegetation map of South Africa. Campbell (2007) conducted a terrestrial vegetation assessment for the development of an aquaculture facility in Zone 10. Three vegetation types were identified: Bontveld, Albany Dune Strandveld and Cape Seashore vegetation.

An Ecological Impact Assessment was compiled by CEN as part of the Dedisa Peaking power Plant EIA in Zone 13 in 2007. The study site was not in a pristine condition at the time of the study as the presence of alien plant species and access tracks were identified, however the vegetation was still considered to be in a good condition. A combination of Mesic Succulent Thicket, Bontveld and Grassy Fynbos were found to exist within the footprint of the Peaking power plant.

During recent search and rescue operations in zone 10 of the SEZ, the critically endangered *Ledebouria coriacea* (not previously listed for the area) was found.

Bontveld with grassy fynbos

This vegetation type is often found on moderately undulating plains and is characterised by scattered circular clumps of bush up to 3 m high and 5 m in diameter, dispersed in grassland or mixed grass and low shrub community with scattered open patches rich in succulent species. It is restricted to shallow stony soils on ridges strongly influenced by an underlying calcareous substrate. This uncommon soil and geological structure, along with the local climate, has given rise to a unique, semi-arid habitat that includes several rare and endangered localised endemics, and a host of Species of Conservation Concern (SCC), often in the form of small succulents and geophytes.

Thicket clumps are generally restricted to doline karsts created through the dissolution of limestone aggregations by rainfall and groundwater creating round depression which accumulate deeper soils allowing the establishment and growth of bigger thicket shrubs. Succulent patches are generally located on calcrete outcrops with shallow soils and a significant gravel component. Grassy shrubland comprises the remainder of the vegetation unit.

The bush clumps are dominated by *Euclea undulata*, and contain typical Thicket dominants such as *Ehretia rigida, Maytenus procumbens, Polygala myrtifolia, Scutia myrtina, Searsia incisa, S. pallens, S. pterota* and *Sideroxlyon inerme*. Robust succulent species such as *Aloe africana, Aloe ferox, Euphorbia caerulescens* and *Euphorbia grandidens* also occur within the bush clumps. The Shrubby Grassland is dominated by *Themeda triandra* and *Eustachys paspaloides* (grasses)*, Passerina rigida, Ficinia truncata, Berkheya heterophylla, Pteronia incana, Osteospermum polygaloides* and *Jamesbrittenia microphylla* with characteristic fynbos components including *Acmadenia obtusata, Achyranthemum recurvatum, Disparago tortilis* and *Muraltia squarrosa.* Open succulent patches are distinctive and include several protected and/or endangered highly localised species such as *Bergeranthus addoensis, Euphorbia globosa, E.meloformis, E. stellata, Lampranthus productus*

Orthopterum coegana, Rhombophyllum romboidium, Ruschia cymbifolia, R. orientalis, R.recurva, and *Trichodiadema intonsum*. Several bulbous and geophytic species are commonly found within the ecotones between the various vegetation components, including *Boophone disticha, Cyrtanthus spiralis, Drimia elata, Hypoxis zeyheri, Massonia hirsuta, Oxalis algoensis* and *Pachypodium succulentum.*

The baseline target for Coega Bontveld conservation is 25%. The final target is 4814.2 ha and the final trimmed target is 27.5% according to the NMBM Final Conservation Assessment (2010). The ecosystem threat status of the vegetation unit is Vulnerable.

Mesic Thicket Clumps

A wide diversity of tree species dominate the woody thicket clumps, with the most commonly occurring including *Puttelickia pyracantha*, *Pterocelastrus tricuspidatus*, *Hippobromus caffra*, *Olea capensis* and *Euclea crispa*. Shrubs such as *Diospyros dicrophyllus* and the succulent *Aloe ferox* are common species with grass *Panicum deustum* commonly occurring in the understorey. Thicket clumps are irregularly scattered within the Bontveld and grassy Fynbos. The canopy height tends to be between 1m and 3m high and is impenetrable. Thicket varies from closely spaced bush clumps to dense pockets having an open canopy with dense (often spiny) undergrowth.

Herbaceous ground cover species include *Delosperma spp, Carpobrotus dimidiatus, Aizoon rigidum* and *Mesembryanthemum aitonis*. Herbaceous species within the thicket clumps include *Asparagus africanus*, *Asparagus densiflorus, Hypoxis hemerocallidea* and *Pelargonium reniforme*. Climber species include *Viscum obscurum, Rhoicissus digitata, Rhoicissus rhomboidea*.

A number of Species of Special Concern (SSC) were found to be present within the Peaking Power Plant site and were largely present within the Bontveld Grassy Fynbos mosaic. These tend to be the succulent ground covers, bulbous and herbaceous type. All *Mesembryanthemaceae* species are protected in terms of the Eastern Cape Nature Conservation Ordinance even though some of the species within this family are common, for example *Mesembryantheceae aitonis*. Two tree species, namely *Olea europeae* subspecies *africana* and *Sideroxylon inerme* and the *Aloe Africana* are present within the woody thicket clumps.

Cape Seashore Vegetation

The environment is characterised by mobile sand and high salt loading. The vegetation cover of this area is very low. The dominant species on these foredunes *were Scaevola plumieri, Gazania rigens* and *Tetragonia decumbens*. *Chrysanthemoides monilifera subsp. rotundata* was also abundant. According to Campbell (2007) the cape seashore vegetation had a low diversity on the site and was invaded by woody aliens as this vegetation type is sensitive to disturbance.

Albany Dune Strandveld

Albany Dune Strandveld is found inland of the mobile sand belt. The Dune Strandveld becomes swamped by high mobile sands in the west and the vegetation is limited to the inland slip face of the high dune. Natural elements of vegetation occur among exotic species that have colonised the dune ridge following artificial stabilisation of the dunes along the central and eastern south of the site.

Most of the plant diversity is found in pockets of uninfested Woodland. Where sands are shallow over calcrete, the indigenous component is dominated by stunted wild olive (*Olea exasperata*) bushes. Where the sands are slightly deeper, candlewood (*Terocelatrus tricuspidatus*) also dominates. The mature Dune Strandveld is dominated by milkwood (*Sideroxylon inerme*), *Brachylaena discolour* and *Rhus crenata* thumb.

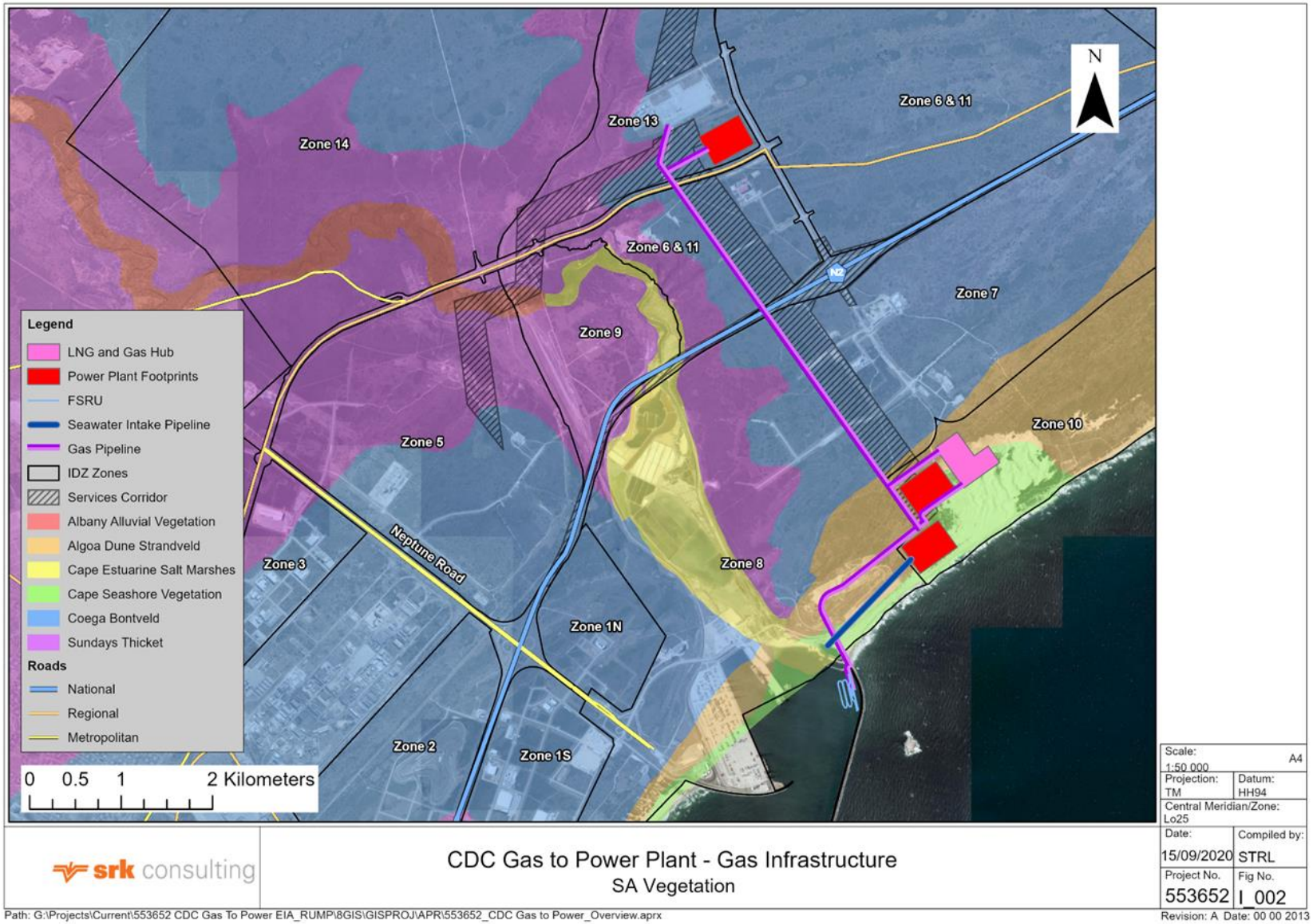


Figure 4-4: Vegetation types within the proposed Gas Infrastructure development footprint (Mucina & Rutherford, 2006)

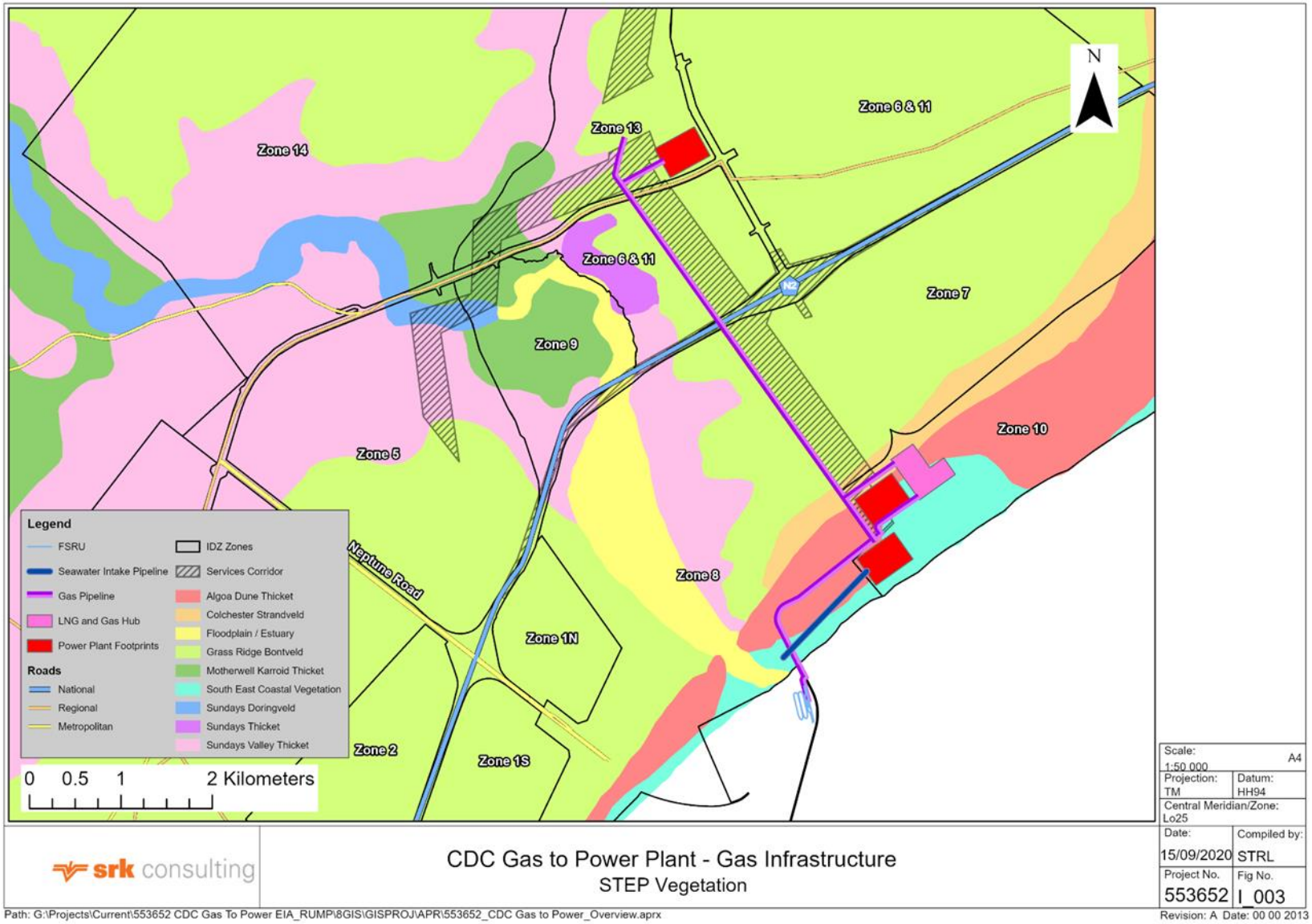


Figure 4-5: STEP vegetation in and around proposed Gas Infrastructure development footprint

Much of the Albany Dune Strandveld areas were found to be infested with rooikrans (*Acacia Cyclops*). Very little intact, mature Dune Strandveld was found.

Coega Bontveld

This vegetation type is characterised by circular clumps of bush up to 3 m high and 5 m in diameter, dispersed in grassland or mixed grass and low shrub community. The Bontveld on the site is found between the Thicket of the northern bank of the Coega valley and the Dune Strandveld in the south. There are two communities in the Bontveld: Bush Clumps and Dwarf Shrubby Grassland.

The Bush Clumps are dominated by *Euclea undulata*, and contain typical Thicket dominants such as *Scutia myrtina, Rhus incisa, Rhus pterota* and *Ehretia rigida* (Archibald, 1955). The Dwarf Shrubby Grassland is dominated by *Themeda triandra* (grass), *Passerina rigida* and *Jamesbrittenia microphylla*.

Inland portions of the zone are dominated by Coega Bontveld. The assessment in 2007 found the bontveld to be depuaperate and infested with prickly pear (*Opuntia ficus*) and *Acacia Cyclops.*

Nelson Mandela Bay Conservation Assessment and Plan

The Nelson Mandela Bay Conservation Assessment identifies the vegetation along the gas infrastructure route as Sandy Beach, Coega Estuary, Algoa Dune Thicket, Colchester Strandveld, Sundays Valley Thicket and Grass Ridge Bontveld.

Algoa Dune Thicket

The Algoa Dune Thicket occurs from about the mouth of the Tsitsikamma River eastwards, up to the Sundays River mouth. Its structure and dynamics are similar to those of the Gouritz Dune Thicket, but it differs in having a richer assemblage of species woody present in the Thicket vegetation. Some of these are localised endemics (e.g. *Gymnosporia elliptica*) or near endemics (e.g. *Aloe africana, Rapanea gilliana,* etc.) that only also occur in the Albany Dune Thicket. The Algoa Dune Thicket mosaic units also contain many highly localised endemics, several of which are critically endangered or already extinct e.g. *Aspalathus cliffortiifolia, Lampranthus algoensis, Pentaschistis longipes, Selago polycephala, Selago zeyheri*, etc., due to urban development and invasion by alien vegetation in this region.

The baseline target[7] for Algoa Dune Thicket conservation is 17%. The final target[8] is 223.1 ha and the final trimmed target is 44.3% according to the NMBM Final Conservation Assessment (2010). The vegetation unit is listed as vulnerable.

Colchester Strandveld

Colchester Strandveld occurs when Algoa Dune Thicket forms a mosaic with Strandveld vegetation. Colchester Strandveld vegetation is described as poorly developed Thicket clumps in matrix vegetation consisting of graminoids e.g. *Cynodon dactylon*, and a few shrubs i.e. *Azima tetracantha, Chrysanthemoides monilifera (Osteospermum moniliferum) Lycium cinereum, Lycium ferocissimum, Nylandtia spinose (Muraltia spinosa), Rhus crenata (Searsia crenata), Sideroxylon inerme* subsp. *inerme* and *Zygophyllum morgsana* (Vlok and Euston-Brown, 2002). It is found on aeolianite /

[7] The baseline target for biodiversity pattern is the minimum percentage of the historical distribution of a vegetation type that must be conserved in order to facilitate its long-term persistence.
[8] The final target for biodiversity pattern is the minimum percentage and hectarage of the (current) remaining distribution of a vegetation type that must be conserved in order to facilitate its long-term persistence, which is calculated using the baseline target. The final target is trimmed to 100% where it is greater than 100% of the remaining distribution of a vegetation type.

calcareous sandstone / sand, and is assigned a Threat status: Vulnerable (SRK Consulting, 2010; NMBM Bioregional Plan, 2015).

The baseline target for Colchester Strandveld conservation is 17%. The final target is 571.2 ha and the final trimmed target is 39.1% according to the NMBM Final Conservation Assessment (2010).

Grass Ridge Bontveld

Small clumps of Sundays Valley Thicket occur in a matrix of veld that consists of a combination of specfies that are characteristic of grassland (*Eustachys paspaloides, Themeda triandra*), succulent karoo (*Pteronia incana*) and fynbos (*Acmadenia obtuse, Euryops ericifolius*). Many highly localised endemics are present. The vegetation unit is present on the Alexandria formation.

The baseline target for Grass Ridge Bontveld conservation is 25%. The final target is 4814.2 ha and the final trimmed target is 27.5% according to the NMBM Final Conservation Assessment (2010). The ecosystem threat status of the vegetation unit is Vulnerable.

Table 4-2: The extent of remaining extant habitats and the Ecosystem Threat status of each vegetation type. Source: (SRK Consulting, 2013)

Vegetation Type	Extant Habitat (ha)	Ecosystem Threat Status 2007
Algoa Dune Thicket	504	Vulnerable
Coega Estuary	1.2	Critically Endangered
Colchester Strandveld	1,459.5	Vulnerable
Grass Ridge Bontveld	17,513.3	Vulnerable
Sandy Beach	1,595	Least Threatened
Sundays Valley Thicket	37,069.6	Vulnerable

Coega Open Space Management Plan

The OSMP sets out the uses of the open space areas within the Coega SEZ. The OSMP informed the preparation of the Management Guidelines for the various open space uses identified on the plan, to identify the actions required to implement the Management Guidelines. Both the NMBM's SCA and Draft Bioregional Plan (Dec 2010) incorporated mapping from the Coega OSMP (PH3_UD_MPLAN_OPEN SPACE PLAN Rev 9 of 23/01/2004), but do not incorporate updates to the Coega OSMP system as reflected in the Environmental and Planning legislative framework for the Coega SEZ. The gas infrastructure proposed for zone 10 falls within 200-300m of the Damara Tern breeding area (OSMP) (see Figure 4-6).

4.2.2 Fauna

There is a general lack of pristine terrestrial habitats in the Coega region. This means that some components of the terrestrial fauna have been severely impacted by previous human activity, particularly the loss of vegetation, invasion of alien vegetation, local extinction of large mammals, and varied industrial developments.

Birds

Two Important Bird Areas (IBAs) lie offshore of the proposed development. The Bird island cluster lies approximately 50 km offshore while the St Croix island cluster lies approximately 5 km offshore. The St Croix island cluster includes the islands of St Croix, and Jahleel. St. Croix Island is home to a large breeding colony of African penguins. Bird Island supports the largest breeding colony of Cape gannets

in the world (over 160 000 birds) as well as other birds such as African penguins and rare roseate terns.

Fourteen seabird, several shorebird and 33 terrestrial bird species have been recorded on the Algoa Bay Islands (St Croix Island cluster and Bird Island cluster) and eight seabird species currently breed there. These islands as well as at the Dyer Island located near Gansbaai, off the coast of the Western Cape, are the only islands off southern mainland Africa where the Roseate Tern (*Sterna dougallii*) breeds annually.

The Algoa Bay islands currently hold 43% of the global population of the African Penguin (*Spheniscus demersus*), the majority of which are on St Croix. St Croix also holds a locally significant breeding population of the Cape Cormorant (*Phalacrocorax capensis*) (Birdlife International, 2020). Bird Island is one of only six breeding sites in the world for Cape Gannet (*Morus capensis)*. Kelp Gull (*Larus dominicanus)* and African Black Oystercatcher *Haematopus moquini* are found throughout the Algoa Bay complex.

Globally threatened species are the African Penguin (11 304 breeding pairs; Crawford et al. 2012), Cape Cormorant (284 breeding pairs; Crawford et al. 2012), Cape Gannet (83 000 breeding pairs; Crawford et al. 2012) and African Black Oystercatcher (55 breeding pairs; SANParks census). Regionally threatened species are the Caspian Tern (*Hydroprogne caspia*) and Roseate Tern (90–100 breeding pairs; Crawford et al. 2012). The species reaching the 1% or more congregatory threshold are Kelp Gull (*Larus dominicanus*) and Antarctic Tern, while Swift Tern (*Thalasseus bergii*) (130 breeding pairs; Crawford et al. 2012) and Ruddy Turnstone (*Arenaria interpres*) are thought to reach the 0.5% or more congregatory threshold.

Due to its varied habitats, the Coega terrestrial region has diverse avifauna and over 150 species are resident or common visitors to the region (CES, 1997). Most diversity occurs in the thicket clumps. A number of terrestrial birds are of conservation concern including the blue crane (*Anthropoides paradiseus*), Denham's bustard (*Neotis denhami*), the Martial eagle (*Polemaetus bellicosus*) and the African marsh harrier (*Circus ranivorus*). Taylor et al. (2015) lists blue crane as Near Threatened, and Martial eagle and African marsh harrier as Endangered. The Denham's bustard is considered Vulnerable in South Africa (Barnes, 2000)

According to the DEFF online screening tool report, the Black Harrier, *Circus maurus* is also recorded for the area.

As part of the CDC / SEZ environmental monitoring plan several sensitive, as well as Red Data listed, bird species have been observed within the coastal region close to the study area. Species with conservation concern observed included the Damara Tern (*Sterna balaenarum*) and the African Oystercatcher (*Haematopus moquini*). There is a breeding colony of Damara Terns within 200-300 m of the proposed gas infrastructure. Under the regional Red Data list Damara Tern is listed as Critically Endangered and African Black Oystercatcher as Least Concern (Taylor *et al*. 2015). Globally, Damara Tern is listed as Vulnerable and African Black Oystercatcher as Least Concern (BirdLife International, 2020). Other species such as the Spotted Thick-knee (*Burhinus capensis*) and Kelp Gull (*Larus dominicanus*) both rated as Least Concern (Birdlife International, 2020) utilise the coastal area, with nesting sites within the Cerebos and Port areas. This observation by the CDC Environmental Control Officer (ECO) was noted in the FSR of the Kalagadi Manganese smelter plant (CES, 2008).

Other terrestrial species of conservation concern in a regional context include the secretary bird (*Sagittarius serpentaris*) and the Knysna woodpecker (*Campethera notata*). The secretary bird is

considered Vulnerable (Taylor *et al*., 2015) and the Knysna woodpecker is considered Near Threatened in South Africa (Barnes, 2000). No breeding populations of all these terrestrial species are known in the Coega region, and with the exception of Stanley's bustard all are uncommon visitors.

Reptiles

The Eastern Cape is home to 133 reptile species including 21 snakes, 27 lizards and eight chelonians (tortoises and turtles). More than half of the Eastern Cape's endemic reptile species occur in the Algoa Bay area, giving the region a high conservation value (Branch, 1988). The majority of these are found in Mesic Succulent Thicket and riverine habitats. The list of reptiles of special concern is very significant since it includes five endemic species (two of which are endangered), eight CITES-listed species banned from International Trade in Endangered Species, one rare species and four species at the periphery of their range. More than a third of the species are described as relatively tolerant of disturbed environments, provided migration corridors of suitable habitat are maintained to link pristine habitats.

Reptile diversity in the Coega PPP region is high, with 46 species known or likely to occur (Branch, 1988a; Branch 1998). This includes 24 snakes, 18 lizards, and 4 chelonians (CES 2006). They represent almost a third of all reptiles recorded from the Eastern Cape.

Only one threatened reptile occurs in the region. The Albany dwarf adder (*Bitis albanica*) is a small species whose only known population occurs in the Grassridge area in Bontveld habitat. The species is known only from 14 specimens, and is of Priority Conservation importance with current knowledge indicating that it is Globally Critically Endangered (Branch 1999).

Three other reptiles are endemic to the Algoa bay region and occur in the vicinity of the zone 13 site. They are as follows:

- Algoa legless skink (*Acontias meleagris orientalis*);
- Algoa dwarf burrowing skink (*Scelotes anguineus*); and
- Tasman's girdled lizard (*Cordylus tasmani).*

St Croix Island holds populations of the Algoa Bay endemic Tasman's girdled lizard *Cordylus tasmani* and the spotted thick-toed gecko *Pachydactylus maculatus.*

Amphibians

Amphibians are well represented in sub-Saharan Africa, from which approximately 600 species have been recorded. A relatively rich amphibian fauna occurs in the Eastern Cape, where a total of 32 species and sub-species occur. This represents almost a third of the species known from South Africa. Knowledge of amphibian species diversity in the Coega region is limited and based on collections housed in national and provincial museums. It is estimated that as many as 17 species may occur. However, none of these species are endemic or of conservation concern.

Mammals

Large game makes up less than 15% of the mammal species in South Africa and a much smaller percentage in numbers and biomass. In developed and farming areas, such as the CDC, this percentage is greatly reduced, with the vast majority of mammals present being small or medium sized. Of the 62 mammal species known or expected to occur in the Coega area, none are now considered endemic to the coastal region. The conservation status of South African mammals has recently been re-assessed. The conservation status of some has been downgraded, with the African

wild cat, Aardvark, Honey badger and Duthie's golden mole no longer considered threatened. The White-tailed rat (*Mystromys albicaudatus*) has not been recorded from the Coega region, whilst Duthie's golden mole is known to be present in the zone 10 coastal area, as is the Hairy-footed gerbil (*Gerbillurus paeba*). The conservation status of two species remains indeterminate (Data Deficient), and the only two terrestrial mammals of conservation concern in the region are the Blue duiker (Vulnerable) and Honey Badger (Near Threatened) (Friedmann & Daly, 2004).

In South Africa, there are currently three national plague surveillance sites, one of these being Coega. The last reported outbreak of plague occurred in Coega, Eastern Cape Province, in 1982, with 13 cases and 1 death. Measures to monitor and manage rodent populations in the port area, are therefore in place.

Terrestrial Invertebrates

The distribution of the terrestrial invertebrates found along the coast depends to a large degree on the extent and composition of the natural vegetation. One grasshopper species (*Acrotylos hirtus*) is endemic to the dunefields. Of nearly 650 butterfly species recorded within the borders of South Africa, 102 are considered of conservation concern and are listed in the South African Red Data Book for Butterflies. Two have become extinct, whilst three rare butterflies are known from a number of scattered localities in the Coega region.

The small blue lycaenid butterfly *Lepidochrysops bacchus* is known from four localities in the Eastern Cape. One of these is reported to occur in the "general area" of the Coega SEZ, but not within the port area. Another rare small copper lycaenid, *Poecilimitis pyroeis*, has a similar distribution to *Lepidochrysops bacchus*, extending from the southwestern Cape to Little Namaqualand. An isolated eastern race, *P.p. hersaleki*, was described from Witteklip Mountain (Lady's Slipper) to the west of Port Elizabeth. It has also been recorded from St Albans and from the Baviaanskloof Mountains. There is currently no evidence that this rare butterfly occurs in the Coega area, or that a suitable habitat for the eastern race exists in the port area (CES, 1997).

According to the DEFF online screening tool report, two additional species of conservation concern, *Chrysoritis thysbe whitei* and *Aloeides clarki* (the Coega Copper) are recorded for the area, and during recent search and rescue operations in Zone 10 the threatened Eastern Cape Golden Baboon Spider (*Harpactira tigrine*) was found.

4.3 Protected Areas

4.3.1 Addo Elephant National Park and Marine Protected Area

SANParks initiated a planning process in 2000 to investigate the expansion of the Addo Elephant National Park (AENP), situated in the Eastern Cape, South Africa. The Bird and St. Croix island groups and a small Marine Protected Area around Bird Island, which protects a large variety of marine life, were proclaimed part of the Park in 2005. Bird Island is home the world's largest breeding colony of Cape gannets St Croix Island is home to the largest breeding colony of African penguins.

The Addo Elephant National Park Marine Protected Area, which incorporates the Algoa Bay Islands, was gazetted in May 2019, and is shown in Figure 4-6. Using information from the marine protected areas website (https://www.marineprotectedareas.org.za/addo-elephant-national-park-mpa) and the EBSA Portal (https://cmr.mandela.ac.za/EBSA-Portal), these areas are described below.

This 1,200 km^2 MPA expands on the original Bird Island MPA (comprising Bird, Seal, Stag and Black Rock Islands) to protect sandy beaches, rocky shores, reefs, an estuary and islands, and aid recovery of valuable fisheries resources such as abalone and kob, as well as great white sharks and whales (Bryde's, minke, humpback and right). The MPA protects important feeding areas for the 9,000 pairs of Endangered African penguins breeding at St Croix Island and the 60,000 pairs of Endangered Cape gannets breeding at Bird Island. These islands are the only important seabird islands along a 1,800 km stretch of coastline between Dyer Island near Hermanus in the Western Cape and Inhaca Island in Mozambique. Together with St Croix, Jahleel and Brenton Islands (also in Algoa Bay), they are classed as Important Bird Areas (IBAs) because they regularly support significant numbers of globally threatened bird species and hold large concentrations of seabirds. The islands form ecological distinct subtidal habitats, containing many endemic invertebrates, algae and linefish (e.g. santer and red roman). Black Rocks is an important seal breeding colony and serves as a great white shark feeding area. The MPA is also of particular importance to the threatened abalone as abalone poaching activities are strictly controlled.

The purpose for declaring this Marine Protected Area is:

- To contribute to a national and global representative system of marine protected areas, by providing protection for species, habitats and ecosystem processes in a biodiversity hotspot, to form a contiguous conservation area between marine, estuarine and terrestrial habitats;
- To facilitate fisheries management by protecting spawning stock, allowing stock recovery, enhancing stock abundance in adjacent areas, in particular linefish and abalone stocks; allowing the development of sustainable aquaculture in a confined area; and
- For the protection of fauna and flora or a particular species of fauna or flora and the physical features on which they depend, including the African penguin and cape gannet.

The MPA consists of several zones with different land use recommendations including restrictions on fishing activities, vessels and recreation activities.

4.4 Sense of Place

As per the Coega Development Zone Architectural Guidelines it is noted that the various operations to be established in the Core Development Area will result in tall or large structures that have a visual impact. The visual impact will be difficult to mitigate and the residual impact is regarded as high, as it will affect a wide area, will be permanent and will definitely occur. The current mitigation plan as per the CDC is that wherever possible, land-use planning has aimed to reduce the residual impact in such structures. Heavy industry has generally been located in the centre of the SEZ and screened from the N2. While it is some distance from the N2, any screening effects especially for any viewers along the coast, or from offshore (e.g. tourists visiting the MPA), would be limited for the Zone 10 LNG and gas hub site. Smaller scale industries are located in the western side of the SEZ

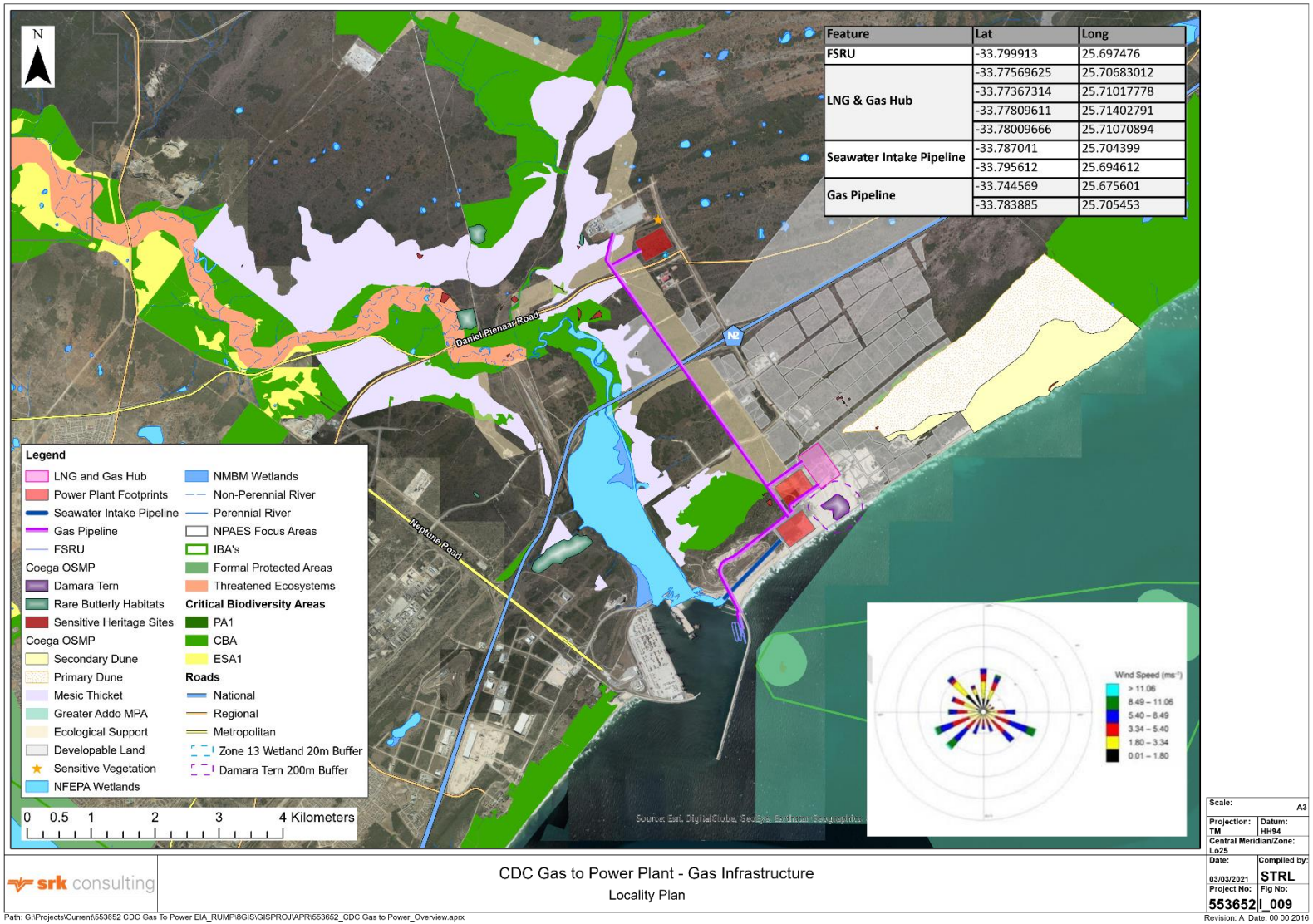
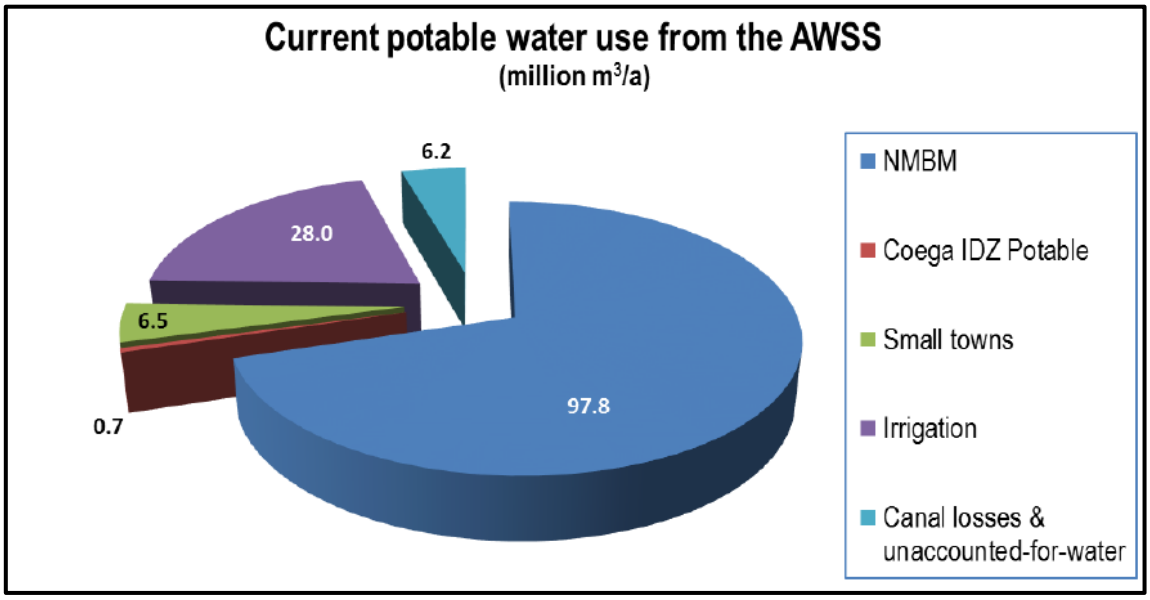


Figure 4-6: Terrestrial and marine environmental sensitivities in the area of the proposed Gas Infrastructure development footprint including buffer areas identified

4.5 Regional Water Supply

The Algoa Water Supply Scheme currently comprises three major dams in the west, several smaller dams and a spring situated near to NMBM, as well as an inter-basin transfer scheme from the Orange River via the Fish and Sundays rivers to the east. The combined total yield of the Algoa Water Supply Scheme is 167.4 million m³/a (458.6 ML/d). Additional water is supplied to the NMBM via the Nooitgedagt treatment work (currently 200 ML/day), and is It is expected that the development of the Coega Wellfield (which is currently underway) will further augment supply.

Figure 4-7 shows the availability of surplus water taking for a scenario where growth in water demand continues at historical levels, and with the addition of additional supply. And water conservation measures.



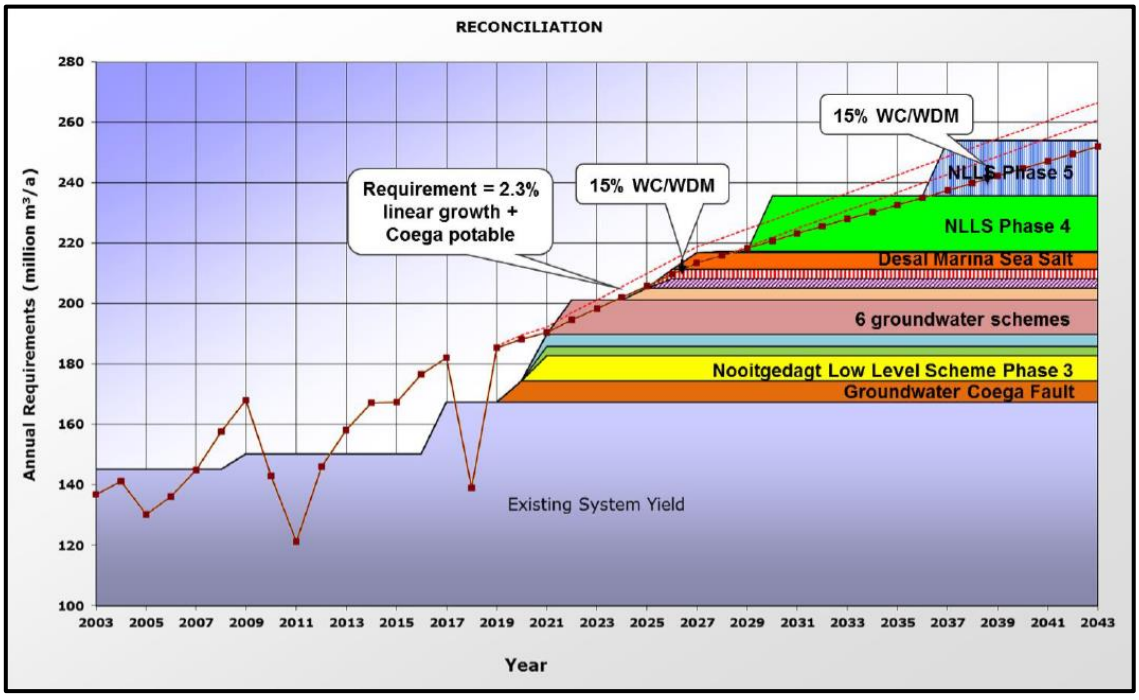


Figure 4-7: 2017/18 Algoa WSS Potable Water Use and predicted growth in water demand in the 'continue historical growth scenario' (Aurecon, November 2018)

4.6 Ambient Noise

The existing ambient noise within the project area was measured at various points by Safetech, the appointed noise specialist, during June 2020. The ambient noise levels were found to vary between 30-50dB(A) during the day and 30-35dB(A) at night, with high variability (especially at the coastal sites) due to the proximity to the sea. The noise sources that have been identified for the proposed gas infrastructure footprint are as follows:

- Marine traffic (tugs and container ships);
- Quayside operations (mostly vehicle movement but also engineering activities relating to oil rig maintenance);
- Vehicle noise within the SEZ and along the N2;
- Metal smelting works;
- Power generation;
- Salt processing;
- Rail operations;
- Sea noise; and
- Wind noise.

There are currently no noise sources that are excessively dominant within the SEZ. Sea, wind and vehicle noise are the main contributors to ambient noise.

4.7 Ambient Air Quality

Coega has an air quality monitoring network, consisting of three monitoring stations; at the Saltworks, Amsterdamplein and in Motherwell (see locations in Figure 1-2).These stations monitor both meteorological and ambient air quality parameters. Data at the monitoring stations is reported 10-minute averages. The monitoring stations at Amsterdamplein and the Saltworks measure total suspended particulates (TSP), nitrous oxides (NOx) and sulphur dioxide (SO2) as well as temperature, relative humidity, wind speed and wind direction. In addition, the station at the Saltworks measures wind speed in the vertical plane, atmospheric pressure, solar radiation and rainfall. The monitoring station at Motherwell measures NOx and SO2 and particulate matter less than 10 microns (PM10) in size, in addition to the standard meteorological variables. The Amsterdamplein station is situated Zone 5 of the Coega SEZ.

The status of ambient air quality in the Coega SEZ is described below using data from the Saltworks monitoring site, and dispersion modelling for existing industries. Monitoring data provided accurate measurement at a single point which may not be representative of the entire area of interest. Dispersion modelling stimulates estimated concentrations over the area.

Ambient monitoring data for 2017 to 2019 at Saltworks is analysed for SO_2, NO_2, and PM_{10}. Monitored SO_2 data show ambient levels for the monitoring period, with no exceedances of NAAQS) (see Figure 4-8 and Figure 4-9). Monitored NO_2 concentrations are elevated with higher concentrations observed in winter (i.e. June to August) (Figure 4-10). Monitored PM_{10} concentrations are elevated year-round with no exceedances of NAAQS (Figure 4-11 below). An estimated background concentration of 10 $\mu g/m^3$ is observed, increasing in late winter and early spring. This is ascribed regional biomass burning. An increasing annual trend can also be observed and suggests of additional air quality management is needed in the area.

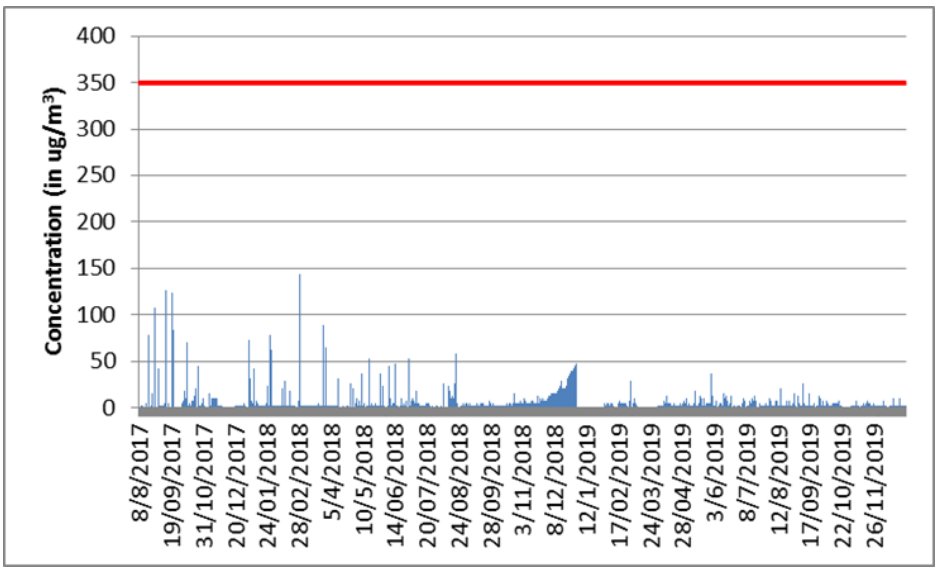


Figure 4-8: 1-hr average SO_2 monitored concentrations at Saltworks monitoring station

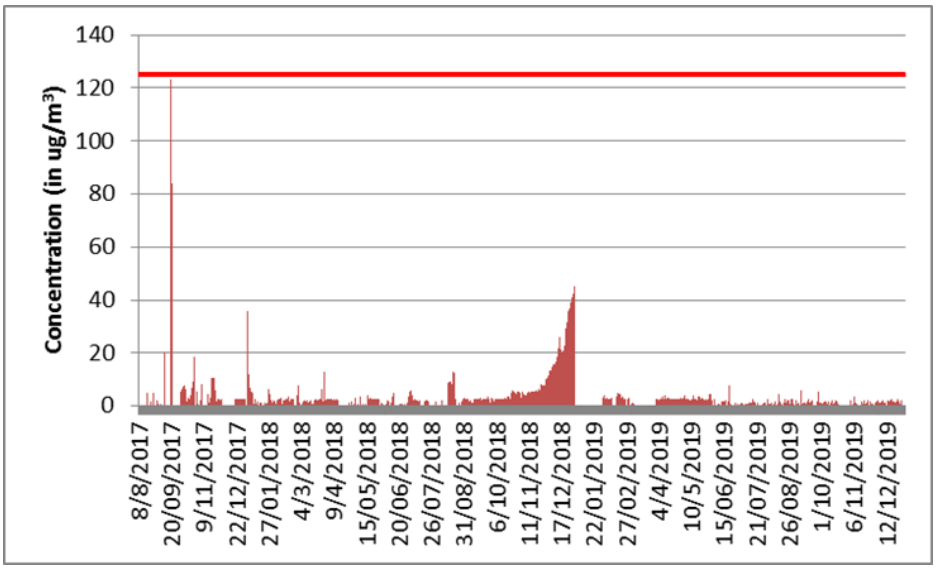


Figure 4-9: 24-hour average SO_2 monitored concentrations at Saltworks monitoring station

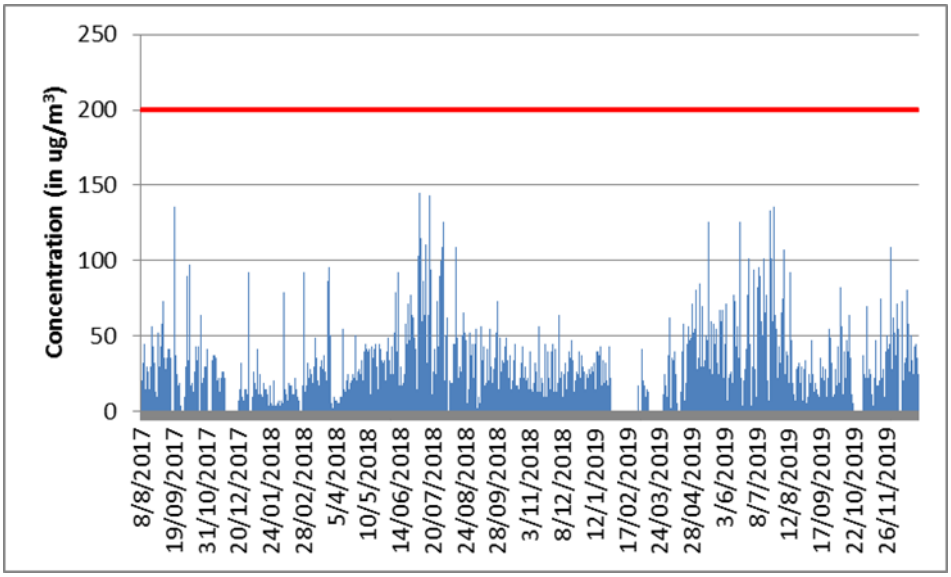


Figure 4-10: 1-hr average NO_2 monitored concentrations at Saltworks monitoring station

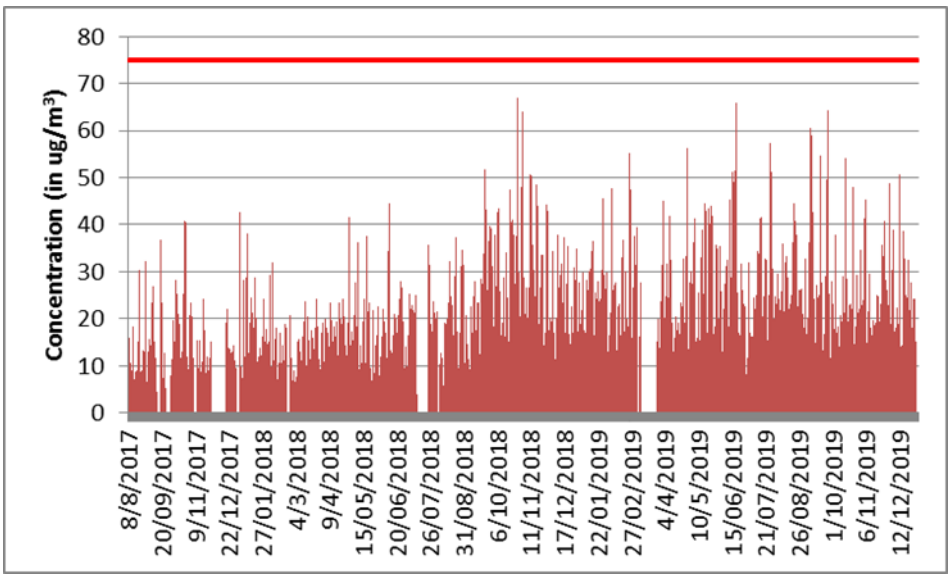


Figure 4-11: 24-hr average PM_{10} monitored concentrations at Saltworks monitoring station

Table 4-3: Annual average monitored concentrations of SO_2, NO_2 and PM_{10} at Saltworks monitoring station

Year	SO_2 (NAAQS 50 µg/m³)	NO_2 (NAAQS 40 µg/m³)	PM_{10} (NAAQS 40 µg/m³)
2017*	3.3	8.5	14.8
2018	4.4	9.1	20.9
2019	1.6	10.7	26.6

* Limited dataset for August – December

4.8 Heritage Resources

A general description of the archaeological and palaeontological resources found at the site area is provided below

4.8.1 Archaeological Resources

Dr Johan Binneman, on behalf of CDC, conducted a Phase 1 Archaeological Impact Assessment of the greater Coega SEZ in 2010. All zones (approximately 9 200 hectares) were investigated apart from Zone 8 as this is owned by the National Port Authority. Sensitive heritage sites identified during this study are shown on Figure 4-12.

Zone 10 is situated along the coast and different areas have been investigated several times by Dr Binneman. Most of the coastal foreland is covered by impenetrable alien Acacia, making it difficult to find archaeological sites/material. A few sites were found in the shifting dunes however further sites may be covered by sand and vegetation. The area is composed of calcrete bedrock covered by a thin layer of dark soil, which do not allow for any deep archaeological deposits. The hinterland behind the coastal dunes is also covered with dense dune and alien vegetation. Occasional weathered/sand polished Middle Stone Age and Later Stone Age stone tools were found along the immediate beach area. These stone tools are of low cultural significance.

Zone 13 is a narrow strip sandwiched between Zones 9, 11 and 14 and comprises mainly the upper Coega River valley with relatively steep sides. An archaeological impact assessment was conducted for the peaking power plant site in 2006. The zone is well covered with low grass, dense patches of bushes, small trees and impenetrable thicket vegetation, which made it difficult to find archaeological

sites/materials. Occasional stone tools were found during the survey for the peaking plant where pebble/cobble river gravels were exposed. The stone tools found were mainly small quartzite flakes, some were well weathered and displayed typical Middle Stone Age facetted striking platforms and features. Apart from the stone tools no other visible archaeological sites/material were found during the investigation.

According to the Phase 1 Archaeological Study conducted for the Coega SEZ (Binneman, May 2010), the most important archaeological sites were found along the coast (on National Ports Authority property) and included mainly shell middens which date from the past ±8,000 to 6,000 years. Similar sites in the shifting sand dunes and coast east of the harbour area were much smaller in size, depth of deposit, quality and quantity of food waste and cultural material. These archaeological features are usually found between two to five kilometres inland from the coast. Earlier, Middle and Later Stone Age stone tools were found throughout the Coega SEZ where pebble/cobble gravel were exposed. They are of low significance, but concentrations of stone tools may be buried, especially areas around pans.

4.8.2 Paleontological resources

Dr John Almond of Natura Viva was commissioned to conduct a palaeontological heritage assessment as part of a comprehensive heritage assessment of the Coega SEZ in 2010.

The Coega SEZ is underlain by a wide spectrum of sedimentary rocks spanning an age range of some 470 million years. Most of the rock units concerned contain fossil heritage of some sort but in most cases this is very limited, with the notable exception of three marine successions – the Sundays River Formation of Early Cretaceous age (c. 136 Ma = million years old), the Alexandria Formation of Miocene / Pliocene age (c. 7-5 Ma), and the Salnova Formation of Mid Pleistocene to Holocene age (< 1 Ma).

Good examples of vertically sectioned dunes showing large scale aeolian cross-bedding are seen in the active sand quarries near the Sea Arc factory site and at Sonop (Coega Zone 10). Apart from the usual concentrations of wind-deflated dune snails (notably superabundant Tropidophora and Natalina), a range of subfossil remains can be seen, especially in deflation hollows. Among these are millipede exoskeletons, small mammal and reptile bones, fragments of charcoal, buried mats of plant roots and incipient rhizocretions (possibly termite mediated). Shell middens of oysters and other edible marine shells situated close to the shoreline are attributable to Late Stone Age (and later) humans.

A small number of sites of special palaeontological and / or geological heritage significance were identified by Dr Almond within the Coega SEZ and are indicated on Figure 4-12. Examples include:

- Main Coega brick quarry – eastern face preserving fossil-rich sandstones and contact with overlying Alexandria Formation;
- Main Coega limestone quarry – eastern face and large disturbed blocks of basal Alexandria shelly conglomerate at the western edge of the quarry;
- Upper, eastern face of Tossies Quarry South – well-preserved contact between Alexandria and Sundays River Formations;
- Erosion gullies into Sundays River Formation just north of Tossies Quarry North as well as on Bontrug 301 – highly fossiliferous sandstones, rare fossil taxa;
- Railway cutting north of N2, SW of marshalling yard as well as the nearby stormwater channel – contact between the Alexandria and Kirkwood Formations, trace fossils near contact; and

- Stratotype section of Salnova Formation on coast at Hougham Park, also showing unconformable contact with Sundays River Formation.

According to (Almond, April 2010), most of the rock units in the Coega SEZ contain fossil heritage of some sort however in most instances this is very limited with the exception of the Sundays River Formation, Alexandria Formation and the Salnova Formation. The proposed sites in zone 10 and 13 do not fall on any of these sensitive sites.

4.9 Socio-economic Environment

At the last census, the population in the municipality was 1.3 million with a population growth of 2% and an unemployment rate is 26.7%. The youth unemployment rate was even higher, at 38.2%. The average household size is 3.4 members, with a dependency ratio of 57.3.

The nearest community to the project is Motherwell. During the 2011 census, 140 000 people lived in the community. Most of the residents were connected to the local sewage network and electrical grid. The average household size was 3.6 and more than 60% of the households received an annual income of less than R38 200 .

With a GDP of R 128 billion in 2018, Nelson Mandela Bay contributed 34.07% to the Eastern Cape Province GDP of R 377 billion, and 2.63% to the GDP of South Africa of R 4.87 trillion in 2018. Its contribution to the national economy is 2.57%.

The Gross Value Added (GVA) is a measure of output (total production) of a region in terms of the value generated within that region. GVA can be broken down into various production sectors. As of 2018, the electricity sector in NMBM contributed R0.9 Billion (of a total national GVA of R111.3 billion), which amounted to 0.55% nationally.

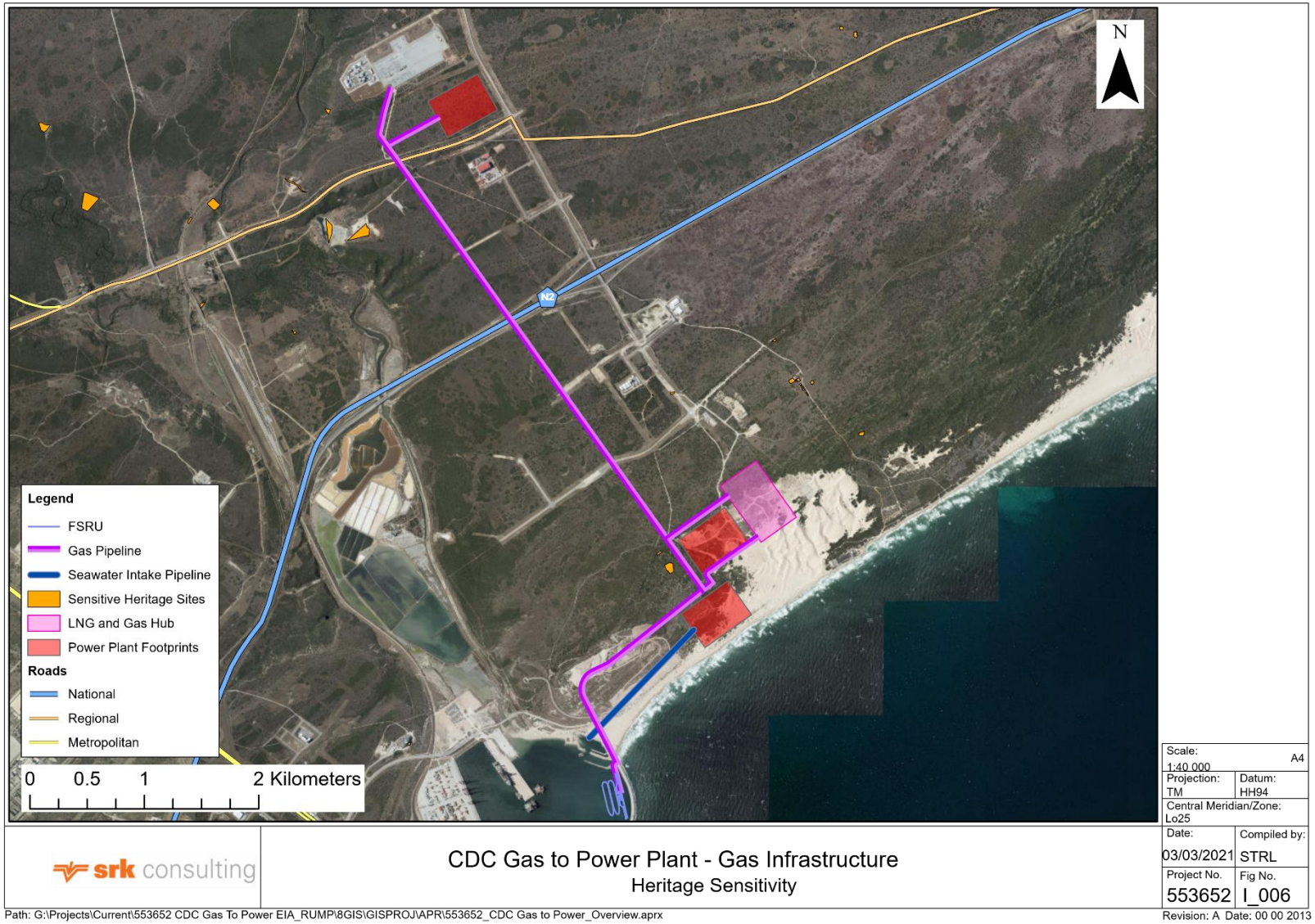


Figure 4-12: Sensitive heritage sites in the Coega SEZ relative to gas to power project infrastructure

5 Stakeholder Engagement

The Public Participation Process (PPP) forms a key component of the EIA process and has already resulted in the identification of a number of issues and concerns. The objectives of the PPP are outlined below, followed by a summary of the approach taken, and the issues raised. The full list of IAPs registered for the project, as well as comments raised on the 2016 BID, DSR, FSR and during the ELC meetings that took place during August and November 2020, with corresponding responses, are provided in the Comments and Responses report as Appendix H. Copies of comments received and proof of notification of IAPs are provided in Appendix G.

5.1 Objectives and Approach to Stakeholder Engagement

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

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

5.2 Stakeholder Engagement during the Scoping Phase

5.2.1 Activities undertaken

The Public Participation Process that was undertaken to solicit public opinion regarding the proposed development has included the following activities so far.

- Distribution of the Background Information Document (BID) from 22nd January 2016 to identified Interested and Affected Parties (IAPs), stakeholders and neighbouring residents. A copy of the BID is attached in Appendix E, and the list of notified IAPs and commenting institutions is given in Appendix H;
- Recording of all issues raised in response to the BID (See summary of issues raised and responses to these in Appendix G 1);
- Preparation of a Draft Scoping Report (DSR), including comments from IAPs and release for public comment;
- On-site notices put up at each site, notifying the public of the project, on 2nd June 2020 (see Appendix C);
- Presentation of the project to the Coega ELC on 20th August (see Appendix F1) and 19th November 2020 (see Appendix F2), and inclusion of queries raised and responses to them in the Draft EIR (this report);
- Advertisements of the development as an e-notice on the CDC notice board on 8th October 2020 (Appendix C);
- Submission of an application for environmental authorisation to DEFF on 9th October 2020, signalling the start of the regulated EIA process (see revised application in Appendix D);

- Distribution of the Executive Summary of the DSR to all IAPs registered for this process;
- Uploading the DSR for download via the public documents link on SRK consulting's website, for review by IAPs for a 30 day comment period, and submissions to relevant competent authorities;
- Placement of Newspaper advertisement in the Herald on 9th October 2020, notifying the public of the project, as per the legal requirements;
- Submission of the FSR, including comments and responses report, to DEFF on 22nd November 2020 for approval to proceed to the Environmental Impact Reporting phase of the EIA; and
- Notifying IAPs of submission of the FSR, distribution of the Executive Summary to all IAPs, and making the full FSR for download via the public documents link on SRK consulting's website.

5.2.2 Key issues raised during Scoping

Key issues raised by IAPs during the comment period on the DSR include the following:

- Provision of alternatives for seawater intake & discharge in the potential absence of the MPS being authorised;
- Interlinkages between the four gas to power EIAs, as well as with the MPS EIA and rationale for running four separate gas to power applications;
- Potential impacts on marine fauna and the islands and how these will be addressed in the EIA;
- Process water supply, given the drought ongoing situation;
- Impact on air quality, including upset conditions (e.g. start up and maintenance);
- Noise impacts;
- Safety concerns relating to firefighting;

5.3 Stakeholder Engagement during the EIR Phase

5.3.1 Activities undertaken

The Public Participation Process that is being undertaken to solicit public opinion regarding the impact assessment for the proposed development has included the following activities so far:

- Presentation of the preliminary findings of the EIR to the Coega ELC on 18 February 2021 (see Appendix F3) and inclusion of queries raised and responses to them in the Final EIR;
- Collation of authority and IAP comments on the DSR and FSR, and incorporation of these into the Draft EIR (this report);
- Inclusion in the Draft EIR of issues that were raised (Appendix H);
- Distribution of the Draft EIR on 15 March 2021 to the relevant Authorities;
- Making the Draft EIR available for download on the SRK 'Public Documents' webpage, for review by IAPs;
- Distribution of the executive summary of the Draft EIR to registered IAPs; and

- Provision of a 30 day comment period on the Draft EIR (16 March – 18 April 2021).

5.4 Availability of Draft Environmental Impact Report

The Executive Summary of this Draft EIR has been distributed to registered IAPs. The report can also be accessed as an electronic copy on SRK's website https://docs.srk.co.za/en/za-cdc-coega-3000-mw-gas-power-project-eias

The public are encouraged to review this Draft EIR and send written comment by **12h00 on 18 April 2021**, clearly indicating which application the comments pertain to. Comments on this report must be forwarded to:

SRK Consulting

PO Box 21842, Port Elizabeth, 6000

Email: lnaidoo@srk.co.za

Fax: (041) 509 4850

Attention: Lyndle Naidoo

Any issues raised will be integrated into the final EIR. Comments received to date are included in Appendix G and Appendix H of this report.

5.5 Next steps

Following the close of the comment period, an Issues and Responses Summary will be compiled for inclusion with the Final EIA Report. The EIA Report will be submitted to the DEFF by 26 April 2021, within 106 days of the acceptance of the Final Scoping Report (including public holidays), as agreed to by the competent authority in terms of Section 3(7) of the EIA Regulations, 2014. IAPs will be informed of the submission of the Final EIA Report to the DEFF and the Final EIA Report, including the Issues and Responses Summary will be made available on SRK's website. After submission of the FEIR, DEFF will have 107 days to make a decision on the application.

6 Environmental Impact Assessment

6.1 Environmental Impacts Identified

Appendix 2 of the 2014 EIA Regulations (as amended in 2017) prescribe the required content of a Draft EIR (see Table 1-1), including the identification and assessment of risks and impacts (potential nature, significance, consequence, extent, duration and probability) of the project, and the degree to which impacts can be reversed, may cause irreplaceable loss of resources and can be avoided, managed or mitigated (Appendix 2 (h)(v) and (vii)).

The potential impacts of the project are mostly linked to the sensitivity of the biophysical environment, expected emissions and discharges, climate change and stakeholders' perceptions

Based on the professional experience of the EIA team, legal requirements and existing authorisations (Section 2), the nature of the proposed activity (Section 3), the nature of the receiving environment (Section 4) and issues raised in the stakeholder engagement process (Section 5 and Appendix H), the following key environmental issues – potential negative impacts and potential benefits – of the proposed development of the Gas Infrastructure identified:

- Climate Change;
- Terrestrial Ecology;
- Noise;
- Air Quality;
- Heritage Resources;
- Socio-Economic;
- Traffic;
- Waste Management;
- Visual impacts;
- Soil, Stormwater and Erosion;
- Marine Ecology;
- Safety Risks resulting from catastrophic events; and
- Impacts resulting from general construction activities.

The above listed impacts and their relevance to the proposed project area are described in more detail in the sections below

6.2 Specialist Studies Undertaken

A number of specialist studies (see Table 4-1 and below) were undertaken during the Impact Assessment Phase to investigate the key potential direct, indirect and cumulative impacts (negative and positive) identified during Scoping. Details of the specialist studies undertaken are provided in Table 6-1 below. These specialist reports are included as Appendices K1 to K6 to this report.

Table 6-1: Specialist studies undertaken as part of the EIA

Study	Specialist	Appendix of DEIR
Air Quality Impact Assessment	Dr Mark Zunckel Umoya-Nilu	Appendix K1
Quantitative Risk Assessment	Mike Oberholzer, Riscom	Appendix K2
Climate Change Impact Assessment	Karien Erasmus, Promethium Carbon	Appendix K3
Noise Impact Assessment	Dr Brett Williams, Safetech	Appendix K4

Traffic Impact Assessment	Cary Hastie, EAS	Appendix K5
Marine Impact Assessment	Andrea Pulfrich, Pisces	Appendix K6

6.3 Alternatives Assessed in the EIA

The no-go alternative must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed. The determination of which alternatives are appropriate needs to be informed by the specific circumstances of the activity and its environment.

Appendix 2 Sections 2 (1) (h) (i) and (x) Appendix 3 Sections 3 (1) (h) (i) and (ix) of the EIA Regulations, 2014 require that S&EIR processes must identify and describe alternatives to the proposed activity that were considered, or motivation for not considering alternatives. Different types or categories of alternatives can be identified, e.g. location alternatives, type of activity, design or layout alternatives, technology alternatives and operational alternatives.

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

The discussion of alternatives in this section aims to demonstrate the process followed during the early planning stages of the Gas to Power project and which have led to the project description as outlined above. It is recognised that this section does not explicitly address the environmental attributes of location alternatives, nor the impacts and risks of each alternative in a comparative format as suggested by Appendix 2 of the EIA regulations. Where decisions on preferred alternatives have been based, or influenced, by environmental considerations, these are mentioned. In the most part, however, considerations have been based on strategic grounds (i.e. the selection of the Port of Ngqura as one of the locations) or technical or financial feasibility.

Depending on the specific project circumstances the following alternatives may be considered:

- Activity Alternatives;
- Site Alternatives;
- Layout and alignment Alternatives;
- Technology; and
- The No-Go Alternative.

6.3.1 Activity Alternatives

No activity alternatives are considered as part of this EIA. The activity of LNG to power generation was selected in response to the ministerial determination (18 August 2015) that 3,126 MW of power be generated from gas and the IRP (2010-2030) which considers LNG as the primary potential source of natural gas. Furthermore, it is assumed that the land use planning for the allocations of the various zones within the Coega SEZ took various activity alternatives into account in determining the appropriate potential land uses for the project sites. The gas infrastructure is required to support the development of large scale gas fired power generation in the Coega SEZ.

6.3.2 Site Alternatives

The feasibility study compiled by Worley Parsons identified the following key considerations in the selection of appropriate sites for the development of gas infrastructure:

- Proximity of the site to users (power plants);
- Access to the site from major roads, railways and harbours;

- Availability of adequate land and appropriate surrounding land uses, including possible future expansion options; and
- Land/ground that would require minimal preparation for civil works.

The selection of the proposed site at the Port of Ngqura within the Coega SEZ follows investigations that progressively considered a range of sites at international, national and local levels. This process of site selection is summarised below.

National site selection process

Shell investigated various options for locating LNG receiving terminals along the South African coast. Together with the National Ports Authority (NPA), sites were investigated at Saldanha Bay, Cape Town, Mossel Bay, Port Elizabeth and Coega. The Shell investigation concluded that Coega was the most viable option for locating a LNG receiving terminal, and approached the national utility Eskom and national gas infrastructure company iGas to evaluate the pre-feasibility of a project to develop LNG receiving and regasification facilities, and a gas pipeline infrastructure at Coega, premised on the development of a CCGT power plant.

Identification of terminal/berthing locations within the Port of Ngqura

An over-arching constraint was that the location of the berth must not constrain other activities in the port nor the planned future expansion of the port both inland into the area of the saltworks (second phase) and south-westwards (third phase). Safety requirements for the berth and activities are also of prime importance when selecting the berth locations. Furthermore, LNG is recirculated through the unloading pipelines to keep the cryogenic line cold, i.e. product remains in the line at all times. This means that safety zones around the jetty are also applicable when the LNGC is not at berth.

As part of the site screening studies (PRDW, 2015a), seven preliminary sites were identified. Each of the sites was developed with due consideration of the functional requirements and the local port constraints. During the initial stages of the site selection process, two main site constraints were identified, the future short term developments, and the existing cargo handling areas. In the process of identification of the preliminary sites, the existing cargo facilities and the future short term developments were avoided.

The seven preliminary sites which were assessed in the multi-criteria analysis (MCA) are shown below in Figure 6-1 to Figure 6-4 (PRDW, 2016). Site 1 and 2 represent onshore regasification facilities. Sites 3, 4 and 5 accommodate FSRUs. Sites 6 and 7 are a yoke mooring and offshore sea island respectively. Sites 1 and 2 and Sites 4 and 5 are only distinguished from each other by the presence of a small stub breakwater intended to lower the risk of incoming vessels colliding with a vessel at the berth.

The selection of the preferred sites and layouts followed a staged process which included input from TNPA and numerous PRDW discipline leads. TNPA was represented across various disciplines which included planning, engineering, regulatory and oversight, port operations and environmental. The site selection developed over two working sessions which culminated in a site selection workshop.

In order to identify the preferred LNG site location a site selection workshop was held, with TNPA, on 29 July 2015. The criteria used in the MCA are briefly described in Table 6-2 below:

Table 6-2: Site selection criteria descriptions ((PRDW, 2016)

Main Criteria	Criteria Description
Environmental and statutory approvals	Evaluating the perceived difficulty of attaining the Environmental Impact Assessment, permits and plans, and land acquisition and servitudes.
Port operations - effect on status quo	Effect on current port operations with respect to navigation of other vessels and general port functionality.
Future developmental potential	Conformity to future plans, effects on future port development and potential scalability and reversibility of the terminal.
Safety risk	Adherence to marine and land safety distances.
Capital cost evaluation	Relative cost comparison based on an order of magnitude capital cost estimate (heavy marine infrastructure only).
Implementation schedule	Estimate of implementation schedule i.e. duration to start-up of operations.

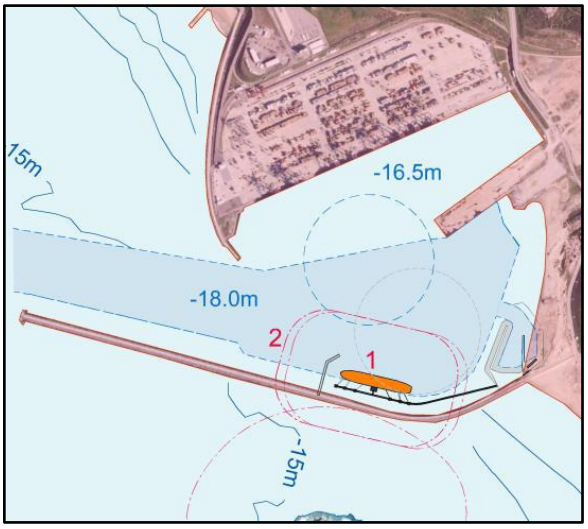


Figure 6-1: Terminal/Berthing Sites 1&2

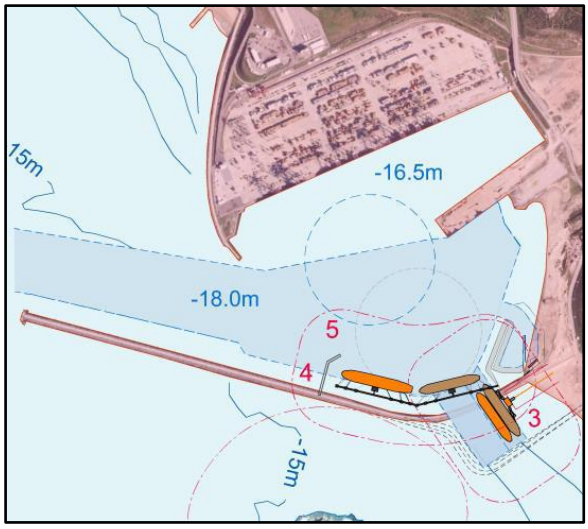


Figure 6-2: Terminal/Berthing Sites 3-5

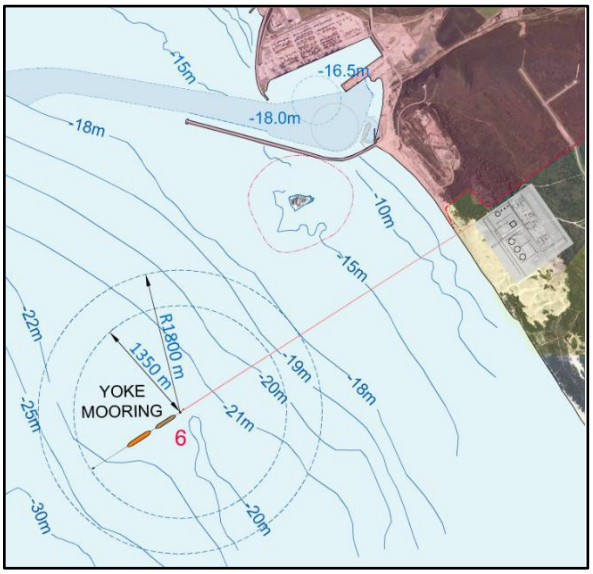


Figure 6-3: Terminal/Berthing Site 6

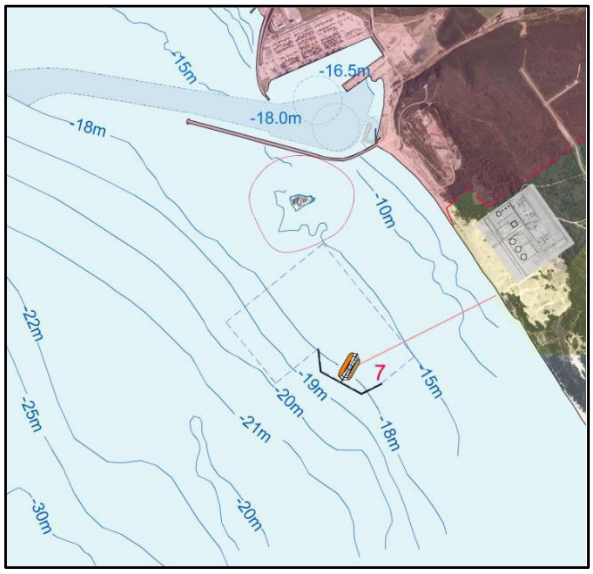


Figure 6-4: Terminal/Berthing Site 7

The following outcomes were reached:

- LNG carrier solutions (options 1 and 2) were not selected, as they are configured for land-based LNG regasification. The time required to construct the storage tanks on land is extensive and the overall build schedule would not meet the time-lines required for the IPPPP.
- Option 3 was preferred from a navigation perspective while Options 4 and 5 were preferred from a capital cost perspective.
- Options 4 and 5 are essentially the same option and further ship manoeuvring studies were required to determine the suitability of this alternative from a navigational safety perspective and whether or not a stub breakwater would be required.
- Option 3 will be the preferred site should Options 4 and 5 not be feasible; and
- Site 6 and 7 were generally the lowest scoring options and were therefore not preferred.

Options 3, 4 and 5 were considered as the preferred options. The navigation assessment subsequent to the selection process, resulted in a further refinement of options 4 and 5. The navigation assessment indicated that the stub breakwater and second, seaward berth would compromise the safety of sailing vessels. The study did, however, demonstrate that there was sufficient space for a single berth in the vicinity of the new ACB, in a double-banked configuration. Options 4 and 5 were therefore adapted to a single berth, double-banked configuration as shown in Figure 3-5.

Following these initial studies, two technically preferred site layouts were identified for the development of LNG import facilities at Coega. The second option known as Layout 2 (Dig-out-basin), is located seaward of the existing eastern breakwater in a new dig-out basin as earmarked in the 2015 Transnet Port Development Framework Plan for the dedicated purposes of LNG. Both terminal options are shown below in Figure 6-5. The layout would require demolition of a section of the breakwater, dredging of a basin, and construction of the berth and access causeway.

The capital cost for Layout 1 (FSRU) was estimated to be R0.91 billion, of which the most significant cost element would be for the quay structure. The capital cost for Layout 2 was estimated to be R4.35 billion, of which the most significant cost elements would be for the rerouting of the breakwater and the capital dredging (PRDW, 2016). Following a cost-benefit analysis undertaken by the IPP Office Layout 1 was selected as the preferred option.

It is noted that the existing Environmental Authorisation for the development for the port states that no infrastructure may be constructed along the eastern breakwater (due to the risk of rodents from ships and associated activities invading the nearby Jahleel island). Layout 1 (as illustrated in Figure 6-5) therefore deliberately avoids locating access routes or pipelines on the existing breakwater for the offshore regasification/FSRU phase of the development.

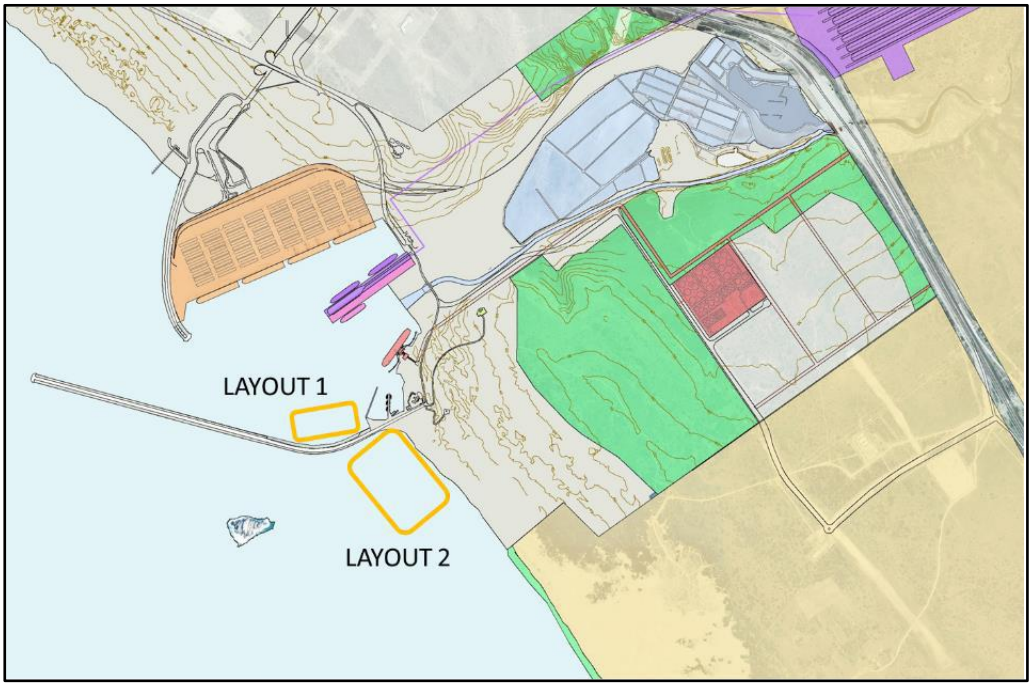


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Figure 6-5: Locality map showing the two layout alternatives that were considered for the FSRU (PRDW, 2016)

6.3.3 Layout and Alignment Alternatives

The gas pipeline from the FSRU, which would probably be developed initially, and then the cryogenic pipeline for the bulk transportation of LNG from the berth to the land-based storage and regasification facility would follow the alignment proposed in the feasibility studies, which are informed by cost and safety considerations and are indicated on the layout plans (Appendix I and Figure 1-2). No alternative corridors for these pipelines are proposed.

The land-based storage and regasification facility will require seawater intake and discharge pipelines, and associated infrastructure (e.g. pump houses) and it is expected that these will be determined by the Marine Pipeline Servitude EIA process. Consideration of these alignment alternatives is therefore outside the scope of this EIA process.

Four LNG terminal development options were considered during a feasibility study that pre-dated this EIA process. The feasibility study concluded that a terminal that could accommodate a FSRU, with provision to convert the terminal to supply LNG to a land-based regasification facility in the future, was the most feasible option. The proposed development is therefore split into two phases with the development of a jetty capable of accommodating the FSRU as the first phase, and capable of being converted in a later phase, in the longer term, to a terminal where LNGC's dock and where the LNG is piped directly to a land-based storage and regasification facility.

The four potential terminal developmental options identified for the preferred site are:

- Option 1: A floating LNG import terminal (FSRU) with no provision for future expansion or conversion, refer Figure 6-6;
- Option 2: A floating LNG import terminal (FSRU) with provision to convert the terminal to supply LNG to a land-based regasification facility in the future, refer Figure 6-7. This is the technically preferred option and is proposed in this application;
- Option 3: A floating LNG import terminal (FSRU) with future construction of a new conventional LNG import terminal to supply LNG directly to a land-based regasification facility, with

provision to convert the floating terminal to import other liquid bulk products, e.g. LPG, refer Figure 6-8; and

- Option 4: A conventional land-based LNG import terminal with no provision for future expansion or conversion, refer Figure 6-9;

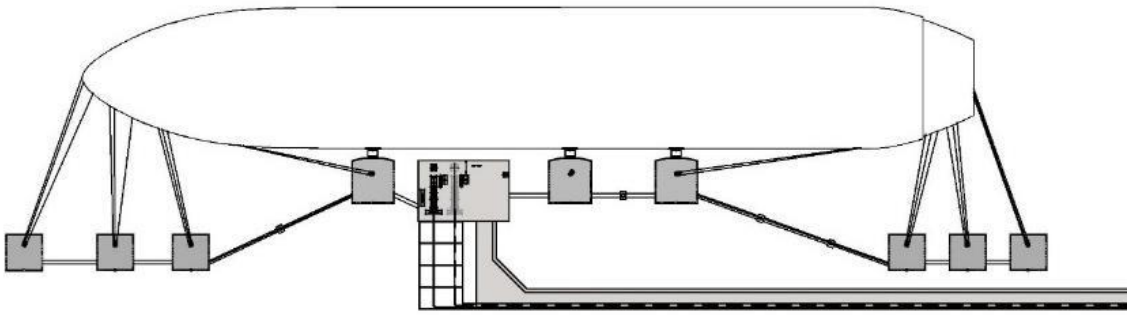

Figure 6-6: Option 1 – FSRU berth only (Source: (PRDW, 2016)

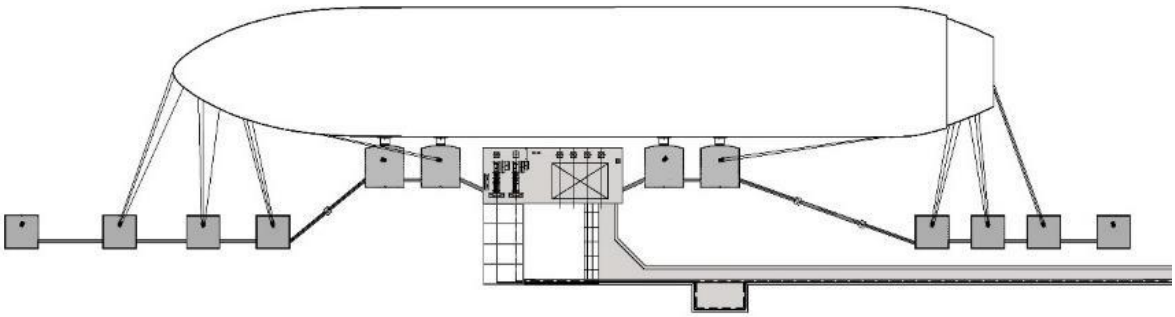

Figure 6-7: Option 2 – FRU berth convertible to LNG (Source: (PRDW, 2016)

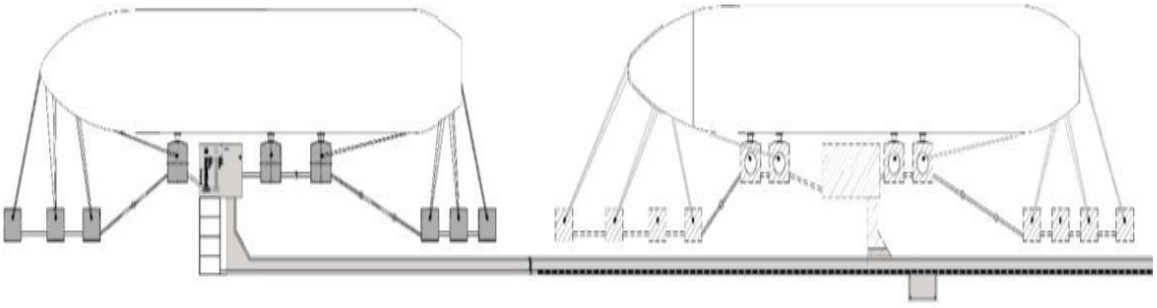

Figure 6-8: Option 3 – FSRU berth only with provision for future LNG berth (Source: (PRDW, 2016)

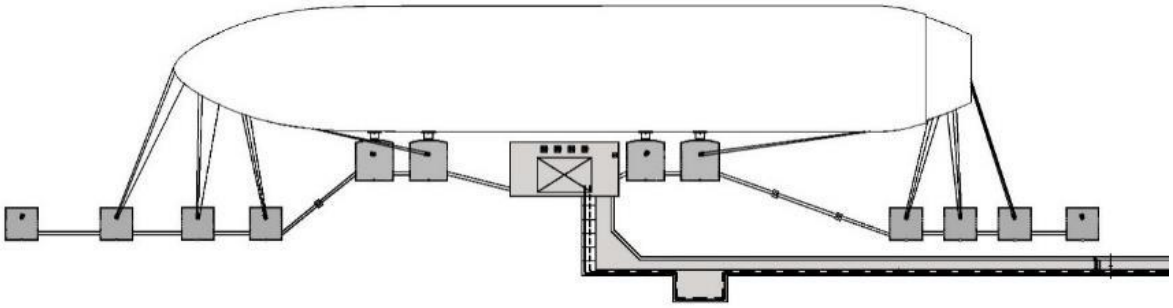

Figure 6-9: Option 4: LNG only berth (Source: (PRDW, 2016)

A workshop was held with TNPA on 10 December 2015, in order to identify the preferred development option. The criteria used in the MCA are presented in Table 6-3 below:

Table 6-3: Terminal development criteria

Main Criteria	Sub-criteria
Implementation	Upfront capital cost of port infrastructure
	Speed of implementation (time to production of first gas)
Scalability	Potential to increase throughput (of same product)
	Capital cost of throughput increase
	Risk of disruption to gas supply during upgrade
Future development potential	Flexibility of the terminal (to upgrade to LNG)
	Long-term throughput potential (LNG)
	Reversibility (ability to export LNG)

The MCA identified Option 2 (FSRU berth convertible to LNG berth) as the preferred development option followed closely by Option 3 (FSRU only berth with provision for future LNG berth). A sensitivity analysis on the criteria weighting was performed to test the outcomes of the MCA. The sensitivity analysis on the evaluation criteria weightings indicated that Option 2 scored consistently well across all weighting alternatives. It was therefore agreed that, based on TNPA's requirements (PRDW, 2015b), Option 2 (FSRU berth convertible to LNG berth) was the preferred terminal development option.

6.3.4 No-Go alternative

The no development option assumes the sites allocated within Zones 10 and 13 of the SEZ would remain undeveloped whereby no jobs are created during the construction and operational phases. Should the development proposal not take place, there would be no social and/ or economic benefits to society resulting from the project, and the current trajectory of increasing unemployment, lack of energy security and little or no economic growth is likely to continue. The absence of a positive impact for job creation and GDP, as described in this report, is not a negative impact, and so the no-go option would not result in a different impact (merely the absence of these two positive impacts). In terms of contribution to increased energy security, it is assumed that even if this project is not authorised, a similar project elsewhere would be authorised, i.e. the 2 000 MW RMIPPPP would achieve its generating capacity targets elsewhere. Consequently, in terms of energy security, the no-go option would also result in the absence of a positive impact from this project, and not a continued negative impact due to the load shedding, etc.

The no-go alternative will be used as a baseline throughout the assessment process against which potential impacts will be compared and will be assessed in the EIR.

6.4 Impact Rating Methodology

The assessment of impacts will be based on the professional judgement of specialists at SRK Consulting according to the SRK impact assessment methodology presented below. The impact ratings will be informed by the findings of specialist assessments conducted, fieldwork, and desk-top analysis. The significance of potential impacts that may result from the proposed development will be determined in order to assist DEFF in making a decision.

The significance of an impact is defined as a combination of the consequence of the impact occurring and the probability that the impact will occur. The criteria that are used to determine impact consequences are presented in Table 6-4 below.

Table 6-4: Criteria used to determine the Consequence of the Impact

Rating	Definition of Rating	Score
A. Extent– the area over which the impact will be experienced		
None		0
Local	Confined to project or study area or part thereof (e.g. site)	1
Regional	The region, which may be defined in various ways, e.g. cadastral, catchment, topographic	2
(Inter) national	Nationally or beyond	3
B. Intensity– the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources		
None		0
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
C. Duration– the time frame for which the impact will be experienced and its reversibility		
None		0
Short-term	Up to 2 years	1
Medium-term	2 to 15 years	2
Long-term	More than 15 years	3

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

Table 6-5: Method used to determine the Consequence Score

Combined Score (A+B+C)	0 – 2	3 – 4	5	6	7	8 – 9
Consequence Rating	Not significant	Very low	Low	Medium	High	Very high

Once the consequence has been derived, the probability of the impact occurring will be considered using the probability classifications presented in Table 6-6.

Table 6-6: Probability Classification

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

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

Table 6-7: Impact Significance Ratings

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

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

Table 6-8:Impact status and confidence classification

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

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

- Insignificant: the potential impact is negligible and will not have an influence on the decision regarding the proposed activity/development.
- Very Low: the potential impact is very small and should not have any meaningful influence on the decision regarding the proposed activity/development.
- Low: the potential impact may not have any meaningful influence on the decision regarding the proposed activity/development.
- Medium: the potential impact should influence the decision regarding the proposed activity/development.
- High: the potential impact will affect the decision regarding the proposed activity/development.
- Very High: The proposed activity should only be approved under special circumstances.

Practicable mitigation measures will be recommended and impacts will be rated in the prescribed way both with and without the assumed effective implementation of mitigation measures. Mitigation measures will be classified as either:

- Essential: must be implemented and are non-negotiable; or
- Optional: must be shown to have been considered, and sound reasons provided by the proponent, if not implemented.

In the case of some of the specialist studies, modifications to the impact significance rating methodology (primarily by means of modifications to the definitions of the assessment criteria used) were required, as appropriate to the particular study. These modifications are detailed by the specialists in their particular study reports, and SRK is confident that the modifications described have not compromised the quality or objectivity of the impact assessment in any way.

6.5 Integration of Studies into the EIA Report and Review

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

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

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

6.6 Assessment of Less Significant (or Minor) Impacts

Certain impacts, while important, are considered likely to be less significant based on the impact rating criteria. These impacts include:

- **Visual/ sense of place** – change in the visual character and sense of place due to the presence of the power plant in an area that was relatively undeveloped;
- **Waste Management** – construction, domestic, and industrial type wastes similar to other industrial or manufacturing concerns would naturally be generated, and are expected to be moderate in quantity;
- **Soil, Stormwater and erosion** – vegetation clearing and physical disturbance of soils during construction could lead to sedimentation in stormwater runoff, potentially clogging the receiving stormwater infrastructure. Hardened surfaces associated with the operation of development will result in less infiltration of stormwater into the soil and increased runoff, potentially exacerbating stormwater impacts;
- **Terrestrial ecology** – with the progression of vegetation clearing and earthworks during construction, as well as operation of machinery and increased human presence on and around the site during construction and operation, habitat destruction, disturbance, and increased presence of scavengers / predators may result. This is especially important due to the presence of protected faunal species (including the Damara tern) in the vicinity of the site;
- **Heritage resources** – construction activities (especially excavation and earthworks) could expose and potentially damage or destroy concentrations of palaeontological/archaeological material;
- **Traffic** – increased traffic may impact traffic flow and safety to other users; and

- **Construction activities** – Additional impacts typically associated with the construction phase include: dust impacts; damage to other infrastructure (e.g. underground cables and pipelines); and veld fires and fire management.

These impacts are not expected to be significant. However, they have been assessed by the EAPs or specialists through desktop investigation (making use of previous studies where relevant) and ground-truthing where appropriate, and are discussed below. Mitigation measures are also identified, and the CDC's Standard Environmental Specification (SES) for Construction, available for download via CDC's website, provides additional measures that will have to be adhered to by all tenants within the SEZ.

6.6.1 Visual Impacts

Description

Altered sense of place and visual intrusion may be caused by earthworks and the operational LNG and Gas Hub. The FSRU(s) and mooring infrastructure will be in keeping with the existing port infrastructure and the other components of the gas infrastructure project (pipelines etc) will largely run within existing services corridors. These components are there not expected to result in significant visual impacts. The project is located in an industrial zone (Coega SEZ) in areas allocated to bulk services, energy and aquaculture development. While the LNG and Gas Hub site is sheltered to an extent from sensitive receptors along the N2 and inland, opportunities for visual screening may be limited for receptors along the coast and for offshore viewers (such as visitors to the MPA). To manage impacts during construction, activities will need to be managed so that negative visual impacts (including those resulting from dust) are minimised.

Standard management measures in the EMPr will be augmented with reference to the CDC's architectural guidelines, which are expected to be applicable to this project.

Impact V1: Visual Impacts and change in Sense of Place during construction and operation

Table 6-9: Significance rating of impact V1 and mitigation measures during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Low	Short-term	Very low	Definite	Very low	-	High
Management Measures								
• Disturbance to the natural vegetation to be kept to the minimum; • Dust control measures such as wetting and covering of stockpiles to be implemented when necessary; and • Effective waste management.								
After Management	Regional	Low	Short term	Very low	Possible	Insignificant	-	High

Table 6-10: Significance rating of impact V1 and mitigation measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Low	Long term	Medium	Possible	Low	-	High
Management Measures								

• Effective waste management; and • Minimise lighting of the facility at night, to reduce light pollution.								
After Management	Regional	Low	Long term	Medium	Possible	Low	-	High

6.6.2 Impacts relating to Waste Management

Description

With the exception of effluent and air emissions, no large scale systematic wate by-products would be generated as part of the process. Wastes similar to other industrial or manufacturing concerns would naturally be generated, and are expected to be moderate in quantity. No specific waste study has therefore been conducted. Lack of adequate waste management during both construction and operation could result in spread of litter, illegal dumping, contamination soil, water resources and the marine environment, and increased prevalence of scavengers at the site.

During construction, the waste generated will largely be construction waste (rubble, cement waste, packaging, small amounts of hazardous materials), with small amounts of domestic waste from workers on-site. It is anticipated that on-site chemical toilets will be used for sanitation during construction, and it must be ensured that the contents thereof are properly disposed of. During operation, waste generated by the LNG and Gas Hub, FSRU and associated facilities could result in the impacts mentioned above if not adequately managed. Waste entering the stormwater system may also result in blockages and downstream contamination.

Impact WM1: Poor Waste Management resulting in pollution of the surrounding area during construction and operation

Table 6-11: Significance rating of impact WM1 and mitigation measures during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Medium	Medium-term	Medium	Definite	Medium	-	High
Management Measures								
• A waste management plan should be in place and should address classification of waste streams, segregation at source, control of waste on site before disposal, removal of wastes from site, and record keeping; • The Contractor must identify and separate materials that can be reused or recycled to minimise waste, e.g. metals, packaging and plastics, and provide separate marked bins/ skips for these items. These wastes must then be sent for recycling and records kept of recycling; • No disposal of wastes, other than at registered landfill sites; • No waste may be burned or buried; • Sufficient portable on-site weather & vermin proof bins with lids need to be provided and appropriately placed and emptied regularly (contents to be disposed of at a licenced landfill site, and proof of disposal retained for auditing purposes); • Ensure that construction materials (e.g. bags of cement) are suitably stored and protected to avoid wastage; and • Excess excavated material that cannot be used for backfill should not be allowed to accumulate on site and should be disposed of at a formal landfill site or suitable spoil site identified in conjunction with the ECO.								
After Management	Regional	Low	Short-term	Very low	Possible	Insignificant	-	High

Table 6-12: Significance rating of impact WM1 and mitigation measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Low	Long term	Medium	Possible	Low	-	High
Management Measures								
• The developer must identify and separate materials that can be reused or recycled to minimise waste e.g. metals, packaging and plastics, and provide separate marked bins/ skips for these items. These wastes must then be sent for recycling and records kept of recycling; • No dumping within the surrounding area shall be permitted, and no waste may be buried or burned on site; • Sufficient portable on-site weather & vermin proof bins with lids need to be provided and appropriately placed and emptied regularly (contents to be disposed of at a licenced landfill site, and proof of disposal retained for auditing purposes); • Cleared alien vegetation should be disposed of so that it does not re-establish on the site or surroundings; • Regular (weekly) waste collection service to be provided; and • All staff shall be trained on correct waste management.								
After Management	Local	Low	Long term	Low	Improbable	Very low	-	High

6.6.3 Soil, Stormwater and Erosion Impacts

Description

Vegetation clearing and disturbance of soils during construction will leave the ground vulnerable to erosion by water and wind. This could lead to increased sediment load in stormwater runoff, potentially clogging the receiving stormwater infrastructure. Loss of topsoil and erosion will also limit the potential for vegetation growth in these areas, leading to further erosion. There is a risk of downstream erosion and sedimentation if undeveloped cleared areas are not properly rehabilitated during and after the construction phase**.**

An increase in the extent of hardened surfaces from the development will increase the impermeable surface area and lead to reduced ground absorption of stormwater and increased surface water runoff. This will result in an increase in the quantity and velocity of stormwater leaving the site and could result in soil erosion and downstream sedimentation impacts if there is improper storm water management design.

Runoff also has the potential to transport potential contaminants (generated from project point sources as well as roads) away from the site into downstream natural environments, including the sea and littoral active zone. Spills or leaks of liquids such as chemicals, hydrocarbons, paints, or water contaminated with paints, solvents, cement of other construction related materials may infiltrate into the soil and thereby enter groundwater resources, by means of ground or surface water runoff. Similarly, during operation, spills or leaks of materials and fuels stored on site may occur during storage or handling, potentially polluting surface and groundwater resources, or the marine environment.

No wetlands or other surface water features have been identified on or within 32 m of the proposed Gas Infrastructure.

Impact WE1: Pollution of Soil and Stormwater, and increase in Erosion during construction and operation

Table 6-13**: Significance rating of impact WE1 and mitigation measures during construction**

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Low	Short-term	Very low	Definite	Very low	-	High
Management Measures								
• Disturbance of soil and the natural vegetation to be kept to the minimum; • Use existing access tracks where possible; • Handling of hazardous liquids over impermeable surfaces only to prevent leaks or spills; and • An erosion control plan must be compiled by a suitably experienced specialist, outlining specific recommendations for stabilisation of dunes that are cleared or disturbed during construction. This must be compiled in conjunction with a revegetation plan by a suitably experienced specialist in coastal vegetation.								
After Management	Regional	Low	Short term	Very low	Possible	Insignificant	-	High

Table 6-14: Significance rating of impact WE1 and mitigation measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Low	Long term	Medium	Definite	Medium	-	High
Management Measures								
• Implementation of a site specific stormwater management plan, in accordance with the CDC's overarching Stormwater Master Plan for the SEZ, to ensure stormwater exiting the site meets the requirements in terms of quality and volume; • Harvesting of rainwater and stormwater where possible for use on site; • Separation of clean and dirty stormwater on site and treatment of dirty stormwater prior to discharge; • Ensure all storage and handling of hazardous liquids takes place over an impermeable surface to capture any leaks or spills for disposal or further treatment; and • Include bunding to at least 110% of storage capacity around all fuel and chemical storage vessels where appropriate to do so, to capture any spills / leaks.								
After Management	Regional	Low	Long term	Medium	Possible	Low	-	High

6.6.4 Impacts on Terrestrial Ecology

Impact TE1: Loss and disturbance of vegetation

Description

Loss and disturbance of vegetation will occur through the clearing of areas for the construction of the power plant units (including associated infrastructure) and the spread of invasive alien vegetation may be promoted through the disturbance to land. Faunal species could be lost and habitats fragmented through vegetation clearing for the development, displacing these animals to adjacent areas.

During operation, noise and other anthropogenic impacts of the development will also disturb and displace fauna in the surrounding habitat. Most species will be able to migrate to other areas of the SEZ further from the site, provided suitable habitat is available.

The site sensitivity map (Figure 4-6) identified the CBAs around the study area. The proposed site in Zone 10 lies to the north west of the Algoa Bay Islands. Clearing of vegetation, has previously been authorised through the "Rezoning of the remainder of the Coega SEZ" impact assessment process, and impacts associated with this are currently managed through the approved Coega OSMP.

Although a number of species of conservation concern have been identified on and around the proposed Gas infrastructure footprint areas in Zone 10, as the terrestrial ecology of the SEZ is already relatively well studied, no terrestrial ecological assessment was undertaken in support of this EIA process. Strict management measures are however proposed to protect protected faunal species in particular that may be present in the area

All terrestrial ecological impacts are proposed to be managed through standard search & rescue procedures (as per the conditions of the relevant search and rescue permits held by the CDC), additional measures detailed below, as well as the measures relating to protection of species listed in the CDC's Environmental Specifications for Construction and the relevant permits for protected species.

Table 6-15: Significance rating of impact TE1 and mitigation measures during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Medium	Short-term	Low	Definite	Low	-	High
Management Measures								
• Keep vegetation clearance to the absolute minimum; keeping the width and length of the earth works to a minimum; • A revegetation plan must be compiled by a suitably experienced specialist in coastal vegetation, outlining specific recommendations for rehabilitation of coastal vegetation that is cleared or disturbed during construction; • No-Go/ open space areas must be clearly demarcated/ clearly marked (i.e. with danger tape) before any construction activities commence on site and appropriate measures implemented to ensure compliance; • Clearing must take place in a phased manner (i.e. the entire area to be developed should not be cleared all at once) to allow any fauna to migrate to adjacent areas safely; • Vehicles and/ or plant and personnel shall only be permitted within the demarcated construction areas, or on existing roads and/ or access tracks between demarcated areas. • No clearing of vegetation, abstraction, storage, disposal or mixing of any substance (e.g. water, cement, petroleum etc.) may take place outside the demarcated construction area without prior approval of the ECO • No fires permitted on site; • Limit all activities to within the construction footprint area, which must be demarcated prior to commencement of clearing; • No hunting, poaching or otherwise harming of wildlife on and around the site; • Site walkthrough and search and rescue to be conducted by a suitably experienced faunal specialist prior to clearing of the site, with particular focus on faunal species of special concern that may occur in the vicinity; • No wildlife may be removed from the site or surrounding areas unless approved by the ECO in conjunction with the appropriate permits obtainable from relevant competent authorities; • Educate workers on site about the protection of all fauna on site; and								

• An alien invasive vegetation monitoring and control programme must be implemented throughout the construction and defects notification period, to clear alien invasive vegetation from all areas affected by construction activities and prevent its regrowth.								
After Management	Regional	Low	Short-term	Very low	Probable	Very low	-	High

Table 6-16: Significance rating of impact TE1 and mitigation measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Low	Long-term	Medium	Probable	Medium	-	Medium
Management Measures								
• Monitor the surrounding area for signs of dumping of waste, harvesting of indigenous vegetation, destruction of natural forest, and invasion of additional informal residences, and take action to prevent these activities.								
After Management	Regional	Low	Long-term	Medium	Possible	Low	-	Medium

Impact TE2: Impact on Damara Terns due to Disturbance

Description

The LNG and Gas Hub proposed for zone 10 lies approximately 200- 300 m of the Damara Tern breeding area (OSMP) (see Figure 4-6). Based on a review of the impact assessment and monitoring reports (AP Martin, November 2019 and March 2020, respectively) for the Damara Tern breeding site close to the sand mining application in zone 10 of the SEZ, the following impact description and mitigation measures are considered to be relevant to the CDC gas to power project. The specialist notes also that the Coega OSMP states that “Any development proposed in this coastal area must take into consideration the impact on Damara Terns”.

Damara Terns are sensitive to disturbance in the vicinity of their nests - this would include construction related activities, vehicular as well as pedestrian disturbance. The increased risk of predation resulting from increased human activity in the area (and the associated domestic / food waste) would also pose a risk to the population.

Previous studies based on mining activities in the area have found that intrusion or disturbance within 200 m of the tern nesting area results in negative impacts on breeding success if this and vehicular access to the coastal zone is not successfully controlled the impact is assessed as Medium Negative that can be reduced to Very Low Negative with mitigation. During construction the duration of the impact is rated as medium term, as the disturbance could potentially affect breeding success and population growth beyond the construction period.

Note that the assessment below excludes noise impacts on the population, which are assessed separately under the noise impact section.

Table 6-17: Significance rating of impact TE2 and mitigation measures during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	High	Medium - term	Medium	Definite	Medium	-	High

Management Measures								
• CDC to establish a Damara Tern Management Program within the CDC OSMP mechanisms, which incorporates: o specialist monitoring of the Damara tern population to determine the extent of their habitat, by an expert with previous experience monitoring this species, o an annual report on the status of the SEZ Damara tern population, and approval of the annual report / management plan by the Coega Environmental Monitoring Committee (EMC). o Continued monitoring of the Damara Tern population must be implemented • Maintain a No-Go buffer area to ensure no access or activities within 200 m of Damara Tern habitat as indicated on the environmental sensitivity map (Figure 4-6); • No-Go buffer areas around the tern breeding area must be demarcated and pedestrian and other access must be prevented both during operation, particularly during the Damara Tern breeding season (early October to late February); and • Environmental awareness / toolbox talks to include awareness of the Damara tern population; • No fires are permitted within the project area. • Measures must be taken to minimise noise from machinery etc. • Drivers of vehicles authorised to drive on the beach must be made aware of the presence of Damara Terns during the breeding season (October to March) and must keep below the high-water mark. • Management actions such as litter picking must be carefully planned to minimise disturbance to breeding pairs.								
After Management	Local	High	Medium-term	Medium	Probable	Medium	-	High

Table 6-18: Significance rating of impact TE2 and mitigation measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	High	Long-term	High	Definite	High	-	High
Management Measures								
• CDC to establish a Damara Tern Management Program within the CDC OSMP mechanisms, which incorporates: o specialist monitoring of the Damara tern population to determine the extent of their habitat, by an expert with previous experience monitoring this species, o an annual report on the status of the SEZ Damara tern population, and approval of the annual report / management plan by the EMC. o Continued monitoring of the Damara Tern population must be implemented • Maintain a No-Go buffer area to ensure no access or activities within 200 m of Damara Tern habitat as indicated on the environmental sensitivity map (Figure 4-6); • No-Go buffer areas around the tern breeding area must be demarcated and pedestrian and other access must be prevented both during operation, particularly during the Damara Tern breeding season (early October to late February); and • Environmental awareness / toolbox talks to include awareness of the Damara tern population; • No fires are permitted within the project area. • Measures must be taken to minimise noise from machinery etc. • Drivers of vehicles authorised to drive on the beach must be made aware of the presence of Damara Terns during the breeding season (October to March) and must keep below the high-water mark. • Management actions such as litter picking must be carefully planned to minimise disturbance to breeding pairs.								

After Management	Local	High	Long-term	High	Probable	High	-	High

6.6.5 Damage or destruction of Heritage Resources

Description

Damage or destruction to heritage resources on the site may occur due to earthworks and excavations during construction or during maintenance activities. As heritage studies have previously been compiled by specialists for the Coega SEZ and no sensitive areas/material was identified within the proposed development area, no additional heritage studies were undertaken. Zone 10, being close to the coast, was however noted as a sensitive area in general from a heritage perspective, and for this reason additional mitigation measures were recommended by the specialist. The mitigation measures listed below are as per the recommendations made by the specialist at the time, and have been commented on by SAHRA.

The management measures will be included in the EMPr and are aimed at identification and assessment of heritage features that may be uncovered during construction. No impacts are anticipated during operation.

Impact HR1: Damage to or destruction of heritage resources during construction

Table 6-19: Significance rating of impact HR1 and mitigation measures during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Medium	Long term	Medium	Possible	Low	-	High
Management Measures								
• An archaeologist must be present on site during vegetation clearing of selected strips of vegetation (to be identified by the archaeologist). Clearing must be by hand or small machinery, or the least invasive method of clearing. • Monitoring by an archaeologist must take place during all earthmoving activities, including, but not limited, to trenching and piling. • If any concentrations of heritage material / fossils are exposed during construction, all work in that area must cease and it must be reported immediately to the Albany Museum so that the required investigations can be undertaken. This could entail Phase 2 mitigation (to be determined by the Albany Museum). • After vegetation clearing a report must be sent to SAHRA for review and guidance on the way forward. • Any excavations in the Salnova formation must be examined and sampled by a professional palaeontologist WHILE fresh bedrock is still exposed. The presence of a palaeontologist is required on site soon after exposure.								
After Management	Local	Medium	Long term	Medium	Improbable	Low	-	High

6.6.6 Impacts on Traffic

Description

The following potential traffic related impacts relating to the proposed Gas Infrastructure have been identified. Note that the impacts will occur both in the short-term (i.e. during the construction phase) and medium to long-term once the plant is completed (operational phase):

- Road Capacity - Additional vehicle trips generated by the proposed development (up to 323 and 34 additional trips during the AM and PM peak hours for the construction and operational scenarios respectively) will have minimal impact in terms of road capacity given the current low hourly volumes along the road links and at the affected intersections, and low trips generated by the proposed power plant.
- Road Pavement - The Coega IDZ Demand Modelling Report indicates that all Class 2 roads would likely need to accommodate 7.5 million E80s per lane over a 20-year period. Given that the Ring Road is a class 2 road it has likely been designed for these volumes. As such the number of E80s generated by the Power Plant traffic relative to the maximum expected loading over the 20-year period is minimal. Similarly, the cumulative impact of all other known power plants will not impact significantly on the road pavements as their design has taken such volumes into account.
- Traffic Safety - Safety issues may initially be a concern given low traffic volumes as traffic is likely to operate at high speeds in low traffic environments.

Impact TI1: Increased Traffic volumes, affecting traffic flow during construction

Table 6-20: Significance rating of impact TI1 and mitigation measures during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Low	Short-term	Very low	Definite	Very low	-	High
Management Measures								
• Provide suitable traffic accommodation measures as part of construction contract to inform other road users of presence of construction related traffic; • Traffic accommodation measures to be provided in terms of Chapter 13 of the South African Road Traffic Signs Manual; • Measures to be provided subject to approval by the Engineer; and • Ensure construction traffic is confined to site area where possible.								
After Management	Local	Low	Short term	Very low	Definite	Very low	-	High

Table 6-21: Significance rating of impact TI1 and mitigation measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Low	Long-term	Very low	Definite	Very low	-	High
Management Measures								
• No measures required to accommodate additional traffic.								
After Management	Local	Low	Long term	Very low	Definite	Very low	-	High

Impact TI2: Additional Axle Loading resulting in deterioration of road condition during construction

Table 6-22: Significance rating of impact TI2 and mitigation measures during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Low	Medium-term	Very low	Definite	Very low	-	High
Management Measures								
• Minimise need for continuous construction traffic on Ring Road by confining construction traffic to the site; • Ensure that vehicle loads are within legislated limits, i.e. maximum Gross vehicle mass of 56 000kg; and • Source relevant permits from the Eastern Cape Department of Transport should abnormal loads be required for transport of components.								
After Management	Local	Low	Medium-term	Very low	Definite	Very low	+	High

Impact TI3: Traffic Safety Impact due to additional / high-speed traffic during construction

Table 6-23: Significance rating of impact TI3 and mitigation measures during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Low	Medium-term	Very low	Probable	Very low	-	High
Management Measures								
• Provide suitable traffic accommodation measures as part of construction contract to inform other road users of presence of construction related traffic, including speed restriction signage; and • Increased law enforcement protocols.								
After Management	Local	Low	Medium-term	Very low	Probable	Very low	+	High

Table 6-24: Significance rating of impact TI3 and mitigation measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Low	Long-term	Very low	Definite	Very low	-	High
Management Measures								
• Suitable warning traffic signage be provided to ensure safe operation along access roads; • Ongoing enforcement along access roads;								
After Management	Local	Low	Long-term	Very low	Definite	Very Low	-	High

6.6.7 General Construction Related Impacts

Description

Impacts typically associated with the construction phase include:

- Dust impacts;
- Damage to other infrastructure (e.g. underground cables and pipelines); and
- Veld fires and fire management.

Impact CA1: Dust impacts

Dust generated by construction activities has the potential to impact on off-site access roads by creating a dust nuisance to other tenants in the SEZ and impairing visibility on the roads thereby affecting traffic safety and visual impacts. Excess dust can also draw undue attention to the site by increasing the visibility of construction activities. The impact of dust is more of a nuisance nature and does not typically pose a health risk due to the typically coarse size of the dust particles.

Table 6-25: Significance rating of impact CA1 and mitigation measures during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Medium	Short-term	Low	Definite	Low	-	High
	Management Measures							
• Clear vegetation in a phased manner; • Areas to be cleared of vegetation or topsoil shall be cleared only when required, and shall be rehabilitated immediately on completion of the construction activity in that area; • Access roads should be kept to a minimum and their length and width should be minimised to reduce the surface area from which dust can be entrained; • When transporting fine materials, dust tarps should be installed on vehicles; • Limit speeds on access and internal roads to 40 kmph; • When necessary, appropriate dust control measures (such as wetting of soil and covering of stockpiles) shall be implemented; • Potable water is not to be used for dust control; and • Maintain a complaints register to monitor dust experienced by neighbours and respond to complaints by increasing the frequency and/or intensity of the dust suppression.								
After Management	Local	Medium	Short-term	Very low	Probable	Very low	-	High

Impact CA2: Damage to other infrastructure.

While the project layout is intended to fit into the existing or yet to be developed services infrastructure in the SEZ, there is a potential remains for damage to existing services infrastructure (both underground and above ground) during excavation and other construction related activities. This may result in temporary disruptions to these services, affecting other tenants in the SEZ.

Table 6-26: Significance rating of impact CA2 and mitigation measures during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Low	Short-term	Very Low	Possible	Insignificant	-	Medium
Management Measures								
• Existing infrastructure and services within or close to the construction footprint are to be located (via GPR if necessary) and demarcated prior to construction activities commencing; • Relevant authority agencies and/or Department of the service supplied are to be notified should existing infrastructure be damaged by construction related activities; and • Other users are to be notified of any planned disruptions to services ahead of time.								
After Management	Local	Low	Short-term	Very Low	Improbable	Insignificant	-	Medium

Impact CA3: Veld fires and fire management

Much of the Zone 10 and surrounding vegetation is largely made up of dune thicket invaded by woody aliens, which is susceptible to burning, and therefore the risk of bush fires spreading to the proposed gas infrastructure must be considered. Zone 13 is largely surrounded by other development and indigenous vegetation including thicket, which is generally not susceptible to burning.

There is a risk however of fires originating from within the development due to construction activities or general anthropogenic impacts.

The potential risks of a fire or explosion occurring during operation of the site are assessed and covered in the Quantitative Risk Assessment, (see Appendix K2 and Section 6.7.4 below)

Table 6-27: Significance rating of impact CA3 and mitigation measures during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Medium	Short term	Low	Possible	Very low	-	High
Management Measures								
• No fires on or around the site allowed; • Smoking is not to be permitted on site except in designated areas; • Sufficient fire-fighting equipment to be maintained and be accessible on sites at all times; and • Any incidents or accidents must be recorded, and a record thereof must be kept on site.								
After Management	Local	Medium	Short term	Very Low	Improbable	Insignificant	-	High

6.7 Assessment of Key Potential Impacts

The following identified impacts that are considered to be key to the impact assessment, in most cases requiring specialist input:

- **Climate change** – both contribution of the proposed power plant to climate change due to increased emissions of greenhouse gases, and potential vulnerability of the project to the effects of climate change;

- **Noise** – impacts of noise generated by the power plant development on surrounding receptors (human and environmental);
- **Air quality** – the impacts of atmospheric emissions resulting from operation of the power plant on ambient air quality in the SEZ and surrounding area of influence;
- **Quantitative Risk Assessment** – potential safety risk to the public and other users resulting from catastrophic events relating to storage and handling of dangerous goods on the site; and
- **Socio-economic** – increased employment and improvement in livelihoods, enhancement of skills and knowledge; improvement of the local economy are some of the socio-economic benefits during construction and operation.

These impacts have been assessed by the various specialists through desktop investigation, supported by ground-truthing and predictive modelling where appropriate, or in-house by SRK. Copies of the full specialist reports are provided in Appendix K, and the findings and recommendations of the studies are discussed below.

6.7.1 Impacts relating to climate change

Description

In South Africa, the regulatory framework and the legal provisions related to climate change are still in the process of being developed and interpreted, as can be seen in the recent development surrounding the Thabametsi case, and currently provide limited guidance in the field of CCIAs.

The CCIA was based on South African legislation, but was augmented by international best practice in the field of climate change risk and vulnerability assessments. The report was informed by the NEMA, recognising that the EIA regulations are designed to assess the impact of local pollutants, and do not sufficiently provide for the assessment of GHG emissions which have long-term, global impacts. Due to the global nature of climate change, GHG emissions from any specific project cannot be directly linked to global climate change, or to the climate change impacts on that project, or on the local area in which the project is implemented.

This CCIA, in the context of the guidance provided by the Thabametsi Case, considered the following key aspects:

- An assessment of the Gas Distribution Infrastructure prospective contribution to climate change through the emission of greenhouse gases, like carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) – collectively referred to throughout this report as CO_2e (carbon dioxide equivalent);
- An assessment of the impacts of climate change on the Gas Distribution Infrastructure (vulnerability assessment) during its lifetime and resilience of the project to climate change; and
- An indication of the possible mitigation or adaptation measures that can be adopted by CDC to ensure minimised impact on/by climate change.

A high-level GHG inventory was developed for the proposed Gas distribution infrastructure, to quantify its impacts on climate change. This GHG inventory estimated the emissions associated with the operation and value chain (both upstream and downstream) of the proposed project. The GHG inventory was assessed in comparison to a calculated South African carbon budget, which, in turn, informed the impact assessment conducted in this CCIA.

The South African carbon budget was used to benchmark the emissions to be released by the proposed Gas Distribution Infrastructure. Emissions are presented in tonnes of CO_2 equivalents (CO_2e),and take into consideration the Global Warming Potential (GWP) of all emitted greenhouse gases over 100 years. The included gases are CO_2, CH_4 and N_2O. The GWP of any GHG is the amount of heat absorbed per mass unit of a GHG divided by the amount of heat an equivalent amount of CO_2 would absorb over the specified period.

Impact CC1: Impact on climate change by way of GHG emissions resulting from the project

The outcomes of the GHG inventory are shown in Table 6-28. The project, with its direct and indirect emissions, will emit in the order of 28 million tons of CO_2e per year. Overall, 855 million tonnes CO_2e of emissions are emitted across the lifetime of the project. This is equivalent to around 19% of the South African carbon budget, or 8.1% of South Africa's low Peak, Plateau, Decline trajectory (PPD) scenario and 5.0% of its high PPD scenario. By comparison, the possible reduction in emissions from the coal-as-fuel baseline that could be achieved is also shown. This is because fuel brought in by the project could replace heat energy generated from the combustion of coal with heat energy generated from the combustion of natural gas.

Table 6-28: Summary of all GHG emissions calculated for the proposed Gas Infrastructure

Source of emissions	Annual Emissions (tCO2e/a)	Life of Plant Emissions (tCO2e)
Scope 1 & 2 (Direct and energy indirect emissions)	865 000	26 000 000
Scope 3 (Other indirect emissions)	27 600 000	829 000 000
Total emission associated with the project	**28 500 000**	**855 000 000**
Baseline emissions that could be avoided	38 300 000	1 150 000 000
Potential avoided emission impact of the project	**-9 840 000**	**-295 000 000**

According to the methodology used for the CCIA, emissions over 10 million tons CO_2e over the lifetime of the project, or greater than 0.227% of SA's carbon budget would be rated as very high impact intensity rating[9]. The resulting impact significance rating is provided Table 6-29. Due to the global nature of the impact, high intensity, long term duration and definite probability, the impact significance rating comes out as high (negative), both with and without mitigation in place.

Avoided emissions have not been considered in this impact significance rating, however the specialist has noted that the possible emission avoidance could be in the order of 10 million tons of CO_2e per annum for the case where a predominantly gas-as-fuel scenario, rather than coal-as-fuel scenario, is considered. The calculation is presented as a possible scenario to illustrate the potential impact that the project could have if there is a shift from coal-as-fuel to gas-as-fuel in industry, due to the lower emission factor associated with the combustion of natural gas when compared to the combustion of coal.

The Scope 1 and Scope 2 emissions were summarised into the following categories: Tanker Berthing and Deberthing; and LNG Regasification. With an assumed project life span of 30 years[10], this amounts to 26 million tCO_2e throughout the lifespan of the Gas Distribution Infrastructure project. These emissions are related to a total annual throughput of 16.9 million m3 of LNG per year. The Scope 1 and Scope 2 emissions equate to 0.56% of South Africa's carbon budget.

The upstream Scope 3 emissions (from natural gas extraction, transport, processing and liquefication) amount to a total of 8.0 million tCO_2e per annum. The most significant portion of Scope 3 emissions, and of the entire project, is the downstream Scope 3 emissions which are 19.6 million tCO_2e per annum, which are related to the combustion of the imported LNG for various processes, including, but not limited to, the combustion emissions arising from the three proposed CDC gas-to-power stations.

[9] In the absence of the "very high" category in the impact rating methodology provided by SRK, the specialist recommended the "high" category to be used.
[10] Power Generation Technology Data for Integrated Resource Plan of South Africa. (2017) Department of Energy

The total annual emissions (Scope 1, 2 and 3) are 28.5 million tCO_2e per annum and the total GHG Inventory across the lifetime of the Gas Distribution Infrastructure is 855 million tCO_2e. These emissions equate to 19.4% of South Africa's carbon budget.

The emissions occurring within South Africa's borders are only Scope 1, Scope 2 and downstream Scope 3 emissions **Error! Reference source not found.** shows that 72% of the emissions across all scopes of the Gas Distribution Infrastructure occur within South Africa (20.5 million tCO_2e emissions annually). This equates to 615 million tCO_2e emissions in South Africa throughout the lifetime of the Gas Distribution Infrastructure.

Furthermore, the total emissions associated with the Gas Distribution Infrastructure cover all the emissions associated with the greater Coega Integrated Gas-to-Power Project proposed by the CDC. All direct emissions from the accompanying gas-to-power plants are covered by the downstream Scope 3 emissions. The upstream Scope 3 emissions of the gas-to-power plants are also covered by the Scope 1 and upstream Scope 3 emissions of the Gas Distribution Infrastructure.

Table 6-29: Significance rating of impact CC1 and mitigation measures during operation

	Spatial Extent	**Intensity**	**Duration**	**Consequence**	**Probability**	**Significance**	**+ -**	**Confidence**
Before Management	International	Very high	Long-term	Very high	Definite	Very high	-	High
Management Measures								
• Source LNG from nearby suppliers such as northern Mozambique, to reduce upstream transport emissions; • Source LNG from responsible suppliers, reducing emissions associated with extraction and upstream processing of the LNG; • Use good quality equipment to reduce the amount of natural gas that escapes as fugitive emissions and reducing the need for flaring The impact of these mitigation measures is however insignificant relative to the overall impact of the project. There are no effective mitigation measures that will significantly reduce the overall GHG emissions of the project and resultant impact on climate change.								
After Management	International	Very high	Long term	Very high	Definite	Very high	-	High

The impact will be irreversible and will result in irreplaceable loss of resources. The impact is not mitigatable and the residual risk remains high due to the potential impact of climate change, despite mitigation efforts.

Impact CC2: Risk and Vulnerability of the Project to Climate Change

An assessment of the climate change risk and vulnerability of the Gas Distribution Infrastructure, considering the core operations, value chain, and social and natural environments, was conducted to inform the resilience of the project to climate change. Several climate change impacts could affect the core operations of the Gas Distribution Infrastructure. These impacts mostly affect the structural integrity of the equipment and installations. The health and safety of employees as well as their performance could also be significantly impacted, mostly due to increasing average temperatures and reducing water security. The climate change impacts that are likely to have severe impacts are associated with the increased frequency and severity of severe weather events, such as severe storms and severe rainfall events.

The overall vulnerability and resilience of the Gas Distribution Infrastructure and its surroundings to climate change impacts can be determined through identifying the exposure, sensitivity and adaptive

capacity of the surrounding region. The interrelation of these aspects impacting on vulnerability and resilience are summarised in Figure 6-10 below.

The main outcomes of the risk and vulnerability assessment indicate that the Gas Distribution Infrastructure is resilient to future climate change impacts. The Port of Ngqura has already taken impacts such as sea level rise and increased storm surge into account during its design, whilst the insulation of pipelines and storage units of the Gas Distribution Infrastructure reduces the evaporative losses of liquefied natural gas caused by an increase in average temperature.

Table 6-30: Significance rating of impact CC2 and mitigation measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Medium	Long-term	Medium	Improbable	Low	-	Low
Management Measures								
• The designs of infrastructure and processes must consider the potential impact of extreme weather events such as severe storms/storm surge, severe winds, extreme heat, heavy rains, and flooding impacts. The corrosive nature of maritime climate on infrastructure and equipment must be taken into account in design and maintenance; • The designs for the piping must account for increasing ambient temperatures as well as an increased frequency of very hot days and the associated material fatigue; • Safety protocols must take into consideration the impacts of climate change on construction and operations. This includes the introduction of disaster management policies, as well as onsite employee training, specifically for risk management of extreme weather events. • Design of an on-site stormwater drainage system, and implementation of a stormwater management plan. • Improve storm water drainage capacity to minimise flood occurrences onsite and the associated contamination occurrences. • Use a closed-loop water system for the gas infrastructure to minimise water losses to evaporation, and reduce water consumption.								
After Management	Local	Medium	Long-tern	Low	Improbable	Very Low	-	Low

The vulnerability assessment further indicated the following:

- The Gas Distribution Infrastructure is very sensitive to upstream disturbances as a result of Climate Change impacting the reliability of supply of LNG.
- The local community could experience worse water security, food security and living standards as there could be a change in rainfall patterns as well as droughts. They could also be susceptible to structural damage of their houses due to increased severity of storms and floods. This could impact the project's social licence to operate.
- The local ecosystems could suffer significantly from climate change impacts due to its high levels of endemism and presence of key migratory species.

The findings of the CCIA are as follows:

- The Gas Distribution Infrastructure does release GHG emissions that will need to be mitigated where possible.
- The project does contribute to climate change and can exacerbate the climate vulnerability of local communities.
- There are several conditions that should be met prior to receiving authorisation by DEFF to go ahead with the Gas Distribution Infrastructure. These are included in the list of mitigation measures in Table 6-30.

Despite the impacts on climate change, the specialist has express support for the project being authorized, noting the following the benefits:

- The Gas Distribution Infrastructure acts as an enabler for a wider use of natural gas within South Africa's economy, especially for power generation. Natural gas is significantly less emission intensive than coal, which will reduce the emission intensity of the national grid, and other combustion related activities. The emissions from natural gas also contain significantly less harmful products and a negligible amount of ash.
- The flexibility of the national grid is especially important for the uptake of renewable energy sources, such as wind and solar. CSIR models[11] shows that the least cost scenario for South Africa's energy mix in 2050 has a significant decrease in coal and an increase in natural gas as fossil fuel sources, whilst the grid is dominated by renewables. Further studies have shown that the flexibility of natural gas is crucial for achieving a renewable dominated grid. The use of natural gas as a fuel source for electricity generation significantly improves the ability of South Africa's National Grid to incorporate more intermittent renewable energy sources, such as wind and solar, by adding flexibility relative to coal fired power stations. Currently, South Africa's national grid can realistically only draw a small portion of its power from these renewable energy sources, as it is mainly driven by coal-fired power stations. When natural gas underpins the national grid as the main fuel, then most of the national grid's power can be drawn from intermittent renewable energy sources.
- In future, the Gas Distribution Infrastructure could also be repurposed for the distribution of biogas or biomethane, further reducing the amount of emissions generated.
- On a national scale, the Gas Distribution Infrastructure could lead to a net emission saving of 295 million tCO2e across the lifetime of the project.

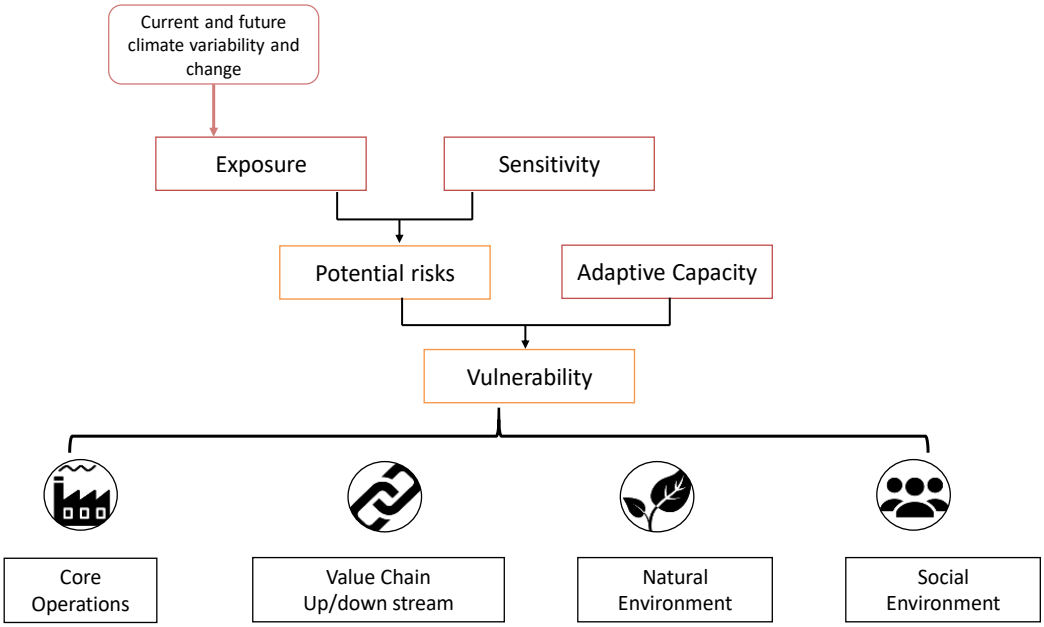

Figure 6-10: Interrelations of Exposure, Sensitivity and Adaptive Capacity which makes up the basis of the vulnerability and resilience assessment[12].

[11] Council of Science and Innovation Research, 2017, *Formal comments on the South African Integrated Resource Plan (IRP) Update Assumptions, Base Case and Observations 2016*, Pretoria.
[12] International Council on Mining and Minerals, 2013, *Adapting to a changing climate: implications for the mining and metals industry*. ICMM.

6.7.2 Noise Impacts

Description

The noise study consisted of a desktop study to model the likely noise emissions from the operations as well as field measurements of the existing ambient noise at the Port of Ngqura and within the SEZ where the power plant will be located. Predictive modelling software was used to model noise from the proposed development, as per the relevant standards, including the effects of meteorological conditions for the worst case scenario. Several NSAs were identified and included as receptors for the noise modelling.

Vehicular traffic in and around the SEZ (including the N2, wind, birds as well as the sea) were found to be the current main noise sources in the test areas.

The noise sources could impact on the local residents outside the study area, tenants within the SEZ, and Port of Ngqura. Various ecological receptors have also been identified, including the Damara Tern colony in Zone 10, and rare butterfly habitats. Noise sensitive areas (NSA's) identified in the vicinity of the proposed Gas Infrastructure sites are listed below and their locations are shown in Figure 6-11.

- NSA 1 - TPT Offices;
- NSA 2 - NPA Offices;
- NSA 3 - Cerebos Offices;
- NSA 4 - CDC Offices;
- NSA 5 - Motherwell Township;
- NSA 6 - St Georges Houses;
- NSA 7 - Jahleel Island;
- NSA 8 - St Croix Island;
- NSA 9- Brenton Island;
- NSA 10 - Damara Tern Colony;
- NSA 11 - Rare Butterfly Habitat 1;
- NSA 12 - Rare Butterfly Habitat 2; and
- NSA 13- Rare Butterfly Habitat 3.

The most sensitive NSA (for proposed Gas Infrastructure) will be Jahleel Island and the Damara Tern Colony. Due to the attenuation of noise by distance, the other sensitive areas identified are too far away from the noise source to be of concern. Noise will also be attenuated by topography and atmospheric conditions such as temperature, humidity, wind speed and direction, but this is ignored for this purpose as worst-case conditions are calculated.

The noise from the power plant will include audible, low frequency and infra sound. The noise impact assessment has addressed the following possible noise sources:

- Construction equipment and vehicle noise;
- Noise from the operation of the Gas infrastructure.

SANS 10103:2008 provides typical rating levels for noise in various types of districts, which indicate that in industrial districts (in the CDC SEZ and port) the noise should not exceed 70 dB(A) during the day and 60 dB(A) at night. There are however no rating levels for protected natural environments. The Addo National Park Marine Protected Area should ideally be free of any anthropogenic noise sources.

These rating levels can thus be seen as the target levels for any noise emissions from a nearby industrial facility. The noise monitoring results show that the current ambient noise is not exceeding the recommended rating levels of industrial districts.

The South African noise control regulations and the local authority regulations describe a disturbing noise as any noise that exceeds the ambient noise by more than 7dB. This difference is usually measured at the complainant's location should a noise complaint arise. Once again this will not strictly apply to a protected area that has no permanent human recipients. The noise emissions primary effect in this case is likely to be on the animals within the protected area.

The specialist has also noted that underwater noise impacts need to be considered in a project of this nature. This has been assessed as part of the Marine ecological study (see 6.7.4).

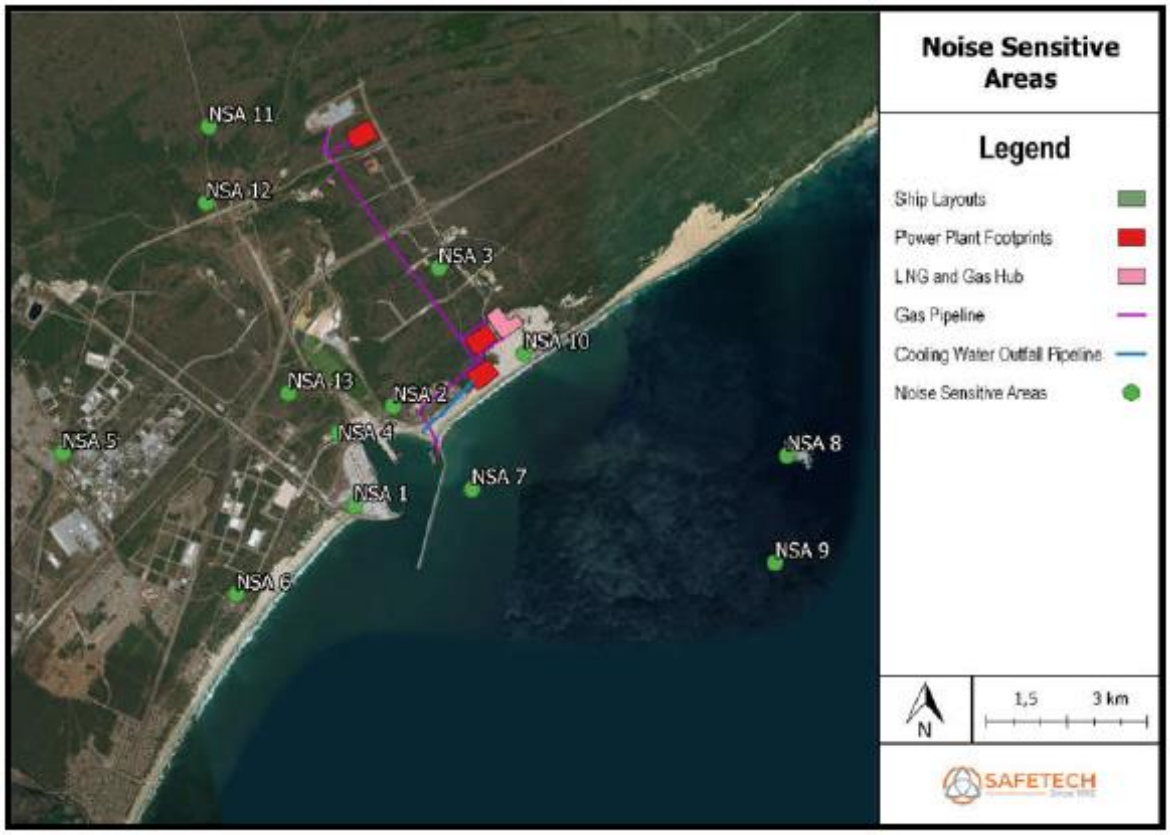

Figure 6-11: Location of identified Noise Sensitive Areas

Impact N1: Noise affecting nearby receptors during construction and operation

The field study results showed that the ambient noise levels in the area of the proposed development were 49.2dB(A). The Cerebos Office (NSA 3) is approximately 440m away from the nearest pipeline location. Taking this distance into consideration, it can be inferred that NSA 3 will experience noise levels of 58.3 dB(A), thus will not experience any impact during the construction phase as the predicted noise levels are below the ambient noise levels. While this is above the ambient noise levels, the receptors are expected to be inside the building and thus experience lower noise levels due to the barrier of the building walls blocking the sound from propagating towards these receptors.

When considering the same approach for the Damara Tern Colony (NSA 10), the noise levels experienced during the construction phase are expected to be 56.9 dB(A), an increase of 7.7 dB(A) above the ambient noise levels.

With the exception of the Damara Tern Colony (NSA 10), for the construction phase it is unlikely that noise resulting from the project will impact on any NSAs. It is recommended that an avifauna specialist is consulted to further assess the impacts that will arise on the Damara Tern Colony at NSA 10.

Table 6-31: Significance rating of impact N1 and mitigation measures during construction

	Spatial Extent	**Intensity**	**Duration**	**Consequence**	**Probability**	**Significance**	**+ -**	**Confidence**
Before Management	Local	Medium	Short term	Very low	Definite	Very Low	-	High
Management Measures								
• All construction operations should only occur during daylight hours if possible. • No construction piling should occur at night where possible. Piling should only occur during the day to take advantage of unstable atmospheric conditions (which lessen the effects of project related noise). • Construction staff should receive “noise sensitivity” training such as switching off vehicles when not in use, especially when close to any NSA’s etc. • An ambient noise survey should be conducted at the noise sensitive receptors during the construction phase.								
After Management	Local	Low	Short term	Very Low	Possible	Insignificant	-	High

The modelling results show that no NSAs will be impacted from the noise levels emitted during the operational phase. This is because the noise levels will be below the ambient noise levels and thus be masked. The predicted operational noise levels of the proposed project are below the SANS 10103 recommended levels for the human receptors within the SEZ and at the SEZ boundary.as shown in the noise contour map below.

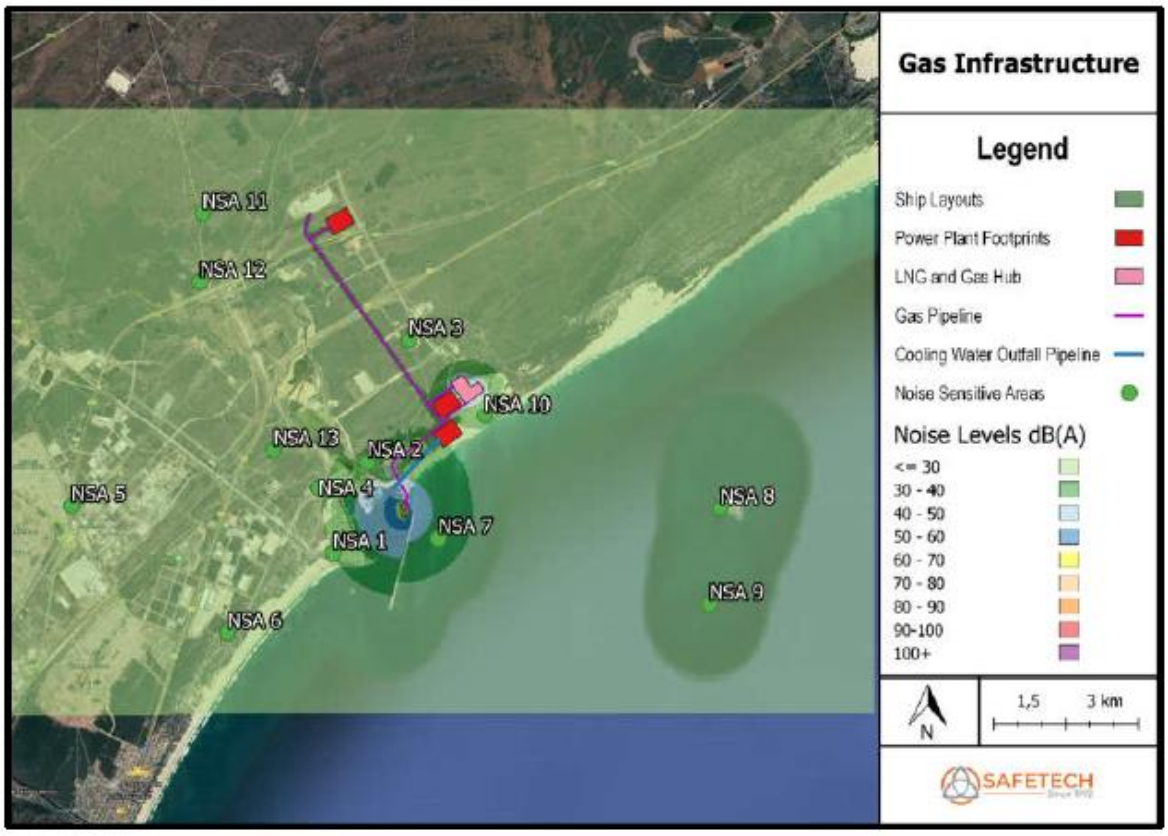

Figure 6-12: Noise contour map for operational phase of the proposed Gas Infrastructure relative to NSAs

The noise impact associated with the operational activities of Gas Infrastructure is predicted to be of very low significance before mitigation on the Port of Ngqura and CDC tenants, well as ecological receptors, as reflected in **Error! Reference source not found.** reflects the impact on the Damara tern colony (NSA 10).

Table 6-32: Significance rating of impact N1 and mitigation measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Low	Long - term	Very low	Improbable	Very Low	-	High
Management Measures								
• The noise impact from the proposed Gas Infrastructure should be measured once the plant is operational, to ensure that the impact is within the required legal limit; and • An avifauna specialist should be consulted to determine the effects that an increase in noise levels will have on the Damara Tern Colony.								
After Management	Local	Low	Long-term	Very Low	Improbable	Very Low	-	High

In addition, the following recommendations are made:

- The noise impacts are re-modelled when the final supplier of equipment and plant design is chosen. This will enable extra noise mitigation measures to be determined before the equipment is finally procured.

- A separate study is conducted to determine the impact on the marine mammals.
- Periodic noise measurements are taken during the construction and operational phases.
- A long-term hydrophone system is installed in the vicinity of the FSRU and LNGC berth and the harbour entrance to determine the current underwater noise climate.

It is noted that impacts on marine ecology (including noise) are assessed separately as part of the marine ecological study and recommendations relating to noise impacts on marine fauna are provided in Section 6.8.6.

6.7.3 Impacts on Air Quality

Description

The process of liquefaction involves extracting most of the impurities in raw natural gas. The remaining natural gas is primarily methane with only small amounts of other hydrocarbons and consequently is widely considered a clean fossil fuel. The quantity and nature of emissions to the atmosphere from LNG combustion depends on the quality of the fuel, fuel consumption, the combustion device, and the air pollution control devices. The combustion of LNG results in gaseous emissions of sulphur dioxide (SO_2), oxides of nitrogen ($NO + NO^2 = NO_X$), carbon monoxide (CO), and some particulate matter (PM). Carbon dioxide (CO_2) is the main Greenhouse Gases resulting from LNG combustion.

SO_2 is produced from the combustion of sulphur in the LNG. NO_X is produced from thermal fixation of atmospheric nitrogen in the combustion flame and from oxidation of nitrogen bound in the LNG. The quantity of NO_X produced is directly proportional to the temperature of the flame. The non-combustible portion of the fuel remains as solid waste and emitted as particulates. Back-up fuels stored on-site can generate VOC's such as benzene, toluene, ethyl benzene and xylene from storage and transportation losses.

For the Gas Infrastructure, the main sources of point source emissions include the Heater Stack, the generators via a combined stack, and the four stacks on a typical LNG carrier. Emissions from LNG handling and storage during start-up are considered to be negligible.

Storage and loading of LNG or NG from the Land-based LNG Terminal and Infrastructure Project generates negligible emissions as the fuel is kept at extremely low temperatures. Any gas that may escape will be returned to the storage unit.

The Air Quality Assessment found that the main sources of fugitive emissions include:

- the LNG resupply vessels during their transit from the eastern breakwater to the berthing area and
- the LNG Truck Loading Facility and associated road infrastructure.

The NAAQS consists of a 'limit' value and a permitted frequency of exceedance. The limit value is the fixed concentration level aimed at reducing the harmful effects of a pollutant. The permitted frequency of exceedance represents the acceptable number of exceedances of the limit value expressed as the 99th percentile. Compliance with the ambient standard implies that the frequency of exceedance of the limit value does not exceed the permitted tolerance. Being a health-based standard, ambient concentrations below the standard imply that air quality poses an acceptable risk to human health, while exposure to ambient concentrations above the standard implies that there is an unacceptable risk to human health.

CO_2 is a Greenhouse Gas, therefore ambient air quality standards do not apply. However, it is a priority pollutant and emissions must be accounted for and reported. This is covered in the Climate Change Impact Assessment (see Appendix K3)

Background concentrations from existing sources of particulates (PM_{10} and $PM_{2.5}$), NO_2, SO_2 and CO in the Coega SEZ and up to 5 km from the SEZ boundary were assessed using the CDC emission inventory. Included are industrial point sources, area sources, roads and shipping. In this assessment, all neighbouring residential and commercial areas are treated as sensitive areas. Air dispersion modelling was undertaken to predict concentrations of the various pollutants, taking into account meteorological conditions and baseline concentrations.

Ambient monitoring and dispersion modelling show that current baseline ambient concentrations of SO_2 and NO_2 in the Coega SEZ are generally low, but there are some areas where NO_2 exceedances occur (refer to isopleth maps in the specialist study report in Appendix K1 for details). PM_{10} concentrations are relatively high and exceedances of ambient standards were modelled from baseline emission data.

Maximum predicted ambient annual, 24 hour and 1-hour concentrations of the various pollutants modelled for, covering various scenarios, and including baseline levels, are shown in Table 6-33 - Table 6-36 below, relative to the NAAQS limits. There are predicted to be no benzene emissions from the Gas Infrastructure Project. Benzene has therefore not been modelled for Scenario 1. The cumulative effect of the proposed power plant is predicted to be very small and will not contribute to exceedances of the ambient standards in the SEZ.

Table 6-33: Maximum predicted ambient annual, 24 hour and 99th percentile 1-hour SO_2 concentrations for modelled scenarios

Scenario	Description	Annual (µg/m3)	24-hour (µg/m3)	1-hour (µg/m3)
1	Land-based LNG Terminal and Infrastructure Project	0.8	8.4	20.7
2	Land-based LNG Terminal and Infrastructure Project + baseline	84.3	341	1322
3	3 000 MW Coega Gas-to Power Project	1.2	15.5	29.2
4	3 000 MW Coega Gas to Power Project + baseline	84.9	341	1322
NAAQS limits		**50**	**180**	**350**

Table 6-34: Maximum predicted ambient annual and 99th percentile 1-hour NO_2 concentrations for modelled scenarios

Scenario	Description	Annual (µg/m3)	1-hour (µg/m3)
1	Land-based LNG Terminal and Infrastructure Project	1.2	17.2
2	Land-based LNG Terminal and Infrastructure Project + baseline	30.4	465
3	3 000 MW Coega Gas-to Power Project	1.5	23.4
4	3 000 MW Coega Gas to Power Project + baseline	30.8	466
NAAQS limits		**40**	**200**

Table 6-35: Maximum predicted ambient annual and 99th percentile 24-hour PM_{10} concentrations for modelled scenarios

Scenario	Description	Annual (µg/m3)	24-hour (µg/m3)
1	Land-based LNG Terminal and Infrastructure Project	0.2	1.1
2	Land-based LNG Terminal and Infrastructure Project + baseline	159	557

3	3 000 MW Coega Gas-to Power Project	0.3	1.9
4	3 000 MW Coega Gas to Power Project + baseline	160	557
NAAQS limits		**40**	**75**

Table 6-36: Maximum predicted ambient 8-hour and 1-hour CO concentrations in µg/m3 with the South African NAAQS

Scenario	Description	8-hour	1-hour
1	Land-based LNG Terminal and Infrastructure Project	839	1 570
2	Land-based LNG Terminal and Infrastructure Project + baseline	839	1 570
3	3 000 MW Coega Gas-to-Power Project	839	1 570
4	3 000 MW Coega Gas-to-Power Project + baseline	839	1 570
NAAQS limits		**10 000**	**30 000**

Impacts resulting from the Land-based LNG Terminal and Infrastructure Project are summarised as follows:

- For SO_2, NO_2, CO and PM_{10} the extent of the potential impact is very small and limited to the SEZ. Benzene emissions are not expected, and the potential impact is therefore irrelevant.
- The predicted ambient concentrations of SO_2, NO_2, CO and PM_{10} emissions from the Gas Infrastructure Project are very low and the intensity is rated as irrelevant;
- Any impact will endure for the life of the operation. The duration is therefore long term;
- The consequence of the potential impact is therefore very low for SO_2, NO_2, CO and PM_{10} and irrelevant for benzene;
- The intensity is very low, so air quality impacts are improbable;
- The significance rating is therefore considered insignificant for SO_2, NO_2, CO and PM_{10}; and
- Air pollutants may have negative health effects even at low concentration. The status of the impact is therefore negative.

Air quality management interventions to reduce emissions from the gas infrastructure are deemed to be unnecessary considering the low impact of the project on air quality. However ambient monitoring and dispersion modelling show that current baseline ambient concentrations of SO_2 and NO_2 in the Coega SEZ are generally low, although there are some areas where NO_2 exceedances occur. Ambient monitoring shows that PM_{10} concentrations are relatively high and modelling current sources indicates exceedances of ambient standards for PM_{10}. This is arguably a motivation for PM_{10} emission reduction interventions on a regional scale. Routine emission measurements and other air quality monitoring may be stipulated by the Licensing Authority in the AEL.

Impact AQ1: Impact on ambient SO2, NO2 and PM10 concentrations during operation

Table 6-37: Significance rating of impact AQ1 during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	None	Long-term	Very Low	Improbable	Insignificant	–	High

Impact AQ2: Impact on ambient CO concentrations during operation

Table 6-38: Significance rating of impact AQ2 during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	None	None	Long-term	Very Low	Improbable	Insignificant	–	High

6.7.4 Safety Risks resulting from catastrophic events

Description

Accidental leaks of LNG could occur and result in a vapour cloud. The vapour cloud is quickly vaporised, however if an ignition source is present this can cause a fire which burns back to the source. The storage and handling of LNG (and other hazardous substances) may be considered to be a Major Hazard Installation (MHI) in terms of the Occupational Health & Safety Act.

A Quantitative Risk Assessment (QRA) has therefore been conducted in order to assess the risks of such catastrophic events to surrounding receptors and determine if the project is considered an MHI. The QRA process is summarised in the following steps:

1. Identification of components that are flammable, toxic, reactive or corrosive and that have potential to result in a major incident from fires, explosions or toxic releases;
2. Development of accidental loss of containment (LOC) scenarios for equipment containing hazardous components (including release rate, location and orientation of release);
3. For each incident developed in Step 2, determination of consequences (such as thermal radiation, domino effects, toxic-cloud formation and so forth);
4. For scenarios with off-site consequences (greater than 1% fatality off-site), calculation of maximum individual risk (MIR), taking into account all generic failure rates, initiating events (such as ignition), meteorological conditions and lethality.

The main hazards that would occur with a loss of containment of hazardous components at the proposed project include exposure to:

- Thermal radiation from fires;
- Overpressure from explosions.

Hazardous materials stored on the site and taken into account in the QRA are as follows:

- LNG and Natural Gas (predominantly methane), at the FSRU(s) and onshore storage

Natural gas consists mostly of methane, which is a flammable gas at atmospheric conditions. Economical transportation of natural gas would require liquefying the gas so that it would occupy less volume by weight. Methane (compressed) is listed as a notifiable substance at a threshold value of 15t. The schedule does not specifically mention LNG, which would be in the liquid state and not compressed, and therefore LNG would not be classified as a notifiable substance.

Given the flammable and potentially explosive nature of natural gas, fires and vapour cloud explosions represent the primary hazards associated with the transfer of the gas. The gas is a fire and explosion hazard when it is exposed to heat and flame. This study concentrated on the loss of containment of natural gas, refrigerated and at elevated pressure from the LNG carrier to the end destination.

To establish which impacts follow an accident, the physical process of the spill (i.e., rate and size), spreading of the spill, evaporation from the spill, subsequent atmospheric dispersion of the airborne cloud and, in the case of ignition, the burning rate and resulting thermal radiation from a fire and the overpressures from an explosion, are estimated.

Thereafter the consequences of a release on humans, fauna, flora and structures in terms of the significance and extent of the impact in the event of a release, are estimated. A comparison of

predicted concentrations, thermal radiation or overpressures to short-term guideline values is then made.

The risks considered acceptable to employees are different to those considered acceptable to the public. This is due to the fact that employees have personal protection equipment (PPE), are aware of the hazards, are sufficiently mobile to evade or escape the hazards and receive training in preventing injuries. The various risk levels indicated as fatalities per person per year on the risk isopleths produced for the site, based on the risk modelling exercise undertaken are described as follows:

- The $3x10^{-7}$ contour represents the threshold for 'trivial' risk and represents acceptability to vulnerable people outside of the isopleth. Risk below this threshold is considered trivial;
- The risks between the $3x10^{-7}$ and $1x10^{-6}$ contours are considered 'broadly acceptable' to the general public but 'tolerable if proven to be ALARP13' for vulnerable populations such as hospitals, retirement homes, nursery schools, prisons, large gatherings in the open, and so forth;
- Risks between the $1x10^{-5}$, and $1x10^{-4}$ contours are considered to be only tolerable if risk reduction is impracticable or if the cost reduction would be disproportionate to improvements gained;
- The $1x10^{-3}$ risk contour would indicate risks excessive to workers.

Impact QR1: Loss of containment of LNG during Phase 1 of the Gas infrastructure development, resulting in fires or explosions

During Phase 1 of the Gas infrastructure, LNG will be imported via an LNG carrier with a nominal capacity of 170 000 m3, and stored and regasified at the FSRU(s). The LNG within the carrier would be contained in a number of tanks at approximately -162°C with no overpressure. LNG would be transferred to the FSRU via the storage via four offloading arms at a shut-off pressure of 6 barg. A loss of containment of LNG could occur due to the following reasons:

- Failure of the LNG tanks on the LNG carrier;
- Failure of the onshore storage tanks
- Failure of the regasification and compression system;
- Failure of the ship transfer arm or hose;
- LNG pipeline failure;
- Compressed Natural Gas (CNG) pipeline failure;
- Leaks during road loading.

The risks from the Phase 1 will remain within the Port of Ngqura and the Coega SEZ and would not impact the general public outside of this area. For this reason, the project would not be considered a Major Hazard Installation. The impacts as listed above are rated to have a high consequence rating, but low probability of occurring, resulting in a medium significance rating (with and without mitigation), with medium confidence (due to uncertainties in rating of impacts resulting from risks).

Table 6-39: Significance rating of impact QR1 and management measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence

[13] ALARP stands for "as low as reasonably practicable"

Before Management	Local	High	Long term	High	Improbable	Medium	-	Medium
Management Measures								
• Installation of instrumentation, including detection and emergency shut down								
After Management	Local	High	Long term	High	Improbable	Medium	-	Medium

Impact QR2: Loss of containment of LNG during Phase 2 of the gas infrastructure development, resulting in fires or explosions

During Phase 2 of the Gas infrastructure development, LNG continue to be imported via an LNG carrier, however, from the mooring facility in the port the cold LNG will be transported to the gas distribution facility via a pipeline. Initially the pipeline would be above ground to the end of the jetty and then travel underground to the gas distribution facility, where it will be stored and regasified before be distributed to users within the SEZ via underground pipeline. The risks from Phase 2 would be reduced at the jetty, but increased at the gas distribution centre, relative to Phase 1.

Loss of containment of LNG may result from the following failures:

- Failure of the LNG tanks on the LNG carrier;
- Failure of the FSRU(s);
- Failure of the regasification and compression system;
- Failure of the ship transfer arm or hose;
- LNG pipeline failure;
- Compressed Natural Gas (CNG) pipeline failure;
- Leaks during road loading.

The extent from fires and explosions could extend considerable distances, particularly at low windspeeds. However, the risks from Phase 2 would remain within the Port of Ngqura and the Coega SEZ and would not impact the general public outside of this area. For this reason, the project would not be considered a Major Hazard Installation. The impacts as listed above are rated to have a high consequence rating, but low probability of occurring, resulting in a medium significance rating (reduced to very low with mitigation), with medium confidence (due to uncertainties in rating of impacts resulting from risks).

Table 6-40: Significance rating of impact QR2 and management measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	High	Long term	High	Improbable	Medium	-	Medium
Management Measures								
• Installation of instrumentation, including detection and emergency shut down								
After Management	Local	Medium	Short term	Low	Improbable	Very Low	-	Medium

Recommendations

The QRA specialist did not find any fatal flaws that would prevent the project proceeding to the detailed engineering phase of the project, and would support the project with the following conditions:

1. Compliance with all statutory requirements, i.e., pressure vessel designs;
2. Compliance with applicable SANS codes, i.e., SANS 10087, SANS 10089, SANS 10108, etc.;
3. Incorporation of applicable guidelines or equivalent international recognised codes of good design and practice into the designs;
4. Completion of a recognised process hazard analysis (such as a HAZOP study, FMEA, etc.) on the proposed facility prior to construction to ensure design and operational hazards have been identified and adequate mitigation put in place. The PHA must cover commissioning, normal operation and decommissioning;
5. Compliance with IEC 61508 and IEC 61511 (Safety Instrument Systems) standards or equivalent to ensure that adequate protective instrumentation is included in the design and would remain valid for the full life cycle of the tank farm:
6. Including demonstration from the designer that sufficient and reliable instrumentation would be specified and installed at the facility;
7. Preparation and issue of a safety document detailing safety and design features reducing the impacts from fires, explosions and flammable atmospheres to the MHI assessment body at the time of the MHI assessment:
8. Including compliance to statutory laws, applicable codes and standards and world's best practice;
9. Including the listing of statutory and non-statutory inspections, giving frequency of inspections;
10. Including the auditing of the built facility against the safety document;
11. Noting that codes, such as IEC 61511 can be used to achieve these requirements;
12. Demonstration by the developers or their contractor that the final designs would reduce the risks posed by the installation to internationally acceptable guidelines;
13. Signature of all terminal designs by a professional engineer registered in South Africa in accordance with the Professional Engineers Act, who takes responsibility for suitable designs;
14. Completion of an emergency preparedness and response document for on-site and off-site scenarios prior to initiating the MHI risk assessment (with input from local authorities);
15. Final acceptance of the facility risks with an MHI risk assessment that must be completed in accordance to the MHI regulations;
16. Basing such a risk assessment on the final design and including engineering mitigation.

6.7.5 Impacts on the Marine Environment

Description

Impact ME1: Elimination of benthic communities through disturbance and loss of substratum

Removal and disturbance of seabed sediments may occur due to the following project-related activities during construction and operation:

- dredging within the port for the new LNG berth and release of dredge spoil;

- construction of underwater revetments and rock armour,
- construction of piles into the seabed for the LNG terminal, and
- discharge of heating and cooling water from the LNGC and FSRU (depending on discharge depth and velocity) during operation

The elimination of marine benthic communities in the dredging area and structural footprint of the LNG Terminal is an unavoidable consequence of the proposed development, and no direct mitigation measures, other than the no-project alternative, are possible. In the case of the heating and cooling water discharges from the LNGC and FSRU, structural adaptations can be implemented to the vessels outlets thereby avoiding impacts to the sediments below the vessels. The initial negative impacts are deemed of low intensity within the immediate vicinity of the LNG terminal and dredge disposal site. Furthermore, the negative impacts persist over the short-term only recolonization of unconsolidated sediments will be rapid and as the new structures and rock armouring will offer a new settling ground for hard bottom species and will be rapidly colonised. The impact is therefore assessed to be of ***very low*** significance both without and with mitigation.

Table 6-41: Significance rating of impact ME1 and mitigation measures during construction and operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Low	Short-term	Very Low	Definite	Very low	–	High
Management Measures								
Essential mitigation measures: • No direct mitigation possible other than the no-project alternative. **Best practice mitigation measures:** • Fit deflector plates to discharges directed vertically downwards to modify the discharge to 45°.								
After Management	Local	Low	Short-term	Very Low	Probable	Very low	–	High

Impact ME2: Reduced physiological functioning of marine organisms due to increased suspended sediment concentrations or turbidity

Sediment resuspension and increased turbidity may occur due to the activities listed above for impact ME1, the difference being that turbidity is increased with decreasing particle size. Impacts on marine organisms are related to the concentration of suspended material and duration of exposure to it, and range from reduced visibility for feeding, clogging of gills, diminished light penetration affecting photosynthetic capability of aquatic plants.

Elevated suspended sediment concentrations and increased turbidity in the Port due to dredging and construction activities, and in the vicinity of the dredge disposal site during dredge spoil disposal is deemed of low intensity within the immediate vicinity of the dredging and construction sites, with impacts persisting over the short-term only. As dredging and construction activities relating to the offloading facilities will be confined to within the Port area, impacts on the adjacent Addo Elephant MPA and Algoa to Amathole EBSA are unlikely. Suspended sediment plumes generated during dumping of dredge spoil and installation of the gas and cryogenic pipelines would, however, overlap with the MPA and EBSA, but as impacts would be highly localised and ephemeral, the impact is assessed to be of ***very low*** significance both without and with mitigation. Similarly, regular movement of maritime traffic already occurs along the existing approach channel to, and within the Port of Ngqura. Although additional sediment resuspension by turbulence generated propeller wash from LNGCs can

be considered a cumulative effect, the impact can be considered insignificant. Although elevated suspended sediment concentrations are an unavoidable consequence of dredging and construction activities, impacts can be kept to a minimum through responsible dredging and construction practices.

Table 6-42: Significance rating of impact ME2 and mitigation measures during construction and operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Low	Short-term	Very Low	Definite	Very low	–	High
Management Measures								
Essential mitigation measures: • All dredging activities and associated environmental monitoring must be conducted in accordance with the conditions stipulated under the port expansion authorisation; and • All contractors must have an approved Environmental Management Plan in place that ensures that environmental impacts are minimised as far as practicable possible. **Best practice mitigation measures:** • Manage suspended sediment plumes generated during dredging and construction of the LNG Terminal by the installation of silt curtains.								
After Management	Local	Low	Short-term	Very Low	Probable	Very low	–	High

Impact ME3: Toxic effects of remobilised contaminants and nutrients in the dredge and construction area on marine organisms

Resuspension of sediments during dredging and dumping of dredge spoil, as well as construction of piles for the access trestle along the breakwater, may result in the release of contaminants, increased nutrient concentrations and potential alteration of dissolved oxygen levels in the water column. This may affect biological organisms in a variety of ways.

As contaminant concentrations in the sediments are low, and if resuspended should dilute rapidly to background levels, the remobilisation of contaminants and nutrients in the dredge area and spoils disposal site is deemed of low intensity within the immediate vicinity of the dredging and construction sites, with impacts persisting over the short-term only. As dredging and construction activities relating to the offloading facilities will be confined to within the Port area, impacts on the adjacent Addo Elephant MPA and Algoa to Amathole EBSA are highly unlikely. Suspended sediment plumes generated during dumping of dredge spoil and installation of the gas and cryogenic pipelines east of the breakwater could, however, overlap with the MPA and EBSA, but as impacts would be highly localised and ephemeral, the impact is assessed to be of ***insignificant*** both without and with mitigation. Although elevated suspended sediment concentrations are an unavoidable consequence of dredging and construction activities, impacts can be kept to a minimum through responsible dredging and construction practices.

Table 6-43: Significance rating of impact ME3 and mitigation measures during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Low	Short-term	Very Low	Improbable	Insignificant	–	High
Management Measures								

Essential mitigation measures: • All dredging activities and associated environmental monitoring must be conducted in accordance with the conditions stipulated under the port expansion authorisation. **Best practice mitigation measures:** • Manage suspended sediment plumes generated during dredging and construction of the LNG Terminal by the installation of silt curtains.								
After Management	Local	Low	Short-term	Very Low	Improbable	Insignificant	–	High

Impact ME4: Disturbance, behavioural changes and avoidance of feeding and/or breeding areas in fish, seabirds, seals, turtles and cetaceans due to underwater noise

Dredging, dumping of dredge spoil, deposition of rocks onto the sea bed and pile driving, drilling, etc. during construction of the port infrastructure, as well as pumping of heating and cooling water by the LNGC and FSRU, and regasification of LNG will generate noise and vibrations that may be transmitted underwater and impact on marine organisms.

The underwater noise generated by construction barges, dredgers and general construction noise is deemed to be of medium intensity but would remain localised to the port or just beyond and would persist over the short-term only. As disturbance effects due to construction noise will definitely occur, the significance of dredging and general construction noise is deemed to be of ***very low*** significance.

Table 6-44: Significance rating of impact ME4 and mitigation measures during construction

	Spatial Extent	**Intensity**	**Duration**	**Consequence**	**Probability**	**Significance**	**+ -**	**Confidence**
Before Management	Local	Medium	Short-term	Very low	Definite	Very low	–	High
Management Measures								
Essential mitigation measures: • Restrict construction noise and vibration-generating activities to the absolute minimum required. **Best practice mitigation measures:** • Have good house-keeping practices in place during construction								
After Management	Local	Low	Short-term	Very low	Probable	Very low	–	High

During operation, the underwater noise generated by the LNGC and FSRU is deemed to be of low intensity, remaining localised to the port or just beyond but persisting over the long-term. As the noise will be a stationary source with likely habituation by affected groups, the behavioural disturbance is considered possible. The significance of noise from the LNGC and FSRU is thus deemed to be of ***very low*** significance.

Table 6-45: Significance rating of impact ME4 and mitigation measures during operation

	Spatial Extent	**Intensity**	**Duration**	**Consequence**	**Probability**	**Significance**	**+ -**	**Confidence**
Before Management	Local	Low	Long-term	Low	Possible	Very low	–	High
Management Measures								
Essential mitigation measures:								

• No mitigation possible other than the no-go option. **Best practice mitigation measures:** • Have good house-keeping practices in place on the vessels to reduce noise effects.								
After Management	Local	Low	Long-term	Low	Possible	Very low	–	High

Impact ME5: Disturbance, behavioural changes and avoidance of feeding and/or breeding areas in fish seabirds, seals, turtles and cetaceans due to pile driving, underwater drilling and hydraulic rock breaking

In the case of pile driving, the intensity of the impact is considered high, and impacts may extend considerable distances beyond the construction site are therefore of regional extent, but persist over the short-term only. Due to the sound levels involved, noise impacts on fish and marine mammals are definite and consequently the impact is considered of ***medium*** significance without mitigation.

Table 6-46: Significance rating of Impact ME5 and mitigation measures during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	High	Short-term	Medium	Definite	Medium	–	High
Management Measures								
Essential mitigation measures: • Ensure that all pile driving is undertaken in accordance with international protocols (e.g. JNCC 2010; DPTI 2012). • Include the standard management and mitigation procedures, and any in the contract documentation of the construction contractor; • Consider the use of a bubble curtain. As the noise from pile driving is transmitted through the sediment into the water, bubble screens do not eliminate all behavioural responses to the piling noise, but reported noise reductions range from 3 to 20 dB (Würsig et al. 2000; DPTI 2012). **Best practice mitigation measures:** • Demonstrate that the BATNEEC (Best Available Technique Not Entailing Excessive Cost) approach has been applied to proposed pile driving operations. • Avoid pile driving in the early morning and evening when penguins and gannets are leaving for offshore feeding areas, or returning to their nesting sites. • Consider the use of Acoustic Deterrent Devices in conjunction with visual and/or acoustic monitoring to exclude animals from the piling area; • To improve the confidence rating in the assessment of significance, consider engaging an acoustic consultant to undertake a site specific underwater noise assessment before the start of construction of the access trestle and dolphin berths. At a minimum this should address: • Determine the existing ambient noise environment based on measurements. • Establish the likely hearing sensitivity and bandwidth for the considered sensitive marine mammal species, and determine noise exposure criteria for behavioural and physiological impacts. • Determine the expected source levels for the piling/construction activity, and predict received levels versus distance from the piling activity using a suitable noise propagation modelling method. • Estimate the size of the zone of audibility, responsiveness, and hearing injury based on the above information, and determine suitable sizes for the safety zones.								
After Management	Local	Medium	Short-term	Very Low	Definite	Very low	–	High

Impact ME6: Creation of artificial hard strata

Deposition of rock material onto the seabed and installation of piles during construction of the port infrastructure will result in creation of artificial hard surfaces for colonization by marine organisms, replacing some of the natural habitat lost due to construction and resulting in a positive impact.

Although artificial structures will provide a new settling habitat for reef dwellers, the biofouling community that will establish itself on the new artificial structures over the short-term will be different from that characterising the original unconsolidated sediments. The creation of artificial hard substrata through the placement of revetments and rock armour, and the installation of piles is thus deemed to be of low intensity. The impact can be considered positive as the developing successional biofouling communities would serve as a food source for reef-associated fish and invertebrate species thereby potentially enhancing the biodiversity and abundance in the port. The effect will be highly localised and limited to the area of the artificial structures themselves. The impact is assessed to be of ***very low*** (+ve) significance. No enhancement measures are proposed

Table 6-47: Significance rating of impact ME6 during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Medium	Short-term	Very Low	Definite	Very low	+	High

Impact ME7: Intake of large volumes of seawater from the port

The operation of the FSRU is estimated to require a seawater flow rate of 45,000 – 600,000 m3/day for the vaporisers, cooling water and onboard desalination, which will be taken in directly from the port. The LNGCs will also require water for engine cooling and to protect the vessel from damage during LNG transfer and regasification, and both vessels would have a ballast control system to maintain vessel stability during cargo transfer. Cumulatively the volumes of seawater circulated through the vessels could be substantial, and could potentially result in entrainment or injury of marine organisms, especially larvae and eggs.

The impingement and entrainment of marine organisms through the intake of large volumes of seawater by the LNGC and FSRU for ballasting and heating and cooling of onboard processes is deemed to potentially be of medium intensity. The effect will be highly localised but would continue over the medium- (FSRU and LNGC) to long-term (LNGC only) and is assessed to be of ***medium*** significance.

Table 6-48: Significance rating of impact ME7 and mitigation measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Medium	Long-term	Medium	Definite	Medium	-	High
Management Measures								
Essential mitigation measures: • Design intakes to minimise entrainment or impingement by reducing the average intake velocity to about 0.1 to 0.15 m/s. This is comparable to background currents in the oceans, and will allow mobile organisms to swim away from the intake under these flow conditions (UNEP 2008). • Optimise operating modes in the open-loop system as far as possible to reduce impacts, or use closed-loop systems in recruitment areas or during periods when abundances of eggs and larvae are seasonally high. • Undertake an entrainment study to more accurately determine the potential impacts of impingement and entrainment on communities within the Port of Ngqura.								

Best practice mitigation measures: As per IFC (2007) and World Bank (2017) guidelines for FSRUs • Consider water conservation opportunities for LNG facility cooling systems (e.g. air cooled heat exchangers in place of water cooled heat exchangers and opportunities for the integration of cold water discharges with other proximate industrial or power plant facilities). The selection of the preferred system should balance environmental benefits and safety implications of the proposed choice. • Discharge cooling or cold water to surface waters in a location that will allow maximum mixing and dulition of the thermal plume to ensure that the temperature is within 3 °C of ambient temperature at the edge of the mixing zone or within 100 meters of the discharge point.								
After Management	Local	Low	Long-term	Low	Definite	Low	-	High

Impact ME8: Introduction and spread of alien invasive species

The operation of the ballast control system in the FSRU and LNGC, as well as bio-fouling organisms on the hulls of LNGCs from outside South African waters may result in introduction of species not naturally found in the area. These may be in the form of larvae, eggs, cysts, or adult organisms, using the vessel hull as substrate.

The introduction and spread of non-native species through hull fouling or ballast water discharge by the LNGC and FSRU is deemed to potentially be of medium intensity. If alien species become established they could spread regionally and persist in perpetuity. As the LNGCs would, however, not be de-ballasting in the Port, it is improbable that non-native species would be introduced through ballast water, although they may still be introduced through hull fouling. The impact is thus assessed to be of ***medium*** significance without mitigation.

This potential impact cannot be eliminated due to the necessity of bringing LNGC vessels into the port from other parts of the world, and the need for de-ballasting these once the vessel returns to its base.

Table 6-49: Significance rating of ME8 and mitigation measures during operation

	Spatial Extent	**Intensity**	**Duration**	**Consequence**	**Probability**	**Significance**	**+ -**	**Confidence**
Before Management	Regional	Medium	Long-term	High	Possible	Medium	-	High
Management Measures								
Essential mitigation measures: • The LNGCs must have a Ballast Water Management Plan in place. • Ballast water exchange must be done at least 200 nautical miles from the nearest land in waters of at least 200 m deep; the absolute minimum being 50 nautical miles from the nearest land. • Ensure that routine cleaning of ballast tanks to remove sediments is carried out, where practicable, in mid-ocean or under controlled arrangements in port or dry dock, in accordance with the provisions of the ship's Ballast Water Management Plan. • Use filtration procedures during loading of ballast in order to avoid the uptake of potentially harmful aquatic organisms, pathogens and sediment that may contain such organisms. **Best practice mitigation measures:** • Ensure that hulls are regularly cleaned in controlled environments at ports certified to undertake such operations.								
After Management	Regional	Low	Long-term	Medium	Improbable	Low	-	High

Impact ME9: Discharge of high volumes of water with depressed or elevated temperatures

Changes in water temperature resulting from thermal water discharges from the LNGC and FSRU during operation can have a substantial impact on aquatic organisms and ecosystems, in terms of physiology oof biota, localised changes in behaviour, or influences om ecosystem functioning.

Based on the results of modelling studies from elsewhere, the discharge of thermal effluents from the FSRU moored at the proposed LNG terminal in the Port of Ngqura would be of low intensity and remain localised to within 100 m of the vessel and to within the port. The negative impacts would, however, persist over the medium-term (assuming the FSRU operations are replaced by land-based LNG storage and re-gasification facilities within 15 years). Although various engineering designs are being developed internationally to reduce the need for high volumes of seawater for heating/cooling, this is an unavoidable impact associated with the operation of FSRUs. The impact is therefore assessed to be of ***very low*** significance both without and with mitigation.

Other than the 'no-go' option, no mitigation can be implemented for the effects of the thermal discharges from the FSRU.

Table 6-50: Significance rating of ME9 and mitigation measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Low	Medium-term	Very low	Probable	Very low	-	High
Management Measures								
Essential mitigation measures: • Optimise operating modes in the open-loop system as far as possible to reduce impacts, or use closed-loop systems whenever practicable. • Use multi-port discharges and adjust discharge rate to facilitate enhanced mixing with the receiving water body. • Ports should discharge horizontally or within -45° of horizontal to maximise dilution and avoid erosion of the sediments where the jet hits the seabed. **Best practice mitigation measures:** **A**s per IFC (2007) and World Bank (2017) guidelines for FSRUs • Consider water conservation opportunities for LNG facility cooling systems (e.g. air cooled heat exchangers in place of water cooled heat exchangers and opportunities for the integration of cold water discharges with other proximate industrial or power plant facilities). The selection of the preferred system should balance environmental benefits and safety implications of the proposed choice. • Discharge cooling or cold water to surface waters in a location that will allow maximum mixing and dilution of the thermal plume to ensure that the temperature is within 3 °C of ambient temperature at the edge of the mixing zone or within 100 meters of the discharge point.								
After Management	Local	Low	Medium-term	Very low	Probable	Very low	-	High

Impact ME10: Discharge of co-pollutants (biocide, metals and salinity)

Disinfection of the pipe and plant system with hypochlorite to prevent fouling of the heat-exchange system of the FSRU, as well as operation of the on-board desalination plant on the LNGC and FSRU, may result in release of heated seawater to the port.

The release of trace amounts of chlorine, aluminium and copper in the thermal discharges, and the discharge of small volumes of brine from the onboard desalination plant is considered to be of low intensity and remain highly localised to within a few 10s of metres of the vessel and to within the port.

Any impacts would, however, persist over the long-term. The impact is therefore assessed to be of ***very low*** significance both without and with mitigation.

Other than the 'no-go' option, no mitigation can be implemented for the effects of the thermal discharges from the FSRU.

As lethal and sublethal effects occur only at concentrations well in excess of those expected in the effluent, the impact of these metals on marine biota is assessed as being insignificant.

Table 6-51: Significance rating of ME10 and mitigation measures during operation

	Spatial Extent	**Intensity**	**Duration**	**Consequence**	**Probability**	**Significance**	**+ -**	**Confidence**
Before Management	Local	Low	Long-term	Low	Improbable	Very low	-	High
Management Measures								
Essential mitigation measures: • Neutralise NaOCl with SMBS prior to discharge to ensure that the most conservative international guideline value (<2 µg/ℓ) for residual chlorine at the point of discharge is met. • Blend the brine with the cooling/heating water prior to release. **Best practice mitigation measures:** **A**s per IFC (2007) and World Bank (2017) guidelines for FSRUs • Implement closed-loop systems whenever practicable. • Implement the principle of mechanical cleaning of the entire system as part of regular annual maintenance of the FSRU in preference to the use of a biocide.								
After Management	Local	Low	Long-term	Low	Improbable	Very low	-	High

Impact ME11: Increase in ambient lighting

The project will result in an increase in ambient night time lighting through operation of the LNGC and FSRU may disturb and disorientate pelagic seabirds feeding in the area,

The intensity of the impact of an increase in ambient lighting at the LNG terminal is considered low, with effects remaining localised. The impact would, however, endure over the life-time of the terminal. The impact of increased lighting is deemed to be of ***very low*** significance, both without and with mitigation. The use of lighting on the LNG vessels and at the terminal cannot be eliminated due to safety, navigational and operational requirements.

Table 6-52: Significance rating of ME11 and mitigation measures during operation

	Spatial Extent	**Intensity**	**Duration**	**Consequence**	**Probability**	**Significance**	**+ -**	**Confidence**
Before Management	Local	Low	Long-term	Low	Improbable	Very low	-	High
Management Measures								
Essential mitigation measures: • Reduce lighting in non-essential areas. • Use of guards to direct lights to areas requiring lighting • Avoid direct light in water, except during safety inspections • Low light mounting where possible								

• Use of long wavelength lights that are less intense for nocturnal animals. **Best practice mitigation measures:** **A**s per IFC (2007) and World Bank (2017) guidelines for FSRUs • Compile a lighting plan that identifies specific measures that could be implemented to minimize or avoid impacts associated with operational night-time lighting on avian species, fish species, and marine mammals.								
After Management	Local	Low	Long-term	Low	Improbable	Very low	-	High

Impact ME12: Waste Discharges to Sea

Dredging and construction activities, as well as operation of the LNGC and FSRU at the LNG terminal will result in a reduction of water quality from routine discharges to the sea from vessels.

The impacts associated with normal waste discharges from construction activities, the LNG vessels and the LNG terminal are deemed to be of low intensity and would remain localised. The impacts would, however, persist over the long-term and, based on the relatively small discharge volumes and compliance with MARPOL 73/78 standards, are considered of ***low*** significance.

Table 6-53: Significance rating of ME12 and mitigation measures during construction and operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Low	Long-term	Low	Probable	Low	-	High
Management Measures								
Essential mitigation measures: • Implement a waste management system that addresses all wastes generated at the various sites, shore-based and marine. This should include: • Separation of wastes at source; • Recycling and re-use of wastes where possible; • Treatment of wastes at source (maceration of food wastes, compaction, incineration, treatment of sewage and oily water separation). • Implement leak detection and repair programmes for valves, flanges, fittings, seals, etc. • Use a low-toxicity biodegradable detergent for the cleaning of all deck spillages. **Best practice mitigation measures:** **A**s per IFC (2007) and World Bank (2017) guidelines for FSRUs • All construction activities in the coastal zone must be managed according to a strictly enforced Environmental Management Plan. • Good house-keeping must form an integral part of any marine construction operations from start-up.								
After Management	Local	Low	Long-term	Low	Probable	Low	-	High

Impact ME13: Accidental Spills of LNG

During operation, accidental spills of LNG may occur during connection and disconnection between the LNGC and FSRU, between the FSRU and onshore unloading arms, leakage from joints, emergency disconnection or rupture of the ship's containment system, or casualty / collision of the LNGC.

The impacts associated accidental spills of LNG at the offloading terminal are deemed to be of low intensity and would remain localised. The impacts would persist over the short-term only as the LNG would rapidly evaporate. Due to the low likelihood of a spill, the potential impacts associated with a spill are considered to be ***insignificant***.

Table 6-54: Significance rating of ME13 and mitigation measures during unplanned events during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Medium	Short-term	Very low	Improbable	Insignificant	-	High
Management Measures								
Essential mitigation measures: As per IFC (2007) and World Bank (2017) guidelines for FSRUs • Prepare an emergency response plan covering recommended measures to prevent and respond to LNG spills.								
After Management	Local	Low	Short-term	Very low	Improbable	Insignificant	-	High

Impact ME14: Accidental Spills of Hypochlorite

During operation, spills of sodium hypochlorite (used or disinfection against biofouling) on the offloading platform may occur. As marine organisms are extremely sensitive to residual chlorine, a spill of concentrated hypochlorite solution into the marine environment at the generation unit would likely have lethal or sublethal effects on the biota in the area affected by the spill.

The impacts associated accidental spills of hypochlorite at the offloading terminal are deemed to be of medium intensity and would remain localised. The impacts would persist over the short-term only as the residual chlorine would rapidly degrade. Due to the low likelihood of a spill, the potential impacts associated with a spill are considered to be ***insignificant***.

Table 6-55: Significance rating of ME14 and mitigation measures during unplanned events during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Medium	Short-term	Very low	Improbable	Insignificant	-	High
Management Measures								
Essential mitigation measures: • The hypochlorite generation unit must be suitably bunded to prevent and spills from the plant entering the marine environment.								
After Management	Local	Low	Short-term	Very low	Improbable	Insignificant	-	High

Impact ME15: Faunal strikes with LNGCs and Dredgers

The movement of dredgers and barges, as well as LNGCs to and from the LNG terminal area may result in collisions, propellor injuries, behavioural disturbance, physiological injury or mortality to marine mammals, turtles, and fish species.

The potential for strikes and collisions with large cartilaginous fish, turtles and cetaceans is highly dependent on the abundance and behaviour of these animals in the project area at the time. Due to their extensive distributions and feeding ranges, the number of large cetaceans encountered during the dredging activities or by LNGCs arriving at or departing from the port is expected to be low. As project-associated vessels will be travelling at low speeds the likelihood of a vessel strike is very low (improbable). However, should strikes occur, the impacts would be of high intensity for individuals but of LOW intensity for the population as a whole. Furthermore, as the duration of the impact would be limited to the short-term and be restricted to the survey area (LOCAL), the impact is considered to be ***insignificant***.

Table 6-56: Significance rating of ME15 and mitigation measures during unplanned events during construction and operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Low	Short-term	Very low	Improbable	Insignificant	-	High
Management Measures								
Essential mitigation measures: • Ensure that vessel speed is kept below 10 knots when underway in Algoa Bay. • The vessel operators should keep a constant watch for slow-swimming large pelagic fish, marine mammals and turtles in the path of the vessel.								
After Management	Local	Low	Short-term	Very low	Improbable	Insignificant	-	High

Impact ME16: Release of diesel to sea during bunkering or due to vessel accident

Refueling of vessels (offshore and in port), collisions or other accidents, or operation of the dredger or construction equipment may result in accidental diesel / oil spills, negatively affecting water quality and causing toxic effects potentially resulting in mortality (e.g. suffocation and poisoning) of marine fauna or affecting faunal health.

In the unlikely event of an operational spill or vessel collision, the magnitude of the impact would depend on whether the spill occurred in offshore waters where encounters with pelagic seabirds, turtles and marine mammals would be low due to their extensive distribution ranges, or whether the spill occurred closer to the shore where encounters with sensitive receptors will be higher. In the case of a spill or collision within Algoa Bay and *en route* to the Port, the spill may extend into the Addo Elephant MPA and would affect the Algoa to Amathole EBSA, and would likely reach the shore affecting intertidal and shallow subtidal benthos and sensitive coastal bird species. The intensity of a heavy oil spill within Algoa Bay can be considered of high intensity, potentially extending regionally, and with impacts potentially persisting over the medium- to long-term. A heavy oil spill would consequently be of HIGH significance. In the case of marine diesel, which evaporates relatively quickly, the impact would only persist over the short-term and would likely remain localised but would be of medium intensity. A precautionary approach is adopted and the worst-case scenario of a heavy fuel oil spill outside of the port boundary is assumed in the assessment below. It must be pointed out that the probability of a spill or collision is highly unlikely.

Table 6-57: Significance rating of ME16 and mitigation measures during unplanned events during construction and operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	High	Long-term	Very High	Improbable	High	-	High
Management Measures								
Essential mitigation measures: • Ensure that all project-associated vessels have an oil spill contingency plan in place. • As far as possible, and whenever the sea state permits, attempt to control and contain the spill at sea with suitable recovery techniques to reduce the spatial and temporal impact of the spill. • Ensure adequate resources are provided to collect and transport oiled birds to a cleaning station. • Refuelling is to take place only under controlled conditions within the port.								
After Management	Local	Medium	Short-term	Very low	Improbable	Insignificant	-	High

6.7.6 Impacts on the Socioeconomic Environment

Description

These impacts have been assessed by SRK based on information provided by the CDC and in-house knowledge and experience; a stand-alone specialist study was not produced. There are a number of positive socio-economic benefits will result as a direct and indirect effect of this activity. The most notable being:

- Job Creation;
- Growth of the local, regional and provincial economies; and
- Contribution to the increase in energy security.

The socio-economic benefits associated with the proposed development will have significant positive long-term positive impacts for the Coega SEZ and the Eastern Cape.

Impact SE1: Job Creation during construction and operation

The proposed Gas Infrastructure development may result in the direct creation of approximately 2000 temporary job opportunities (over a construction period of 3 years), of which 30% would be unskilled labour. Indirect job opportunities (industries that provide construction materials and services for the project) may also benefit as a result of the construction of the proposed development.

It is estimated that during the operational phase, approximately 200 long-term skilled and unskilled personnel will be required which will in turn create employment opportunities for local labour.

Table 6-58: Significance rating of impact SE1 and management measures during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Medium	Short term	Low	Definite	Low	+	High
Management Measures								
• Recruit local labour as far as feasible to increase the benefits to the local households;								

• Employ labour intensive methods in construction where feasible; • Sub-contract to local construction companies where possible; and • Use local suppliers where feasible and arrange with local SMMEs and BBBEE compliant enterprises to provide transport, catering and other services to the construction crews.								
After Management	Regional	Medium	Short term	Low	Definite	Low	+	High

Table 6-59: Significance rating of impact SE1 and management measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Low	Long-term	Medium	Definite	Medium	+	High
Management Measures								
• Recruit local labour as far as feasible to increase the benefits to the local households; • Sub-contract to local maintenance companies where possible; and • Use local suppliers where feasible and arrange with local SMMEs and BBBEE compliant enterprises to provide transport, catering and other services to the maintenance crews.								
After Management	Regional	Low	Long-term	Medium	Definite	Medium	+	High

Impact SE2: Growth of the local, regional and provincial economies

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

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

CDC estimates the total cost of construction (CapEx) to develop the entire Gas to Power project at R8 billion. As a rough estimate the Gas Infrastructure development is therefore estimated to have a CapEx of approximately R2 billion, disbursed over a 36 month construction period, representing 0.6% of the GVA of R 111.3 billion for the NMBM in 2018, annually for 3 years – a significant short-term investment for a single project. Furthermore, taxes generated by local procurement will contribute a small but significant portion of national income.

Table 6-60: Significance rating of impact SE2 and management measures during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Medium	Short-term	Low	Probable	Low	+	high
Management Measures								
• Recruit local labour for construction works as far as feasible to increase the benefits to the local households; • Sub-contract to local construction companies where possible; and								

• Use local suppliers where feasible and arrange with local SMMEs and BBBEE compliant enterprises to provide transport, catering and other services to the construction crews.								
After Management	Regional	Medium	Short-term	Low	Definite	Low	+	Medium

Table 6-61: Significance rating of impact SE2 and management measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Low	Long-term	Medium	Probable	Medium	+	Medium
Management Measures								
• Recruit local labour for maintenance works as far as feasible to increase the benefits to the local households; • Sub-contract to local maintenance companies where possible; and • Use local suppliers where feasible and arrange with local SMMEs and BBBEE compliant enterprises to provide transport, catering and other services to the maintenance crews.								
After Management	Regional	Low	Long - term	Medium	Definite	Medium	+	Medium

Impact SE3: Contribution to increased energy security during operation

The main purpose of the proposed CDC Gas-to-Power project is to provide electricity into the national electricity grid whereby contributing to cover the increasing demand of electricity in the country. The energy generated by the project will be fed into the national energy grid and will contribute to energy security both directly, and indirectly by allowing for increased uptake of energy from renewable energy projects. This could have significant economic benefits for downstream users, in terms of decreased incidence of power outages due to load-shedding. No management measures are proposed.

Table 6-62: Significance rating of impact SE3

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	National	Low	Long-term	High	Probable	High	+	High

6.8 Cumulative Impact Assessment

Cumulative impacts for this project have been identified based on the extent and nature of the AoI of the projects, status of VECs and understanding of external natural and social stressors. These insights have been informed by engagements with project stakeholders, review of existing documentation, field observations and data collection. The cumulative impacts considered relevant are:

- Air quality;
- Climate change;
- Noise;
- Traffic;
- Safety Risks;
- Socio-economic benefits;

- Marine ecology; and
- Terrestrial ecology (Damara tern colony).

By and large, the cumulative impacts of past and existing projects are incorporated in the baseline (Section 4) and the focus hereafter is on planned and foreseen projects and activities. Given the limited detail available regarding such future developments, the analysis is of a more generic nature and focuses on key issues and sensitivities for the project and how these might be influenced by cumulative impacts with other activities. The future developments that are considered are:

- Those for which EAs have already been granted;
- Those that are currently subject to environmental authorisation applications and for which there is currently information available; and
- Those forming part of Provincial or National initiatives.

Where further developments are identified, but are not yet at the stage of planning as detailed above, these are noted in the cumulative impact assessment.

Proposed future similar projects within a 30 km radius of the site that have been considered in the cumulative impact analysis are listed below:

- 1000 MW Gas to power plants in zone 10 and 13 in the Coega SEZ, using gas provided via the gas infrastructure (EIAs running concurrently with gas infrastructure EIA);
- Engie 200 MW gas to power plant in zone 13;and
- Karpowership SA gas to power plant in the Ngqura port.

In the sections below, the severity and extent of cumulative impacts is qualitatively rated to derive a high, medium or low significance rating.

6.8.1 Cumulative Air Quality Impacts

The cumulative effect of the 3 000 MW Coega Gas-to-Power Project is summarised as follows:

- For SO_2, NO_2 and PM_{10}, the extent of the potential impact is small and limited to the SEZ. For CO and benzene the predicted concentrations are very low and the extent of any potential impact is regarded as irrelevant. The cumulative effect in the SEZ will therefore be very small or negligible.
- The predicted ambient concentrations resulting from the three power plant emissions are very low and the intensity is rated as low for NO_2 and irrelevant for the other pollutants. It is highly unlikely that they will contribute to exceedances of the ambient standards. The cumulative effect in the SEZ will be very small or negligible.

The cumulative effect of the proposed gas-to-power projects in the Coega SEZ (based on their respective AIRs) is summarised as follows:

- The predicted maximum concentrations of SO_2, NO_2 and PM for the proposed Karpowership project in the port of Ngqura are predicted to be very low relative to the NAAQS. In all cases the predicted maximum increase is within the Coega SEZ. The maximum predicted annual concentrations are 0.09 µg/m^3 for SO_2, 1.8 µg/m^3 for NO_2 and 0.4 µg/m^3 for PM_{10} (uMoya-NILU, 2020).
- The predicted maximum concentrations of SO_2, NO_2 and PM for the proposed 3 000 MW Coega gas-to-power project is predicted to be very low relative to the NAAQS. In all cases the predicted maximum increase is over the Coega SEZ. The maximum predicted annual

concentrations are 1.2 µg/m^3 for SO_2, 1.5 µg/m^3 for NO_2 and 0.3 µg/m^3 for PM_{10} (uMoya-NILU, 2021a).

- The proposed Engie gas-fired power plant will result in very low ambient concentrations of SO_2, NO_2 and PM relative to the NAAQS. In all cases the predicted maximum increase will occur over the Coega SEZ (uMoya-NILU, 2021b).
- For SO_2, NO_2 and PM_{10}, the extent of the potential impact of the other gas-to-power projects is local and limited to the SEZ. The contribution will not significantly increase the ambient concentrations and will not result in exceedances of the NAAQS. The cumulative effect in the SEZ will therefore be very small or negligible and is therefore also regarded as low.
- The predicted ambient concentrations resulting from the combined power plant emissions are very low and the intensity is rated as low for NO_2 and irrelevant for the other pollutants. It is highly unlikely that they will contribute to exceedances of the ambient standards (any exceedances predicted are attributed to existing sources and not the proposed gas to power projects). The cumulative effect of the gas-to-power projects will be very small or negligible and is therefore also regarded as low.

Impact AQ2: Cumulative Impact on ambient SO2, NO2 and PM10 concentrations during operation

Table 6-63: Significance rating of impact AQ2 during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Low	Long-term	Very Low	Improbable	Insignificant	–	High

6.8.2 Cumulative Climate Change Impacts

For the climate change impact assessment (in terms of the Thabametsi case judgement), greenhouse gas emissions are quantified to determine the impact of a project on climate change. Since the project impact on climate change (the project's greenhouse gas emissions) cannot be directly linked to local impacts, it is not possible to determine / quantify cumulative impacts associated with other gas to power projects within a 30 km radius of the site.

The CCIA did however consider the cumulative nature of climate change, by contextualising impact in terms of the global carbon budget, and on a national level by using the South African carbon budget.

In terms of the project's vulnerability to climate change, the assessment considers climate change trends impacting both the project and its context. The granularity of this component of the climate change impact assessment relates to a broader area, indicating existing project or contextual risks which could be exacerbated.

6.8.3 Cumulative Noise Impacts

The noise impact assessment shows that the noise impacts from the construction and operation of the proposed Gas Infrastructure will be negligible. However, the cumulative levels show that several NSAs will be impacted by the noise that arises during the operational phase from all components of the project. Figure 6-13 below shows the predicted noise levels when all components of the CDC gas to power project are considered. The high intensity rating is due to ecological receptors in Zone 10 that may be affected by noise resulting cumulatively from the proposed projects in that area.

Table 6-64: Significance rating of impact N1 during operation - cumulative

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Medium	Long term	High	Definite	High	-	High

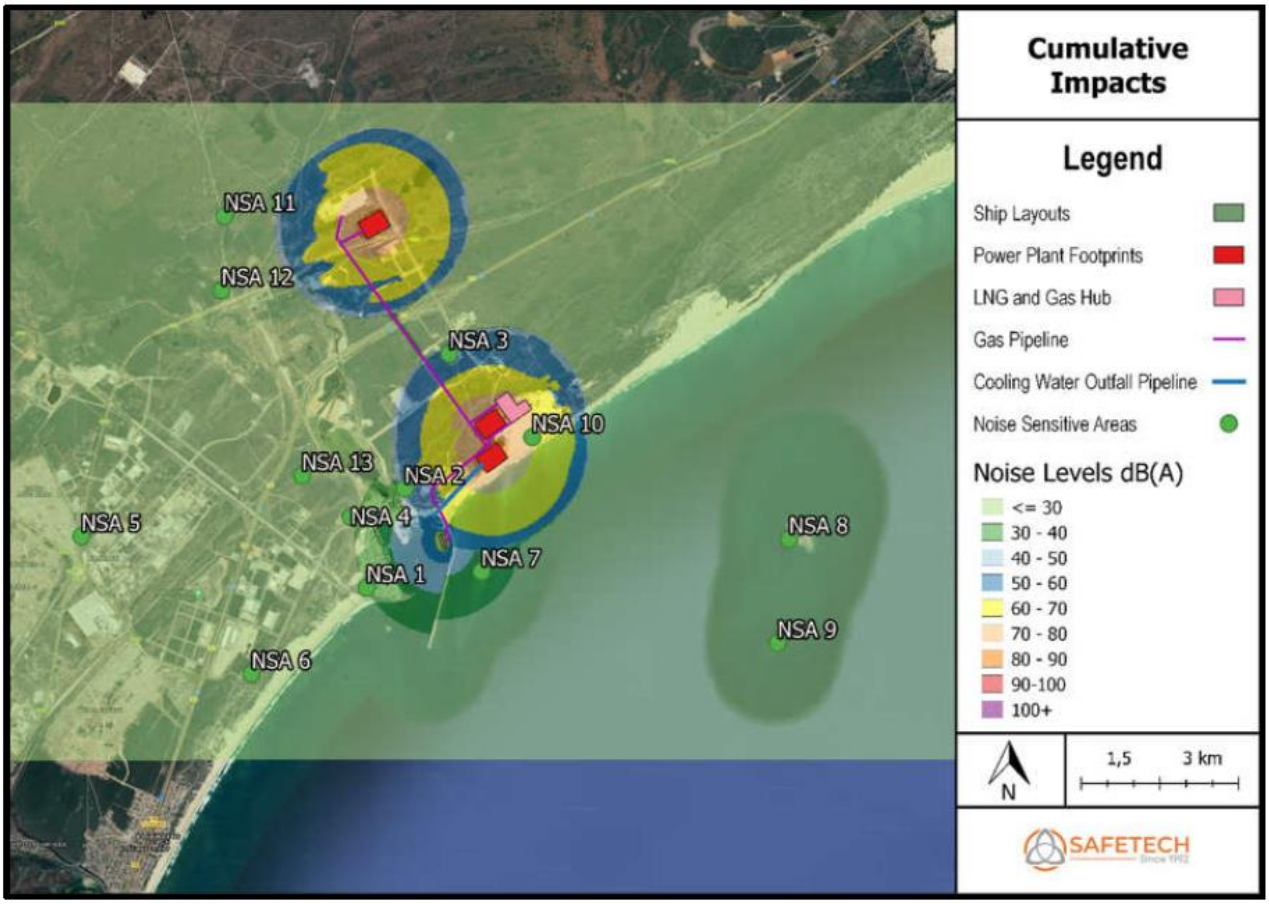

Figure 6-13: Cumulative noise impacts of all components of the CDC gas to power project

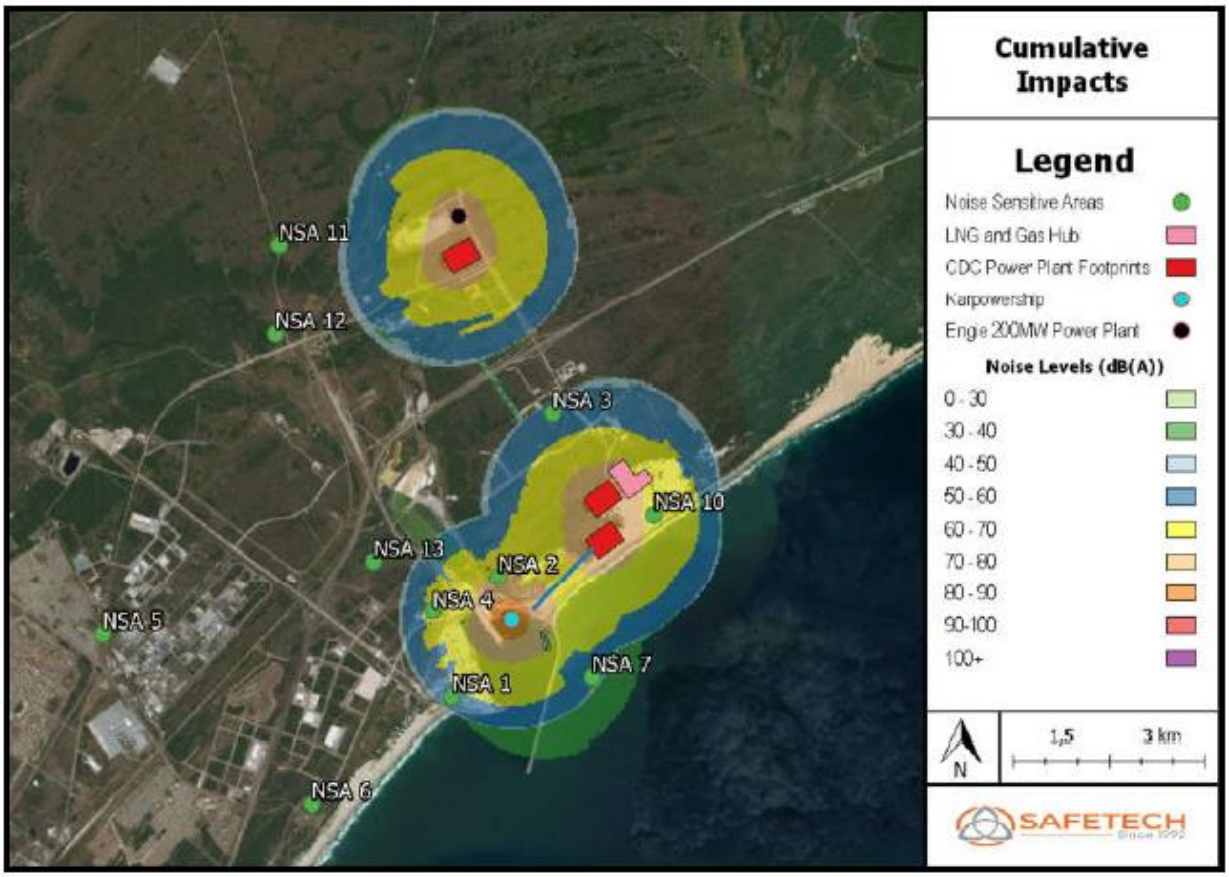

Figure 6-14: Cumulative noise impacts from all gas to power projects in the SEZ and port

Other projects in the area that may contribute to the cumulative noise impacts include the proposed ENGIE Risk Mitigation Power Project and the Karpowership Gas to Power Powership project in the Port of Ngqura. Figure 6-14 illustrates the noise levels of these proposed developments.

Modelling of the cumulative impacts shows that the TPT offices (NSA 1), NPA Offices (NSA 2), Jahleel Island (NSA 7) and Damara tern colony (NSA 10) will be impacted more severely than in a scenario that only considers the Gas infrastructure project. With the exception of the NPA offices (NSA 2) and Damara Tern Colony (NSA 10), the cumulative impacts if all proposed developments were fully operational would be within the SANS 10103 limits.

6.8.4 Cumulative Traffic Impacts

It is assumed that all proposed plants will be operational by 2030. As such, the TIA has assessed the cumulative operational traffic for the Zone 10 South and North Power Stations, the Zone 13 Power Station and the Liquified Natural Gas terminal and distribution facility added to the latent volumes and the ENGIE Zone 13 plant and the escalated background traffic volumes for the 2030 development horizon.

It is noted that the proposed Karpowership will not generate any traffic impact, and nor will the conversion of Dedisa power plant to gas-fuelled as the gas will be transported to Dedisa via pipelines.

Impact TI1: Road and Intersection capacity (additional traffic loading) during operation

Table 6-65: Significance rating of impact TI1 during operation - cumulative

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence

Before Management	Local	Low	Long-term	Very low	Definite	Very low	-	High

Impact TI2 Traffic Safety Impact due to additional traffic during operation

Table 6-66: Significance rating of impact TI2 during operation - cumulative

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	Low	Long-term	Very low	Definite	Vey low	-	High

6.8.5 Cumulative Quantitative Risk Impacts

All proposed power plants in the Coega SEZ have been quantitatively assessed for impacts from fires and explosions. The consolidated risks for the power plants and gas distribution infrastructure for the Phase 1 (offshore storage and regasification of LNG) and Phase 2 (onshore storage and regasification of LNG) of the CDC's gas distribution infrastructure projects are shown in the figures below.

The risks for Phase 1 of the gas infrastructure development, is shown in Figure 6-15. Here the operating risks would remain within the Coega SEZ, except for some road transportation that would exit the Coega SEZ onto the N2 and then re-enters the Coega SEZ. The transportation risks are sufficiently low to the public and would be considered acceptable.

While risks were developed for the LNG carriers and FSRU, one should be cautious in interpreting these for decision making. The risk used in the QRA assessment were based on assumptions and did not include a cumulative marine transportation risk assessment, taking into account marine conditions, number and type of port vessels, international standards and requirements. This risk assessment did not find the risks from the proposed LNG vessels in port to be unacceptable. However, a more detailed cumulative marine risk assessment specific to the LNG vessels within the Port of Ngqura, should be conducted to confirm the acceptability of LNG ships at the positions suggested.

Phase 2 of the gas infrastructure project essentially moves the LNG storage from the FSRU to the onshore storage, that will supply the power stations with LNG. It is anticipated that the road transportation of LNG will stop after completion of Phase 1, and the risks would increase around the onshore centralised LNG storage ad regasification area at the LNG & gas hub.

Road transportation to deliver LNG would not be required – the LNG would be piped from the port to the onshore storage and regasification area. The consolidated risks for Phase 2 of the gas infrastructure development are shown in Figure 6-16. All risks will remain within the Coega SEZ and thus the risk to the public, located outside of the Coega SEZ will be considered acceptable.

Impact QR1 and 2: Cumulative risk of loss of containment of LNG resulting in fire or explosion during operation

Leaks or spills of LNG and / or natural gas from various components of phases 1 and 2 of the gas infrastructure (LNGC, FSRU, pipelines, onshore storage tanks, etc), as well as from other developments in the area, may result in fires and explosions, which may have fatal consequences.

Table 6-67: Significance rating of cumulative impact QR2 and management measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence

Before Management	Local	High	Long term	High	Improbable	Medium	-	High
Management Measures								
• Installation of instrumentation, including detection and emergency shut down								
After Management	Local	High	Long term	High	Improbable	Medium	-	High

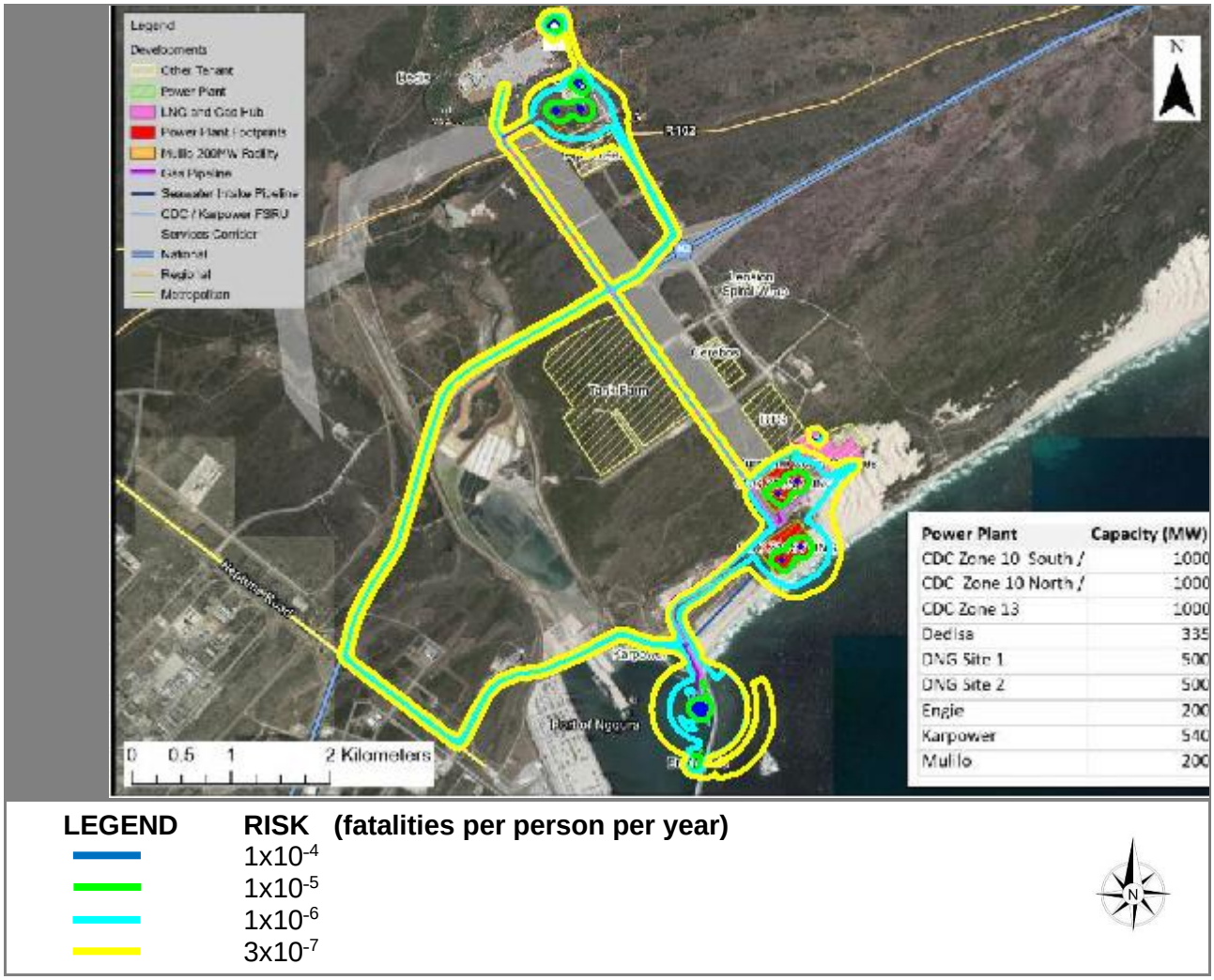

Figure 6-15: Lethal probability isolines associated for the Coega SEZ Phase 1 of the gas distribution projects

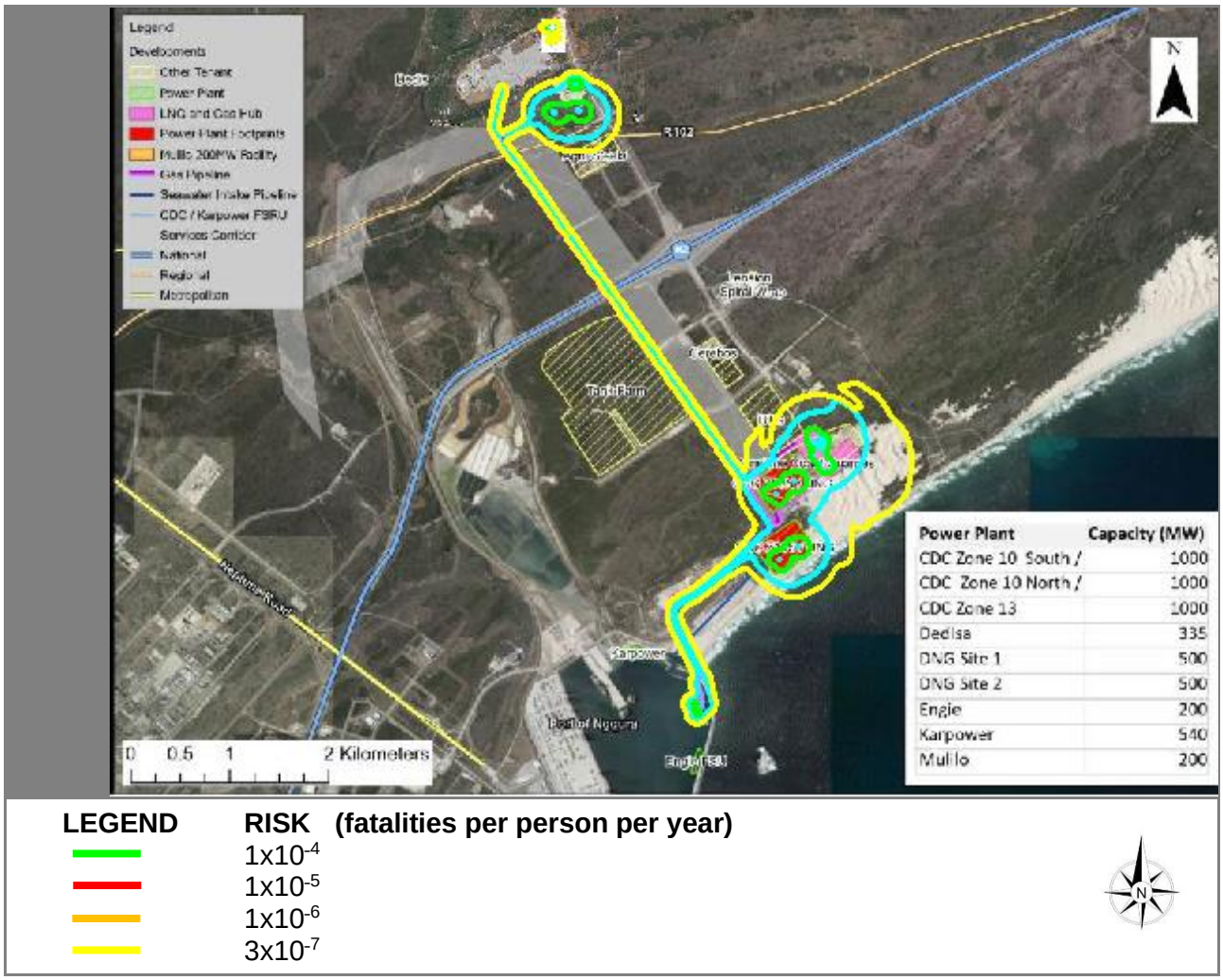

Figure 6-16: Lethal probability isolines associated for the Coega SEZ Phase 2 of the gas distribution and power plants projects

6.8.6 Cumulative Marine Ecology Impacts

Comments provided by the specialist regarding the various cumulative impacts that may be expected to result from the gas infrastructure project along with relevant proposed similar projects in and around the Ngqura port are listed below, along with estimated impact significance ratings where applicable.

Impact ME1: Elimination of benthic communities through disturbance and loss of substratum

Any disturbance of sediments within the Port of Ngqura, be it as a result of dredging or the construction of quays, breakwaters, underwater revetments, jetties and mooring and berthing dolphins or placement of mooring legs, will have cumulative impacts on the marine communities associated with those sediments. Over the lifetime of the port, these impacts are likely to be of *medium* significance.

Impact ME2: Reduced physiological functioning of marine organisms due to increased suspended sediment concentrations or turbidity

Although increased suspended sediment concentrations associated with construction activities are ephemeral, when taken in combination with capital and maintenance dredging operations, cumulative impacts on water quality of *medium* significance can be expected over the medium to long term.

Impact ME3: Toxic effects of remobilised contaminants and nutrients in the dredge and construction area on marine organisms

Although contaminant concentrations in the sediments are currently low, compromised sediment quality within the port over the long-term due to cumulative impacts resulting from port developments and other anthropogenic sources in the Coega SEZ can be expected. Over the lifetime of the port, these impacts are likely to be of *medium to high* significance.

Impact ME4, ME5 and ME6: Underwater noise and vibration levels

Although noise and vibrations associated with construction activities are ephemeral, the cumulative impact of increased background anthropogenic noise levels in the oceans has been recognised as an ongoing and widespread issue of concern (Koper & Plön 2012). The long term cumulative impacts of noise on marine organisms in the port are therefore predicted to be of *medium* significance.

Impact ME7: Creation of artificial hard strata

Any developments within the port that require the installation of hard structures will have a cumulative impact on the availability of hard substrata for colonisation by marine organisms. The long term cumulative impacts are, however, expected to be of *low* significance.

Impact ME8: Intake of large volumes of seawater from the port

With the development of multiple gas-to-power projects within the port and in the Coega CDC large volumes of seawater will be required for both cooling and regasification. Any impingement and entrainment effects will therefore be cumulative, potentially extending over the long term. Without the results of an entrainment study to more accurately determine the potential impacts of impingement and entrainment on communities within the Port of Ngqura, the cumulative impacts of the extraction of large volumes of seawater from the harbour is difficult to predict with confidence. In a comparatively confined space such as the Port of Ngqura, cumulative impacts could be of *medium to high* significance.

Impact ME9: Introduction and spread of alien invasive species

Any further port developments that result in an increase in vessel traffic to and from the port will result in an increased risk in the introduction of non-native marine organisms. The long term cumulative impacts of the introduction and spread of alien species are difficult to predict with confidence, but could be of *medium to high* significance (depending on the species involved and its invasive abilities). The implementation of an invasive species monitoring programme by the Port authorities should provide valuable information on this.

Impact ME10: Discharge of high volumes of water with depressed or elevated temperatures

The cumulative impacts of the thermal effluents from the FSRU, the proposed Engie FSU, and those from the on-land re-gasification facility and power-plants need to be considered. A modelling study undertaken by PRDW (2020) for anticipated thermal discharges in the Coega marine pipeline servitude ascertained that water quality guideline targets with respect to temperature were met within 300 m of the proposed discharge location to the east of the breakwater. There would therefore be no overlap of the thermal plumes from the FSRU moored at the LNG terminal within the Port, with the thermal discharges from the power-plant outfalls to the east of the breakwater and within the Addo Elephant MPA and Algoa Bay to Amathole EBSA. If the thermal plumes are limited to within 100 m of the discharge point, there will also unlikely be cumulative impacts between the thermal discharges from the FSRU and proposed Engie FSU to be situated a few 100 m south along the breakwater. Cumulative impacts of thermal discharges are thus not expected.

Impact ME11: Discharge of co-pollutants (biocide, metals and salinity)

No long term cumulative impacts on marine organisms are expected as effluents will comply with water quality guidelines.

Impact ME12: Increase in ambient lighting

No long term cumulative impacts on marine organisms are expected relative to the ambient light levels in the Coega SEZ.

Impact ME13: Waste Discharges to Sea

Although pollutant levels in the waters of the Port of Ngqura are currently low, compromised water quality within the port over the long-term due to cumulative impacts resulting from port developments, vessel discharges and other anthropogenic sources in the Coega SEZ can be expected. Over the lifetime of the port, these impacts are likely to be of *medium* significance.

6.8.7 Cumulative Socio-Economic Impacts

The proposed Gas Infrastructure project will help to secure approximately 2,000 direct employment opportunities in the short term and 200 in the long term, and, cumulatively the overall CDC gas to power project could potentially result in a significant number of employment opportunities over the construction and operational phases of the project (assuming similar employment numbers for each power plant). The impact is anticipated to be realised over a number of years, as construction of the various components of the broader project is likely to be phased. As the relative timing of development of the various components of the overall project are not yet known, total employment numbers at any one time may vary widely.

Increased economic activity is desirable, or even critical, in the context of high unemployment and low income levels. Together with all other productive economic activities in the region, energy production at the CDC gas to power project benefits the local and national community cumulatively.

The net cumulative economic impact of the gas to power project is positive and is arguably of a ***medium*** to ***high*** significance.

Impact SE1: Cumulative job creation during construction and operation

Table 6-68: Significance rating of impact SE1 - cumulative

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Low	Long-term	Medium	Definite	Medium	+	High

Impact SE2: Cumulative growth of the local, regional and national economies

The CDC estimates the total cost of construction (CapEx) to develop the entire Gas to Power projects at R8 billion. While the timing and duration of this disbursement is dependent on securing external investors, this would amount to a significant portion of the GVA, at both a local and national level.

Table 6-69: Significance rating of impact SE2 - cumulative

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Regional	Low	Long-term	Medium	Probable	Medium	+	Medium

Impact SE3: Cumulative contribution to increased energy security

The main purpose of the proposed CDC Gas-to-Power project is to provide electricity into the national electricity grid whereby contributing to cover the increasing demand of electricity in the country. The energy generated by the project will be fed into the national energy grid and will contribute to energy security both directly, and indirectly by allowing for increased uptake of energy from renewable energy projects. This could have significant economic benefits for downstream users, in terms of decreased incidence of power outages due to load-shedding.

Table 6-70: Significance rating of impact SE3 – cumulative

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	National	Low	Long-term	High	Probable	High	+	High

6.8.8 Cumulative Impacts on Terrestrial Ecology

Impact TE2: Impact on Damara Terns due to Disturbance

A number of projects and activities are proposed in the vicinity of the Damara Tern breeding area (see Figure 4-6), including the two 1000 MW CDC gas to power projects, the CDC gas infrastructure project (the LNG and gas hub is located approximately 300 m from the Damara tern breeding area), and the CDC Marine Pipeline Servitude. While sand mining is currently being undertaken in the area, and the Damara Tern population does appear to show a level of resilience to disturbance at a distance greater than 200 m (AP Martin, November 2019 and March 2020), whether this population will withstand the additional disturbance (especially noise and increased human activity) resulting from multiple projects in the Zone 10 coastal area remains uncertain. The mitigation measures recommended include the monitoring and management planning by the CDC, covering all relevant projects.

Table 6-71: Significance rating of impact TE2 and mitigation measures during construction

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	High	Medium - term	Medium	Definite	Medium	-	High

Management Measures

- CDC to establish a Damara Tern Management Program within the CDC OSMP mechanisms, which incorporates:
  - specialist monitoring of the Damara tern population to determine the extent of their habitat, by an expert with previous experience monitoring this species,
  - an annual report on the status of the SEZ Damara tern population, and approval of the annual report / management plan by the EMC.
  - Continued monitoring of the Damara Tern population must be implemented
- Maintain a No-Go buffer area to ensure no access or activities within 200 m of Damara Tern habitat as indicated on the environmental sensitivity map (Figure 4-6);
- No-Go buffer areas around the tern breeding area must be demarcated and pedestrian and other access must be prevented both during operation, particularly during the Damara Tern breeding season (early October to late February); and
- Environmental awareness / toolbox talks to include awareness of the Damara tern population;
- No fires are permitted within the project area.
- Measures must be taken to minimise noise from machinery etc.

• Drivers of vehicles authorised to drive on the beach must be made aware of the presence of Damara Terns during the breeding season (October to March) and must keep below the high-water mark. • Management actions such as litter picking must be carefully planned to minimise disturbance to breeding pairs.								
After Management	Local	High	Medium-term	Medium	Probable	Medium	-	High

Table 6-72: Significance rating of impact TE2 and mitigation measures during operation

	Spatial Extent	Intensity	Duration	Consequence	Probability	Significance	+ -	Confidence
Before Management	Local	High	Long-term	High	Definite	High	-	High
Management Measures								
• CDC to establish a Damara Tern Management Program within the CDC OSMP mechanisms, which incorporates: o specialist monitoring of the Damara tern population to determine the extent of their habitat, by an expert with previous experience monitoring this species, o an annual report on the status of the SEZ Damara tern population, and approval of the annual report / management plan by the EMC. o Continued monitoring of the Damara Tern population must be implemented • Maintain a No-Go buffer area to ensure no access or activities within 200 m of Damara Tern habitat as indicated on the environmental sensitivity map (Figure 4-6); • No-Go buffer areas around the tern breeding area must be demarcated and pedestrian and other access must be prevented both during operation, particularly during the Damara Tern breeding season (early October to late February); and • Environmental awareness / toolbox talks to include awareness of the Damara tern population; • No fires are permitted within the project area. • Measures must be taken to minimise noise from machinery etc. • Drivers of vehicles authorised to drive on the beach must be made aware of the presence of Damara Terns during the breeding season (October to March) and must keep below the high-water mark. • Management actions such as litter picking must be carefully planned to minimise disturbance to breeding pairs.								
After Management	Local	High	Long-term	High	Probable	High	-	High

7 Conclusions and Recommendations

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

As is to be expected, the construction and operation of the power plant have the potential to cause impacts, both negative and positive. However, since the development is located within an industrial area, is consistent with strategic planning for the area, and is intended to supply much needed power to the national energy grid, apart from contribution to climate change, which is unavoidable for a project of this nature, and potential impacts on the Damara Tern colony close to the site, negative impacts are generally of low intensity, and are not predicted to be of major concern. Impacts from the project will, however, persist in the long term.

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

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

7.1 Environmental Impact Statement

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

7.2 Evaluation and Summary of Positive and Negative Impacts

The evaluation is undertaken in the context of:

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

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

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

The evaluation and the basis for the subsequent discussion are represented concisely in Table 7-1 and Table 7-2, which summarises the potentially significant impacts and their significance ratings before and after application of mitigation and/or optimisation measures.

Table 7-1: Summary of potential impacts of the Gas Infrastructure project during Construction

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

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
V	**Visual Impact / sense of place**			
V1	Change in visual character and sense of place due to earth moving and other construction activities	Very low	Insignificant	• Disturbance to the natural vegetation to be kept to the minimum; • Dust control measures such as wetting and covering of stockpiles to be implemented when necessary; and • Effective waste management.
WM	**Waste Management**			
WM1	Poor Waste Management resulting in pollution of the surrounding area	Medium	Insignificant	• A waste management plan should be in place and should address classification of waste streams, segregation at source, control of waste on site before disposal, removal of wastes from site, and record keeping; • The Contractor must identify and separate materials that can be reused or recycled to minimise waste, e.g. metals, packaging and plastics, and provide separate marked bins/ skips for these items. These wastes must then be sent for recycling and records kept of recycling; • No disposal of wastes, other than at registered landfill sites; • No waste may be burned; • Sufficient portable on-site weather & vermin proof bins with lids need to be provided and appropriately placed and emptied regularly (contents to be disposed of at a licenced landfill site, and proof of disposal retained for auditing purposes); • Ensure that construction materials (e.g. bags of cement) are suitably stored and protected to avoid wastage; and • Excess excavated material that cannot be used for backfill should not be allowed to accumulate on site and should be disposed of at a formal landfill site or suitable spoil site identified in conjunction with the ECO.
WE	**Soil, Stormwater and Erosion Impacts**			
WE1	Pollution of Soil and Stormwater, and increase in Erosion	Very low	Insignificant	• Disturbance of soil and the natural vegetation to be kept to the minimum; • Use existing access tracks where possible; • Handling of hazardous liquids over impermeable surfaces only to prevent leaks or spills; and • An erosion control plan must be compiled by a suitably experienced specialist, outlining specific recommendations for stabilisation of dunes that are cleared or disturbed during construction. This must be compiled in conjunction with a revegetation plan by a suitably experienced specialist in coastal vegetation.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
TE	**Terrestrial Ecology Impacts**			
TE1	Loss of habitat / species and disturbance of fauna due to vegetation clearing and other construction related disturbance	Low	Very low	• Keep vegetation clearance to the absolute minimum; keeping the width and length of the earth works to a minimum; • A revegetation plan must be compiled by a suitably experienced specialist in coastal vegetation, outlining specific recommendations for rehabilitation of coastal vegetation that is cleared or disturbed during construction; • No-Go/ open space areas must be clearly demarcated/ clearly marked (i.e. with danger tape) before any construction activities commence on site and appropriate measures implemented to ensure compliance; • Clearing must take place in a phased manner (i.e. the entire area to be developed should not be cleared all at once) to allow any fauna to migrate to adjacent areas safely; • Vehicles and/ or plant and personnel shall only be permitted within the demarcated construction areas, or on existing roads and/ or access tracks between demarcated areas. • No clearing of vegetation, abstraction, storage, disposal or mixing of any substance (e.g. water, cement, petroleum etc.) may take place outside the demarcated construction area without prior approval of the ECO • No fires permitted on site; • Limit all activities to within the construction footprint area, which must be demarcated prior to commencement of clearing; • No hunting, poaching or otherwise harming of wildlife on and around the site; • Site walkthrough and search and rescue to be conducted by a suitably experienced faunal specialist prior to clearing of the site, with particular focus on faunal species of special concern that may occur in the vicinity; • Clear vegetation in a phased manner in order to allow any fauna to migrate to adjacent areas safely; • No wildlife may be removed from the site or surrounding areas unless approved by the ECO in conjunction with the appropriate permits obtainable from relevant competent authorities; • Educate workers on site about the protection of all fauna on site; and • An alien invasive vegetation monitoring and control programme must be implemented throughout the construction and defects notification period, to clear alien invasive vegetation from all areas affected by construction activities and prevent its regrowth.
TE2	Impact on Damara Terns due to Disturbance	Medium	Medium	• CDC to establish a Damara Tern Management Program within the CDC OSMP mechanisms, which incorporates: o specialist monitoring of the Damara tern population to determine the extent of their habitat, by an expert with previous experience monitoring this species,

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
				○ an annual report on the status of the SEZ Damara tern population, and approval of the annual report / management plan by the EMC. ○ Continued monitoring of the Damara Tern population must be implemented • Maintain a No-Go buffer area to ensure no access or activities within 200 m of Damara Tern habitat as indicated on the environmental sensitivity map (Figure 4-6); • No-Go buffer areas around the tern breeding area must be demarcated and pedestrian and other access must be prevented both during operation, particularly during the Damara Tern breeding season (early October to late February); and • Environmental awareness / toolbox talks to include awareness of the Damara tern population; • No fires are permitted within the project area. • Measures must be taken to minimise noise from machinery etc. • Drivers of vehicles authorised to drive on the beach must be made aware of the presence of Damara Terns during the breeding season (October to March) and must keep below the high-water mark. • Management actions such as litter picking must be carefully planned to minimise disturbance to breeding pairs.
HR	**Heritage Resources Impacts**			
HR1	Damage or destruction of concentrations of palaeontological/ archaeological material	Low	Low	• An archaeologist must be present on site during vegetation clearing of selected strips of vegetation (to be identified by the archaeologist). Clearing must be by small machinery, or the least invasive method of clearing. • Monitoring by an archaeologist must take place during all earthmoving activities, including, but not limited, to trenching and piling. • If any concentrations of heritage material / fossils are exposed during construction, all work in that area must cease and it must be reported immediately to the Albany Museum so that the required investigations can be undertaken. This could entail Phase 2 mitigation (to be determined by the Albany Museum). • After vegetation clearing a report must be sent to SAHRA for review and guidance on the way forward. • Any excavations in the Salnova formation must be examined and sampled by a professional palaeontologist WHILE fresh bedrock is still exposed. The presence of a palaeontologist is required on site soon after exposure.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
TI	**Traffic Impacts**			
TI1	Increased traffic volumes affecting traffic flow	Very low	Very low	• Provide suitable traffic accommodation measures as part of construction contract to inform other road users of presence of construction related traffic; • Traffic accommodation measures to be provided in terms of Chapter 13 of the South African Road Traffic Signs Manual; • Measures to be provided subject to approval by the Engineer; and • Ensure construction traffic is confined to site area, where possible.
TI2	Additional axle loading resulting in deterioration of road condition	Very low	Very low	• Minimise need for continuous construction traffic on Ring Road by confining construction traffic to the site; • Ensure that vehicle loads are within legislated limits, i.e. maximum Gross vehicle mass of 56 000kg; and • Source relevant permits from the Eastern Cape Department of Transport should abnormal loads be required for transport of components.
TI3	Traffic safety impact due to additional / high-speed traffic	Very low	Very low	• Provide suitable traffic accommodation measures as part of construction contract to inform other road users of presence of construction related traffic, including speed restriction signage; and • Increased law enforcement protocols.
CA	**General Construction Related impacts**			
CA1	Dust impacts	Low	Very low	• Clear vegetation in a phased manner; • Areas to be cleared of vegetation or topsoil shall be cleared only when required, and shall be rehabilitated immediately on completion of the construction activity in that area; • Access roads should be kept to a minimum and their length and width should be minimised to reduce the surface area from which dust can be generated; • When transporting fine materials, dust tarps should be installed on vehicles; • Limit speeds on access and internal roads to; • When necessary, appropriate dust control measures (such as wetting of soil[14] and covering of stockpiles) shall be implemented; and • Maintain a complaints register to monitor levels of nuisance experienced by neighbours and respond to complaints by increasing the frequency and/or intensity of the dust suppression.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
CA2	Damage to other infrastructure	Insignificant	Insignificant	• Existing infrastructure and services within or close to the construction footprint are to be located (via GPR if necessary) and demarcated prior to construction activities commencing; • Relevant authority agencies and/or Department of the service supplied are to be notified should existing infrastructure be damaged by construction related activities; and • other users are to be notified of any planned disruptions to services ahead of time.
CA3	Veld fires and fire management	Very low	Insignificant	• No fires on or around the site allowed; • Smoking is not to be permitted on site except in designated areas; • Sufficient fire-fighting equipment to be maintained and be accessible on sites at all times; and • Any incidents or accidents must be recorded, and a record thereof must be kept on site.
N	**Noise Impacts**			
N1	Noise affecting nearby receptors	Very low	Insignificant	• All construction operations should only occur during daylight hours if possible. • No construction piling should occur at night where possible. Piling should only occur during the day to take advantage of unstable atmospheric conditions (which lessen the effects of project related noise). • Construction staff should receive “noise sensitivity” training such as switching off vehicles when not in use, location of NSA’s etc. • An ambient noise survey should be conducted at the noise sensitive receptors during the construction phase.
ME	**Impacts on Marine environment**			
ME1	Elimination of benthic communities through disturbance and loss of substratum	Very Low	Very Low	• None
ME2	Reduced physiological functioning of marine organisms due to increased suspended sediment concentrations or turbidity	Very Low	Very Low	• All dredging activities and associated environmental monitoring must be conducted in accordance with the conditions stipulated under the port expansion authorisation; and • All contractors must have an approved Environmental Management Plan in place that ensures that environmental impacts are minimised as far as practicable possible.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
ME3	Toxic effects of remobilised contaminants and nutrients in the dredge and construction area on marine organisms	Insignificant	Insignificant	• All dredging activities and associated environmental monitoring must be conducted in accordance with the conditions stipulated under the port expansion authorisation.
ME4	Disturbance, behavioural changes and avoidance of feeding and/or breeding areas in fish, seabirds, seals, turtles and cetaceans due to underwater noise generated by dredging and general construction	Very Low	Very Low	• Restrict construction noise and vibration-generating activities to the absolute minimum required.
ME5	Disturbance, behavioural changes and avoidance of feeding and/or breeding areas in fish seabirds, seals, turtles and cetaceans due to pile driving, underwater drilling and hydraulic rock breaking	Medium	Very Low	• Ensure that all pile driving is undertaken in accordance with international protocols (e.g. JNCC 2010; DPTI 2012; • Include the standard management and mitigation procedures, and any additional measures, in the contract documentation of the construction contractor; • Consider the use of a bubble curtain. As the noise from pile driving is transmitted through the sediment into the water, bubble screens do not eliminate all behavioural responses to the piling noise, but reported noise reductions range from 3 to 20 dB (Würsig et al. 2000; DPTI 2012).

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
ME6	Creation of Artificial Hard strata	Very Low	N/A	• None

ME12	Waste Discharges to Sea	Low	Low	• Implement a waste management system that addresses all wastes generated at the various sites, shore-based and marine. This should include:
				  ○ Separation of wastes at source;
				  ○ Recycling and re-use of wastes where possible;
				  ○ Treatment of wastes at source (maceration of food wastes, compaction, incineration, treatment of sewage and oily water separation).
				• Implement leak detection and repair programmes for valves, flanges, fittings, seals, etc.
				• Use a low-toxicity biodegradable detergent for the cleaning of all deck spillages.

ME15	Faunal strikes with LNGCs and Dredgers	Insignificant	Insignificant	• Ensure that vessel speed is kept below 10 knots when underway in Algoa Bay. • The vessel operators should keep a constant watch for slow-swimming large pelagic fish, marine mammals and turtles in the path of the vessel.
ME16	Release of diesel to sea during bunkering or due to vessel accident	High	Insignificant	• Ensure that all project-associated vessels have an oil spill contingency plan in place. • As far as possible, and whenever the sea state permits, attempt to control and contain the spill at sea with suitable recovery techniques to reduce the spatial and temporal impact of the spill. • Ensure adequate resources are provided to collect and transport oiled birds to a cleaning station. • Refuelling is to take place only under controlled conditions within the port.
SE	**Impacts on Socio-economic environment**			
SE1	Direct and Indirect employment opportunities	Low	Low	• Recruit local labour as far as feasible to increase the benefits to the local households; • Employ labour intensive methods in construction where feasible; • Sub-contract to local construction companies where possible; and • Use local suppliers where feasible and arrange with local SMMEs and BBBEE compliant enterprises to provide transport, catering and other services to the construction crews.
SE2	Growth of the local, regional and provincial economies	Low	Low	• Recruit local labour for construction works as far as feasible to increase the benefits to the local households; • Sub-contract to local construction companies where possible; and • Use local suppliers where feasible and arrange with local SMMEs and BBBEE compliant enterprises to provide transport, catering and other services to the construction crews.

Table 7-2: Summary of Key potential impacts of the Gas Infrastructure during Operation

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

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
V	**Visual Impact / sense of place**			
V1	Change in the visual character and sense of place	Low	Low	• Effective waste management; and • The CDC must maintain infrastructure and services associated the proposed Gas Infrastructure.
WM	**Waste Management**			
WM1	Poor Waste Management resulting in pollution of the surrounding area	Low	Very low	• The developer must identify and separate materials that can be reused or recycled to minimise waste e.g. metals, packaging and plastics, and provide separate marked bins/ skips for these items. These wastes must then be sent for recycling and records kept of recycling; • No dumping within the surrounding area shall be permitted, and no waste may be buried or burned on site; • Sufficient portable on-site weather & vermin proof bins with lids need to be provided and appropriately placed and emptied regularly (contents to be disposed of at a licenced landfill site, and proof of disposal retained for auditing purposes); • Cleared alien vegetation should be disposed of so that it does not re-establish on site; • Regular (weekly) waste collection service to be provided; and • All staff shall be trained on correct waste management.
WE	**Soil, Stormwater and Erosion Impacts**			
WE1	Pollution of Soil and Stormwater, and increase in Erosion	Medium	Low	• Implementation of a site specific stormwater management plan, in accordance with the CDC's overarching stormwater management strategy for the SEZ, to ensure stormwater exiting the site meets the requirements in terms of quality and volume; • Harvesting of rainwater and stormwater where possible for use on site; • Separation of clean and dirty stormwater on site and treatment of dirty stormwater prior to discharge; Ensure all storage and handling of hazardous liquids takes place over an impermeable surface to capture any leaks or spills for disposal or further treatment; and • Include bunding to at least 110% of storage capacity around all fuel and chemical storage vessels where appropriate to do so, to capture any spills / leaks
TE	**Terrestrial Ecology Impacts**			
TE1	Loss of habitat / species and	Medium	Low	• Monitor the surrounding area for signs of dumping of waste, harvesting of indigenous vegetation, destruction of natural forest, and invasion of additional informal residences, and take action to prevent these activities.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
	disturbance of fauna and flora			
TE2	Impact on Damara Terns due to Disturbance	High	High	• CDC to establish a Damara Tern Management Program within the CDC OSMP mechanisms, which incorporates: o specialist monitoring of the Damara tern population to determine the extent of their habitat, by an expert with previous experience monitoring this species, o an annual report on the status of the SEZ Damara tern population, and approval of the annual report / management plan by the EMC. o Continued monitoring of the Damara Tern population must be implemented • Maintain a No-Go buffer area to ensure no access or activities within 200 m of Damara Tern habitat as indicated on the environmental sensitivity map (Figure 4-6); • No-Go buffer areas around the tern breeding area must be demarcated and pedestrian and other access must be prevented both during operation, particularly during the Damara Tern breeding season (early October to late February); and • Environmental awareness / toolbox talks to include awareness of the Damara tern population; • No fires are permitted within the project area. • Measures must be taken to minimise noise from machinery etc. • Drivers of vehicles authorised to drive on the beach must be made aware of the presence of Damara Terns during the breeding season (October to March) and must keep below the high-water mark. • Management actions such as litter picking must be carefully planned to minimise disturbance to breeding pairs.
TI	**Traffic Impacts**			
TI1	Increased traffic volumes affecting traffic flow	Very low	Very low	• None
T13	Traffic safety impact due to additional / high-speed traffic	Very low	Very low	• Suitable warning traffic signage be provided to ensure safe operation along access roads; and • Ongoing enforcement along access roads.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
CC	**Climate Change Impact**			
CC1	Impact on climate change by way of GHG emissions resulting from the project	Very High	Very High	• Source LNG from nearby suppliers such as northern Mozambique, to reduce upstream transport emissions; • Source LNG from responsible suppliers, reducing emissions associated with extraction and upstream processing of the LNG; and • Use good quality equipment to reduce the amount of natural gas that escapes as fugitive emissions and reducing the need for flaring
CC2	Risk and Vulnerability of the Project to Climate Change	*Low*	*Very low*	• The designs of infrastructure and processes must consider the potential impact of extreme weather events such as severe storms/storm surge, severe winds, extreme heat, heavy rains, and flooding impacts. The corrosive nature of maritime climate on infrastructure and equipment must be taken into account in design and maintenance; • The designs for the piping must account for increasing ambient temperatures as well as an increased frequency of very hot days and the associated material fatigue; • Safety protocols must take into consideration the impacts of climate change on construction and operations. This includes the introduction of disaster management policies, as well as onsite employee training, specifically for risk management of extreme weather events. • Design of an on-site stormwater drainage system, and implementation of a stormwater management plan. • Improve storm water drainage capacity to minimise flood occurrences onsite and the associated contamination occurrences. • Use a closed-loop water system for the gas infrastructure to minimise water losses to evaporation, and reduce water consumption.
N	**Noise Impact**			
N1	Noise affecting nearby receptors	Very low	Very low	• The noise impact from the proposed Gas Infrastructure should be measured during the operational phase, to ensure that the impact is within the required legal limit.; and • An avifauna specialist should be consulted to determine the effects that an increase in noise levels will have on the Damara Tern Colony.
ME	**Impacts on Marine environment**			
ME1	Elimination of benthic communities through disturbance and loss of substratum	Very Low	Very Low	• No direct mitigation possible other than the no-project alternative.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
ME2	Reduced physiological functioning of marine organisms due to increased suspended sediment concentrations or turbidity	Very Low	Very Low	• All dredging activities and associated environmental monitoring must be conducted in accordance with the conditions stipulated under the port expansion authorisation; and • All contractors must have an approved Environmental Management Plan in place that ensures that environmental impacts are minimised as far as practicable possible.
ME4	Disturbance, behavioural changes and avoidance of feeding and/or breeding areas in fish, seabirds, seals, turtles and cetaceans due to underwater noise from the LNGCs and FSRU	Very Low	Very Low	• No mitigation possible other than the no-go option.
ME7	Intake of large volumes of seawater from the port	Medium	Low	• Design intakes to minimise entrainment or impingement by reducing the average intake velocity to about 0.1 to 0.15 m/s. This is comparable to background currents in the oceans, and will allow mobile organisms to swim away from the intake under these flow conditions (UNEP 2008). • Optimise operating modes in the open-loop system as far as possible to reduce impacts, or use closed-loop systems in recruitment areas or during periods when abundances of eggs and larvae are seasonally high. • Undertake an entrainment study to more accurately determine the potential impacts of impingement and entrainment on communities within the Port of Ngqura.
ME8	Introduction and spread of alien invasive species	Medium	Low	• The LNGCs must have a Ballast Water Management Plan in place. • Ballast water exchange must be done at least 200 nautical miles from the nearest land in waters of at least 200 m deep; the absolute minimum being 50 nautical miles from the nearest land. • Ensure that routine cleaning of ballast tanks to remove sediments is carried out, where practicable, in mid-ocean or under controlled arrangements in port or dry dock, in accordance with the provisions of the ship's Ballast Water Management Plan. • Use filtration procedures during loading of ballast in order to avoid the uptake of potentially harmful aquatic organisms, pathogens and sediment that may contain such organisms.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
ME9	Discharge of high volumes of water with depressed or elevated temperatures	Very Low	Very Low	• Optimise operating modes in the open-loop system as far as possible to reduce impacts, or use closed-loop systems whenever practicable. • Use multi-port discharges and adjust discharge rate to facilitate enhanced mixing with the receiving water body. • Ports should discharge horizontally or within -45° of horizontal to maximise dilution and avoid erosion of the sediments where the jet hits the seabed.
ME10	Discharge of co-pollutants (biocide, metals and salinity)	Very Low	Very Low	• Neutralise NaOCl with SMBS prior to discharge to ensure that the most conservative international guideline value (<2 µg/ℓ) for residual chlorine at the point of discharge is met. • Blend the brine with the cooling/heating water prior to release.
ME11	Increase in ambient lighting	Very Low	Very Low	• Reduce lighting in non-essential areas. • Use guards to direct lights to areas requiring lighting • Avoid direct light in water, exept during safety inspections • Use Low light mounting where possible • Use long wavelength lights that are less intense for nocturnal animals.
ME12	Waste Discharges to Sea	Low	Low	• Implement a waste management system that addresses all wastes generated at the various sites, shore-based and marine. This should include: o Separation of wastes at source; o Recycling and re-use of wastes where possible; o Treatment of wastes at source (maceration of food wastes, compaction, incineration, treatment of sewage and oily water separation). • Implement leak detection and repair programmes for valves, flanges, fittings, seals, etc. • Use a low-toxicity biodegradable detergent for the cleaning of all deck spillages.
ME13	Accidental Spills of LNG	Insignificant	Insignificant	• Prepare an emergency response plan covering recommended measures to prevent and respond to LNG spills.
ME14	Accidental Spills of Hypochlorite	Insignificant	Insignificant	• The hypochlorite generation unit must be suitably bunded to prevent and spills from the plant entering the marine environment.
ME15	Faunal strikes with LNGCs and Dredgers	Insignificant	Insignificant	• Ensure that vessel speed is kept below 10 knots when underway in Algoa Bay. • The vessel operators should keep a constant watch for slow-swimming large pelagic fish, marine mammals and turtles in the path of the vessel.
ME16	Release of diesel to sea during bunkering or due to vessel accident	High	Insignificant	• Ensure that all project-associated vessels have an oil spill contingency plan in place. • As far as possible, and whenever the sea state permits, attempt to control and contain the spill at sea with suitable recovery techniques to reduce the spatial and temporal impact of the spill. • Ensure adequate resources are provided to collect and transport oiled birds to a cleaning station. • Refuelling is to take place only under controlled conditions within the port.

ID #	Impact	Significance rating		Key mitigation/optimisation measures
		Before mitigation/ optimisation	After mitigation/ optimisation	
SE	**Socioeconomic Environment Impacts**			
SE1	Direct and Indirect employment opportunities	Medium	Medium	• Recruit local labour as far as feasible to increase the benefits to the local households; • Sub-contract to local maintenance companies where possible; and • Use local suppliers where feasible and arrange with local SMMEs and BBBEE compliant enterprises to provide transport, catering and other services to the maintenance crews.
SE2	Growth of the local, regional and provincial economies	Medium	Medium	
SE3	Contribution to increased energy security	High	NA	• N/A
AQ	**Air Quality Impacts**			
AQ1	Impact on ambient SO_2, NO_2 and PM_{10} concentrations	Insignificant	NA	• No mitigation measure required.
AQ2	Impact on CO concentrations	Insignificant	NA	
QR	**Safety Risks resulting from catastrophic events (Quantitative Risk Assessment)**			
QR1	Loss of containment of LNG – Phase 1	Medium	Medium	• Installation of instrumentation, including detection and emergency shut down
QR2	Loss of containment of LNG – Phase 2	Medium	Very Low	• Installation of instrumentation, including detection and emergency shut down

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

- The predicted *air quality* impact, mainly associated with increased emissions of SO_2, NO_2, CO and PM_{10} during operation, affecting ambient concentrations of these pollutants, potentially affecting nearby receptors and the surrounding natural environment, is rated as *insignificant* due to the relatively minor contribution of the proposed gas infrastructure to ambient concentrations, which show exceedances in some instances.
- The predicted impact of the power plant on *climate change*, by way of increased *greenhouse gas emissions*, is rated as *very high* significance due to the large amounts of CO_2 emitted mainly due to downstream emissions from burning of natural gas. While this is significantly less than what would be emitted from burning of coal and significantly more than emitted by renewables, the contribution to GHG emissions will be substantial.
- The predicted impact of climate change on the project, by way of *vulnerability or resilience* to extreme weather events, is predicted to be *very low.* It is noted however that due to its unpredictability this risk is difficult to rate and should not be seen as unimportant.
- The predicted *safety risks* to surrounding receptors, in the unlikely event of a catastrophic event due to loss of containment of LNG from the LNGC, FSRU, onshore storage tanks, pipelines, etc., are predicted to be of *medium* significance (Phase 1) and *very low* (Phase 2) during operation.
- The predicted *marine ecological* impacts resulting mainly from the construction phase and operation of Phase 1 of the project (involving the use of FSRU(s)), are largely rated as very low significance, assuming adequate mitigation. Key impacts that would need to be mitigated include noise disturbance associated with pile driving etc. during construction; impingement and entrainment of marine organisms during intake of water by the LNGC and FSRU for ballasting and heating and cooling; introduction and spread of non-native species through hull fouling or ballast water discharge by the LNGC and FSRU; and the unexpected release of diesel from a vessel at sea.
- The predicted *terrestrial ecological* impacts of a localised loss / change of floral and faunal habitat from physical disturbance, vegetation clearing, and increased human activities in the area, are rated to be of *low* or *very low* significance. The predicted impact on the nearby Damara tern colony, primarily due to disturbance, is however rated to be of *high* significance. No-go areas have been identified and search and rescue permits will be required for protected fauna and flora within the site footprint area.
- The predicted *socio-economic* benefit of job creation, increased revenue to government, economic investment during construction are rated as *medium - low* (+ve) significance, and during operation, with the additional benefit of increased energy security, *high* (+ve) significance.
- The predicted *visual* impacts of altered sense of place and visual intrusion are rated as *low* significance due to the visibility of the gas infrastructure and persistence of impacts in the (very) long term, but noting the absence of sensitive receptors locally.
- Impacts relating to *waste management* during construction and operation are predicted to be *very low to insignificant* provided adequate management measures are in place to manage waste on the site.
- The predicted *traffic* impact during construction and operation is rated as *very low* due to the SEZ roads being designed for large volumes of industrial type traffic.
- The predicted *noise* impact due to construction and operation of the gas infrastructure is rated as *very low* due to the development being located in an industrial area and limited noise sensitive

receptors being present in the surrounding area, provided impacts on the nearby Damara tern colony can be adequately mitigated.

- The predicted *heritage* impact of a loss of or damage to heritage remains that may be uncovered during construction is rated as *low*. A chance finds procedure will be in place for the unexpected event of heritage resources being found.
- Impacts relating to pollution of *soils, stormwater and erosion* due to leaks or spills of pollutants, or unmanaged stormwater during construction and operation are rated as *low to insignificant*, with adequate stormwater control measures in place.
- *General construction* related impacts, such as dust nuisance, fire risks, and damage to other infrastructure are rated as *very low to insignificant*, and will generally be of short duration.
- The No-Go alternative entails no development of the site and the current situation continuing with regard to biophysical and socio-economic impacts. No impact rating is therefore provided for the no-go alternative.
- *Cumulative impacts* mainly derive from existing industries in the area, contributing to baseline concentrations of atmospheric pollutants, as well as proposed similar gas to power developments in the SEZ area. In the context of the project, cumulative impacts relating to safety risk are rated as *medium* significance, noise and terrestrial ecology (specifically the Danara tern colony) *high*, while those relating to traffic are rated as *very low,* air quality as *insignificant,* and those relating to marine ecology are largely rated as *medium to high* significance. The cumulative *socio-economic benefits* of job creation, local and regional economic growth, and increased energy security are considered to be of *medium to high* significance.

7.3 Integrated Project and Sensitivity Map

The EIA Regulations, 2014 prescribe that an integrated map at an appropriate scale is presented in the EIS. The map should, so far as it is applicable, superimpose the proposed activity and associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers. In the case of the project, **no environmental sensitivities have been identified within the development footprint area**, **however a 200 m buffer area around the around the Damara tern breeding area has been recommended**. These are included on Figure 4-6.

7.4 Principal Findings

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

1. The CDC proposes to develop key supporting gas infrastructure required for the operation of the CDC's proposed gas to power plants in the Coega SEZ, as part of their overall 3000 MW gas to power project, which includes gas distribution infrastructure for supply of piped natural gas to the site.
2. Phase 1 of the development proposal (entailing storage and regasification of LNG at a FSRU) is not reliant on the proposed Marine Pipeline Servitude and will be able to operate in the absence of the MPS. Phase 2 (onshore LNG storage and regasification) will however be reliant on the MPS as the use of seawater is proposed to be used as heating water for the regasification process.

3. The potential key environmental impacts associated with the proposed project considered in the S&EIR process include atmospheric emissions (both of pollutants and greenhouse gases, contributing to climate change), vulnerability of the project to climate change, noise generated by the FSRU, LNGC, and LNG and Gas Hub, traffic flow and safety, safety risks to the surrounding area, altered stormwater quality and flow patterns, disturbance of protected fauna in the surrounding area, including the nearby Damara Tern colony, impacts on the marine environment in the port, and socio-economic benefits, including job creation and provision of electricity to the national grid.
4. Assuming that the recommended mitigation measures will be effectively implemented, most of the adverse impacts predicted to result from the project will not be unacceptably significant, while socio-economic benefits are also fairly modest.
5. The notable exception to this is climate change impacts, resulting from greenhouse gas emissions from operation of the gas infrastructure (as well as upstream and downstream sources), which is predicted to result in a very high negative impact. The impact will remain very high and is unavoidable for a project of this nature.
6. Another concern is potential noise and disturbance impacts on the Damara Tern colony, which are not sufficiently understood.
7. Potential benefits of the use of natural gas for power generation (which could contribute towards offsetting greenhouse gas emissions generated) include the greater flexibility of this type of power plant relative to coal, allowing for increased uptake of renewable energy to the grid, and over time a shift in the South African power generation mix to greater reliance on renewables, with the associated advantages in terms of reduced greenhouse gas emissions.
8. The No-Go alternative entails no development of the site, meaning that the positive and negative impacts associated with the development would not be realised.
9. While recognising that some negative impacts (notably greenhouse gas emissions) cannot be effectively mitigated, a number of mitigation and monitoring measures have been identified to avoid, minimise and manage direct potential environmental impacts associated with the project. These are laid out in the EMPr (Appendix L).
10. Cumulative impacts may result from the other proposed similar projects in the area, which were included in the assessment. At this stage it is not known which of these projects will be developed and when, so for the purposes of the cumulative impact assessment it is assumed that all will be developed.

7.5 Analysis of Need and Desirability of the Project

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

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

the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage" (DEA, 2017a).

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

The consideration of need and desirability in EIA decision-making therefore requires the consideration of the strategic context of the project along with broader societal needs and the public interest (DEA, 2017a). However, it is important to note that projects which deviate from strategic plans are not necessarily undesirable. The DEA notes that more important are the social, economic and ecological impacts of the deviation, and "the burden of proof falls on the applicant (and the EAP) to show why the impacts…might be justifiable" (DEA, 2010).

The *social* component of need and desirability can be assessed using *regional* planning documents such as SDFs, IDPs and Environmental Management Frameworks (EMFs) to assess the project's social compatibility with plans. These documents incorporate specific social objectives and emphasise the need to promote the social well-being, health, safety and security of communities, especially underprivileged and/or vulnerable communities.

The project is located within an area set aside for industrial development, and is in keeping with surrounding developments in the area. The project will result in both direct and indirect employment opportunities and will provide much needed power to the national electricity grid, while also potentially allowing for increased power supply from renewable energy sources over the longer term, thereby mitigating intermittency of supply to facilitate a more assured, dispatchable power supply.

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

- Promote economic growth;
- Ensure environmental integrity and reconcile ecosystem requirements with conflicting land development pressures;
- Promote tourism through the protection and rehabilitation of the environment;
- Integrate bio-diversity conservation and mining through rehabilitation;
- Use environmental resources sustainably;
- Promote development in transformed areas and in areas with proven economic potential;
- Retain existing jobs;
- Reserve mineral deposits for future use;
- Attract new investments; and
- Promote social well-being of the community and share economic benefits.

The social and economic benefits of the proposed project would need to be weighed up against the negative impacts particularly in terms of greenhouse gas generation and the contribution thereof to climate change and progress in terms of meeting national and provincial targets in that regard. While emissions are significantly lower than those from coal fired power generation, the greenhouse gas emissions from the proposed project, is not insubstantial. While the inclusion of renewable energy

sources in the South African energy grid has increased over the last decade, the limitations of renewable energy in terms of storage and intermittent dispatchabilty of energy supply are recognised challenges. It is hoped that the inclusion of natural gas in the local energy supply mix, and the relative flexibility it offers in terms of power generation, will increase opportunities for additional renewable energy uptake by eliminating intermittency in power supply (acting on a peaking or mid merit power supply basis as opposed to base load).

NEMA and the EIA Regulations, 2014 call for a hierarchical approach to the selection of development options, as well as impact management which includes the investigation of alternatives to avoid, reduce (mitigate and manage) and/or remediate (rehabilitate and restore) negative (ecological) impacts (DEA, 2017).

In summary:

- Social, economic biophysical and ecological factors are considered and assessed during the EIA process, to ensure that the development is sustainable. Mitigation measures are recommended in the EIA Report to prevent, minimise (and optimise) impacts and to secure stakeholders' environmental rights. An EMPr has been drafted and will be implemented to ensure that potential environmental pollution and degradation can be minimised, if not prevented (see Appendix L).
- The Project will generate impacts, both negative and positive (see Section 6) and these should be considered in evaluating the desirability of the project. Section 6 demonstrates that the majority of, if not all, impacts can be managed to acceptable levels. The acceptability of the very high negative impacts on climate change could only be considered to be acceptable if seen in the broader context of diversification of the South African energy mix and enabling an increased contribution of renewable energy to the national energy mix, along with a decreased reliance on coal fired power. In the absence of further data, potential noise/ disturbance impacts on the Damara Tern colony are a concern.

7.6 Recommendations

The specific recommended mitigation and optimisation measures are presented in Chapter 6 and the EMPr (Appendix L) and key measures are summarised in Table 7-1 and Table 7-2 above. The CDC would need to implement these mitigation measures to demonstrate compliance with the various authorisations (should they be granted).

Although it is in theory possible that the potential impacts (or unintended consequences) of implementing mitigation and optimisation measures could offset their intended effect, the majority of the recommendations made in this EIA Report can be implemented without resulting in any physical effects. The potential for such unintended consequences in the case of the project is therefore considered low.

Key recommendations, which are considered essential, are:

1. Implementation of the EMPr to guide construction and operations activities and to provide a framework for the ongoing assessment of environmental performance;
2. Implementation of the CDC Standard Environmental and Standard Vegetation Specifications for Construction (CDC, 2005), and any other relevant CDC guidelines / specifications for design (architecture), construction, and revegetation;
3. Ensure the relevant permits (e.g. for search and rescue of protected vegetation, damage to protected trees, Provisional Atmospheric Emissions Licence) are in place prior to commencement of construction;

4. Demarcate all identified no-go areas, including stipulated buffers, to prevent access / disturbance during both construction and operation;
5. The implementation of a chance finds procedure as outlined in the EMPr, specifying the actions to be taken in the event of discovery of any heritage materials during vegetation clearing and construction;
6. Design and implementation of a site specific stormwater management plan that aligns with the CDC's Stormwater Master Plan for the SEZ;
7. Any water required for construction related activities should be sourced from non-potable sources (e.g. return effluent) where possible;
8. A revegetation plan must be compiled by a suitably qualified specialist and implemented to stabilise and rehabilitate dune vegetation that is disturbed during construction;
9. An alien invasive plant management plan must be compiled and implemented in all areas disturbed during construction;
10. A waste management plan should be in place and should address classification of waste streams, segregation at source, control of waste on site before disposal, removal of wastes from site, and record keeping;
11. Traffic management measures during construction:
    a. Provide suitable traffic accommodation measures as part of construction contract to inform other road users of presence of construction related traffic;
    b. Traffic accommodation measures to be provided in terms of Chapter 13 of the South African Road Traffic Signs Manual;
    c. Measures to be provided subject to approval by the Engineer;
    d. Ensure construction traffic is confined to site area where possible.
    e. Ensure that vehicle loads are within legislated limits, i.e. maximum Gross vehicle mass of 56 000kg;
    f. Source relevant permits from the Eastern Cape Department of Transport should abnormal loads be required for transport of components;
    g. Increased law enforcement protocols along access roads;
    h. Suitable warning traffic signage be provided to ensure safe operation along Ring Road.
12. Noise mitigation measures before and during construction and operation:
    a. All construction operations should only occur during daylight hours if possible;
    b. Construction related piling should only occur during the day to take advantage of unstable atmospheric conditions (which lessen the effects of project related noise).
    c. Construction staff should receive "noise sensitivity" training such as switching off vehicles when not in use, location of NSA's etc.
    d. An ambient noise survey should be conducted at the noise sensitive receptors during the construction phase;
    e. The noise impact from the proposed Gas Infrastructure should be measured during the operational phase, to ensure that the impact is within the required legal limit.

13. Measures to minimise impacts on the Damara Tern population due to disturbance

    a. CDC to establish a Damara Tern Management Program within the CDC OSMP mechanisms, which incorporates:

        - specialist monitoring of the Damara tern population to determine the extent of their habitat, by an expert with previous experience monitoring this species,
        - an annual report on the status of the SEZ Damara tern population, and approval of the annual report / management plan by the EMC.
        - Continued monitoring of the Damara Tern population must be implemented

    b. Maintain a No-Go buffer area to ensure no access or activities within 200 m of Damara Tern habitat as indicated on the environmental sensitivity map (Figure 4-6);

    c. No-Go buffer areas around the tern breeding area must be demarcated and pedestrian and other access must be prevented both during operation, particularly during the Damara Tern breeding season (early October to late February); and

    d. Environmental awareness / toolbox talks to include awareness of the Damara tern population;

    e. No fires are permitted within the project area.

    f. Measures must be taken to minimise noise from machinery etc.

    g. Drivers of vehicles authorised to drive on the beach must be made aware of the presence of Damara Terns during the breeding season (October to March) and must keep below the high-water mark; and

    h. Management actions such as litter picking must be carefully planned to minimise disturbance to breeding pairs.

14. Climate Change mitigation measures before and during operation:

    a. Source LNG from nearby suppliers such as northern Mozambique, to reduce upstream transport emissions;

    b. Source LNG from responsible suppliers, reducing emissions associated with extraction and upstream processing of the LNG.

    c. Use good quality equipment to reduce the amount of natural gas that escapes as fugitive emissions and reducing the need for flaring

15. Measures to mitigate climate change risk and vulnerability of the project to climate change:

    a. Consider climate change impacts in the engineering design of the gas infrastructure.

    b. Design of an on-site stormwater drainage system, and implementation of a stormwater management plan.

    c. The plant equipment and infrastructure must be weather-proofed, specifically in light of the anticipated increase in extreme weather occurrences (severe winds, extreme heat, heavy rains, and flooding impacts). The corrosive nature of maritime climate on infrastructure and equipment must be taken into account in design and maintenance.

    d. Increase the capacity of the fuel storage tank holding bunds to accommodate excessive rain and include drainage methods to avoid fuel storage tank damage or spillage.

    e. Improve storm water drainage capacity to minimise flood occurrences onsite and the associated contamination occurrences.

    f. Use a closed-loop water system for the gas infrastructure to minimise water losses to evaporation, and reduce water consumption.

g. Implement disaster management policies and onsite employee training specifically for extreme weather event (including severe winds, extreme heat, and heavy rain and drought) risk management protocols.

16. Installation of instrumentation, including detection and emergency shut down, to mitigate safety risks from catastrophic events during operation. Additional recommendations are made by the QRA specialist, most of which are legal requirements / industry standards and therefore are considered to be essential..

17. Measures to minimise impacts on the marine environment during construction and operation of the port infrastructure, FSRU and LNGC:

    a. All dredging activities and associated environmental monitoring must be conducted in accordance with the conditions stipulated under the port expansion authorisation.

    b. All contractors must have an approved Environmental Management Plan (EMP) in place that ensures that environmental impacts are minimised as far as practicably possible.

    c. Restrict construction noise and vibration-generating activities to the absolute minimum required.

    d. Ensure that all pile driving is undertaken in accordance with international protocols (e.g. JNCC 2010; DPTI 2012).

    e. Consider the use of a bubble curtain to minimise noise impacts from pile driving being transmitted through the sediment into the water.

    f. Implement a waste management system that addresses all wastes generated at the various sites, shore-based and marine.

    g. Implement leak detection and repair programmes for valves, flanges, fittings, seals, etc.

    h. Use a low-toxicity biodegradable detergent for the cleaning of all deck spillages.

    i. Ensure that vessel speed is kept below 10 knots when underway in Algoa Bay.

    j. The vessel operators must keep a constant watch for slow-swimming large pelagic fish, marine mammals and turtles in the path of the vessel.

    k. Ensure that all project-associated vessels have an oil spill contingency plan in place.

    l. As far as possible, attempt to control and contain any diesel spill at sea with suitable recovery techniques to reduce the spatial and temporal impact of the spill.

    m. Ensure adequate resources are provided to collect and transport oiled birds to a cleaning station.

    n. Refuelling is to take place only under controlled conditions within the port.

    o. Design intakes to minimise entrainment or impingement by reducing the average intake velocity to about 0.1 to 0.15 m/s.

    p. Optimise operating modes in the open-loop system as far as possible to reduce impacts, or use closed-loop systems whenever practicable.

    q. Use multi-port discharges and adjust discharge rate to facilitate enhanced mixing with the receiving water body.

    r. Ports should discharge horizontally or within -45° of horizontal to maximise dilution and avoid erosion of the sediments where the jet hits the seabed.

    s. The LNGCs must have a Ballast Water Management Plan in place.

t. Ballast water exchange must be done 200 nautical miles from the nearest land in waters of at least 200 m deep (the minimum being 50 nautical miles from the nearest land).

u. Ensure that routine cleaning of ballast tanks to remove sediments is carried out, where practicable, in mid-ocean or under controlled arrangements in port or dry dock, in accordance with the provisions of the ship's Ballast Water Management Plan.

v. Use filtration procedures during loading of ballast to avoid the uptake of potentially harmful aquatic organisms, pathogens and sediment that may contain such organisms.

w. Neutralise NaOCl with SMBS prior to discharge to ensure that the most conservative international guideline value (<2 µg/ℓ) for residual chlorine at the point of discharge is met.

x. Blend the brine from the onboard desalination plant with the cooling/heating water prior to release.

y. Reduce lighting in non-essential areas.

z. Use guards to direct lights to areas requiring lighting

aa. Avoid direct light in water, except during safety inspections

bb. Use low light mounting where possible

cc. Prepare an emergency response plan covering recommended measures to prevent and respond to LNG spills.

dd. The hypochlorite generation unit on the offloading platform must be suitably bunded to prevent and spills from the plant entering the marine environment.

Monitoring Recommendations highlighted in the Marine assessment are as follows:

a. During pile-driving operations monitoring by Marine Mammal Observers (MMO) and Passive Acoustic Monitoring (PAM) operatives to detect marine mammals must be undertaken;

b. Engage an acoustic consultant to undertake a site-specific underwater noise assessment.

c. Undertake an entrainment study to more accurately determine the potential impacts of impingement and entrainment on communities within the Port of Ngqura.

d. Implement an invasive species monitoring programme both in the harbour and on the St Croix Island Group.

7.7 Conclusion and Authorisation Opinion

This Draft EIA Report has identified and assessed the potential biophysical and socio-economic impacts associated with the proposed Gas infrastructure. which entails developing key supporting gas infrastructure required for the operation of the various proposed gas to power plants in the Coega SEZ.

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

The project will result in unavoidable adverse environmental impacts, some of which cannot be effectively mitigated. Assuming that the recommended mitigation measures will be effectively implemented, most of the adverse impacts predicted to result from the project will not have be unacceptably significant. The notable exception to this is climate change impacts, resulting from greenhouse gas emissions from operation of the power plant (as well as upstream and downstream

sources), which is predicted to result in a very high negative impact. While downstream emission levels will differ depending on the power generation technology used, the impact will remain very high and this impact is unavoidable for a project of this nature.

Potential benefits of the use of natural gas for power generation (which could contribute towards offsetting greenhouse gas emissions generated) include the greater flexibility of this type of power plant relative to coal, allowing for increased uptake of renewable energy to the grid, and over time a shift in the South African power generation mix to greater reliance on renewables, with the associated advantages in terms of reduced greenhouse gas emissions. In addition, the project will be of ongoing regional socio-economic benefit of the Coega SEZ and the Nelson Mandela Bay Metro Municipality, as well as nationally in terms of security of energy supply.

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

The fundamental decision is whether to allow the development and the operation of the Gas Infrastructure, which is consistent with development policies for the area, but which may have significant climate change impacts in terms of greenhouse gas emissions, and possibly contribute to the localised extinction of the Damara tern colony, should the level of disturbance be found to be incompatible with their continued occupation.

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

If approved, it is SRK's opinion that the authorisation should be valid for a period of 10 years.

7.8 Way Forward

This Draft EIR is now available for public comment and SRK invites stakeholders to review the report and to participate in the public consultation process. An Executive Summary of this report has been distributed to registered stakeholders and is available from SRK on request (details below).

Copies of this report can also be accessed as an electronic copy on SRK's website https://docs.srk.co.za/en/za-cdc-coega-3000-mw-gas-power-project-eias

Stakeholders are invited to submit comments on the Draft EIA Report and/or send relevant contact details so that SRK can register them on the project database (if you are not registered already). Comments and/or requests to be registered on the project database can be submitted to:

Lyndle Naidoo

Email: lnaidoo@srk.co.za

Tel: + 27 41 509 4800

Fax: +27 41 509 4850

PO Box 21842, Port Elizabeth, South Africa, 6000

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

Comments must be submitted by **18 April 2021** to be incorporated into the Final EIR.

Once stakeholders have commented on the information presented in the EIA Report, the Final EIA Report will be prepared and submitted to DEFF for approval. . A copy of the report will also be uploaded to SRK's website and IAPs will be notified via email of submission of the FEIR Once a decision is taken by authorities, this decision will be communicated to registered IAPs.

Prepared by

SRK Consulting - Certified Electronic Signature
srk consulting
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Abby van Nierop

Environmental Consultant

Prepared by

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srk consulting
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Nicola Rump

Principal Environmental Consultant

Reviewed by

SRK Consulting - Certified Electronic Signature
srk consulting
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Chris Dalgliesh

SRK Partner

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

8 References

Adriatic LNG. (n.d.). How open rack vaporizer work.

Almond, J. E. (April 2010). *Kalagadi Manganese Smelter, Zone 5, Coega IDZ, Nelson Mandela Bay Municipality, Eastern Cape Province: Desktop Palaeontological Assessment.* Nature Viva cc.

Barnes, K. (. (2000). *The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland.*

Binneman, J. (May 2010). *A Phase 1 Archaeological Heritage Impact Assessment of Zone 5 in the Coega Industrial Development Zone for the proposed construction of a Manganese Smelter, near Port Elizabeth, Nelson Mandela Bay Municipality, Eastern Cape Province.* Eastern Cape Heritage Consultants.

Birdlife International. (2020). Retrieved November 17, 2020, from Birdlife International IUCN Red List for birds: http://www.birdlife.org

Branch, W. (1988). Terrestrial reptiles and amphibians. In R. Lubke, F. Gess, & M. Bruton (Eds.), *A Field Guide to the Eastern Cape Coast* (pp. 251-264). Grahamstown Centre for the Wildlife Society of Sothern Africa.

Branch, W.R. (1988a). Terrestrial reptiles and amphibians. . In: A Field Guide to the Eastern Cape Coast, R. A. Lubke, F. W. Gess and M. N. Bruton (eds.), Grahamstown Centre for the Wildlife Soc. S. Afr., 251-264.

Branch, W.R. (1998). Field Guide to the Snakes and other Reptiles of Southern Africa. Rev. ed. Struiks Publ., Cape Town, 399 pp, num. maps, 112 col. plsBranch, W.R. (1999). Save our Species. Threatened small adders. Africa Environment andWildlife 7(4): 36-37.

C&M Consulting Engineers. (2012). *Coega annual ambient air quality report: January 2011 - December 2011.*

Carnegie Energie. (2019). *Memo: Technical Inputs to Coega Gas to Power EIA Scoping Report.*

CDC. (20 July 2015). The Case for Coega's Gas Readiness - Fast Facts.

CDC. (23 September 2015). Coega Readiness: Location for Gas-to- Power Plant.

CDC. (23 September 2015). Overview of 2009 Feasibility Study.

CES. (1997). *Strategic Environmental Assessment of the Coega IDZ - Terrestrial Specialist Report.* Grahamstown: Coastal & Environmental Services.

CES. (2008). *Scoping Report: Proposed Kalagadi Manganese Smelter in the Coega IDZ.* Grahamstown: Coastal & Environmental Services.

Cooperman, A., Dieckmann, J., & Brodrick, J. (2012, January). Power Plant Water Use. *ASHRAE Journal*, 65-68.

CSIR. (1997). *Strategic Environmental Assessment for the Proposed Industrial Development Zone Harbour at Coega.* CSIR, Stellenbosh: CSIR Report No. ENV-S-C 97025.

DEFF. (2019). National Climate Change Adaptation Strategy. Pretoria: Department of Environment, Forestry and Fisheries (National).

DOE. (October 2016). *Information Memorandum for New Generation Capacity for the LNG-to-Power Independent Power Producer Procurement Programme.* Independent Power Producer Office: Department of Energy.

Dold, A. (2002). *A taxanomic revision of the genus Bergeranthus Schwantes (Mesembryanthemaceae) in South Africa.* Rhodes University: MSc Thesis.

DWS. (n.d.). *Reconcilliation Strategy for the Algoa Water Supply System*. Retrieved April 25, 2016, from Department of Water & Sanitation: https://www.dwa.gov.za/Projects/algoa/

Eisentrout, B. (2006). Study focuses on six LNG regasification systems. *LNG journal*, 21-22.

Enggcyclopedia. (2012, October 6). Retrieved 12 5, 2016, from Enggcyclopedia: http://www.enggcyclopedia.com/2012/10/procedures-pigging-operations/

Eskom. (2014, August 5). *Homeflex Tariff.* Retrieved December 5, 2016, from Eskom: http://www.eskom.co.za/CustomerCare/TariffsAndCharges/Documents/Eskom%20Booklet.pdf

Friedmann, Y., & Daly, B. (Eds.). (2004). *Red Data Book of the Mammals of South Africa: A Conservation Assessment. CBSG Southern Africa, Conservation Breeding Specialist Group (SSG/IUCN).* Endangered Wildlife Trust, South Africa.

GIIGNL. (2012-2015). Summary Report by the GIIGNL Technical Study Group on the Behaviour of LNG in Storage. *Rollover in LNG 2nd Ed.*

Grange, E. l. (2013, August 9). *Engineering news*. Retrieved December 5, 2016, from Engineering news: http://www.engineeringnews.co.za/article/the-case-for-mid-merit-power-generation-2013-08-09

Keltic Petrochemicals Inc. . (2007). *Liquid Natural Gas Facilities and Marginal Wharf: Comprehensive Study Report - Final Report.*

Lloyd's Register. (2016). *Floating Storage and Regasification Units: A report on the commercial and technical aspects of the construction and conversion of floating units for storage and/or regasification.*

Mechanical Booster. (2013). Retrieved December 5, 2016, from Mechanical Booster: http://www.mechanicalbooster.com/2016/06/closed-cycle-gas-turbine.html

Mott Macdonald. (2016). *IPP LNG-to-Power Project.*

MSLGROUP. (n.d.). *LNG for shipping*. Retrieved 12 5, 2016, from LNG for shipping: https://lngforshipping.eu/lng-for/bunkering

Mucina, L., & Rutherford, M. (2006). *The vegetation of South Africa, Lesotho and Swaziland.* Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Patel, D. (2013). *LNG VAPORIZER SELECTION BASED ON SITE AMBIENT CONDITIONS.*

PRDW. (10 June 2016). *SA Gas to Power Medium-term Programme: Ngqura: Dredging Assessment.* Prestedge Retief Dresner Wijnberg (Pty) Ltd.

PRDW. (2016). *SA Gas to Power Medium-term Programme: Ngqura Pre-feasibility Study (FEL2).* Prestedge Retief Dresner Wijnberg (Pty) Ltd.

Quirijns, S. (2015). *A literature study into the world of LNG.*

Saussus, P. (2012, January 10). *Power Magazine*. Retrieved January 13, 2016, from http://www.powermag.com/major-noise-sources-and-mitigation-cost-estimates-for-gas-fired-power-facilities/

STEP. (2004). *The STEP Mapbook. Subtropical Thicket Ecosystem Planning Project: Sundays River Mapbook.* Port Elizabeth: Nelson Mandela Metroplitan Municipality Spatial Development Framework.

Taylor et al. (2015). The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.

Transnet SOC Ltd. (2015). *Natural Gas Infrastructure and Planning.*

Vlok, J., & Euston-Brown, D. (2002). *The patterns within, and the ecological processes that sustain, the Subtropical Thicket Vegetation in the planning domain for the Subtropical Thicket Ecosystem Planning (STEP) Project.* Terrestrial Ecology Research Unit, University of Port Elizabeth. Report No. 40.

Weatherspark. (2012). Retrieved November 2, 2012, from Average Weather for Port Elizabeth, South Africa: http://weatherspark.com/averages/29027/Port-Elizabeth-Eastern-Cape-South-Africa

Worley Parsons. (2009). CCGT Prefeasibility Study.

WSP. (2020). *Techno-Economic Assessment Report Cooling Concept for 3x1000MW Gas Fired Power Plant.* Coega Development Coorporation.

Zaretskaya, V. (2015, April 27). *Floating LNG regasification is used to meet rising natural gas demand in smaller markets.* Retrieved December 5, 2016, from U.S. Energy Information Administration (EIA) : http://www.eia.gov/todayinenergy/detail.php?id=20972

Appendices

Appendix A: CV's of Key Professionals

Appendix B: EIA Application Form

To be provided with Final EIR

Appendix C: On-site and E - Notices

Appendix D: Newspaper Notice

Appendix E: Background Information Document

Appendix F: Public Participation

Appendix F1: Presentation to ELC Meeting on 20 August 2020

Appendix F2: Presentation to ELC Meeting on 19 November 2020

Appendix F3: Presentation to ELC Meeting on 18 February 2021

Appendix G 1: Proof of IAP Notification of BID

Appendix G 2: Proof of IAP Notification of DSR

Appendix G 3: Proof of IAP Notification of FSR

Appendix G 4: IAP Correspondence on BID

Appendix G 5: IAP Correspondence on DSR

Appendix G 6: IAP Correspondence on FSR

Appendix G 7: DEFF Letter of Approval of the FSR and Plan of Study for the EIA

Appendix H: Comments & Responses Report

Appendix I: Layout drawings

Appendix J: Site Photographs

Appendix K: Specialist Reports

Appendix K1: Air Quality Impact Assessment Report and Addendum

Appendix K2: Quantitative Risk Assessment Report

Appendix K3: Climate Change Impact Assessment Report

Appendix K4: Noise Impact Assessment Report

Appendix K5: Traffic Impact Assessment Report

Appendix K6: Marine Impact Assessment Report

Appendix L: Draft Environmental Management Programme

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