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Environmental Screening Study for a proposed LNG terminal at Saldanha and associated pipeline infrastructures to Atlantis and Cape Town, Western Cape, South Africa.

Prepared for:
Western Cape Government
Department of Economic Development and Tourism

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SUMMARY

The Western Cape Government is committed to advancing the Green economy. Within this context, the Green Economy Strategic Framework (adopted by the Western Cape Cabinet in March 2013) highlights the importation of natural gas and the provision of associated infrastructures as a key element of this economic development strategy.

The Western Cape Government's Department of Economic Development and Tourism, through the Chief Directorate: Trade and Sector Development, commissioned a pre-feasibility study for the importation of natural gas to the Western Cape with specific focus on the Saldanha Bay – Cape Town corridor (Visagie, 2013). The pre-feasibility study concluded that a project to import LNG to the region was potentially viable and merited further investigation. Consequently, the CSIR was commissioned to undertake an environmental screening study for constructing a proposed 2 MMTPA LNG importation facility and associated gas pipeline infrastructure to the Cape Town, Saldanha, Stellenbosch, Paarl and Wellington regions. This throughput may increase to 4 MMTPA if additional customers and/or suppliers join the project.

LNG will be transported by sea in LNG carriers and will either be pumped via cryogenic pipeline as a liquefied gas to a permanent land-based storage facility at Saldanha or to a semi-submersible LNG receiving terminal (also called FSRU vessel) within the Port of Saldanha or offshore at two locations along the West Coast (southern section of St Helena Bay and between Dassen and Robben islands).

The liquefied gas will be re-gasified on demand and will be distributed to identified markets in the Western Cape - namely Cape Town, Stellenbosch, Paarl, Wellington and Saldanha - via a transmission[1] and distribution[2] gas pipeline network. The general philosophy is that the pipeline will be buried with a cover of at least 1m to the top of the pipe, and up to 1.5 m cover when crossing ploughed areas and vineyards, and will follow existing servitudes as far as possible. In the case where LNG is discharged to an on-land storage facility, the cryogenic pipeline from the vessel to the land-based facility cannot be buried and would run above ground on trestles over the coastal dune belt.

An important aim of undertaking feasibility studies for a proposed project is to establish whether or not there are any aspects of the development that are either technically flawed or have the potential to give rise to unacceptable environmental consequences (ecological, social, economic, etc.). In the context of this study, these are defined as potential 'fatal flaws'.

During this screening process, various factors (e.g. habitat sensitivity, land use, etc.) have been used to characterise the constraints and key issues associated with the proposed pipeline and where required, alternatives to the proposed routing were assessed. The environmental sensitivity of the LNG terminal

[1] High pressure (100 – 120 bar), large bore, cross country pipelines
[2] 2–15 bar pipelines supplying the clients with branches off to client at a pressure of 1-2 bars

location and the various affected sections of the proposed pipeline were assessed on a nominal scale of low, medium, high, very high and fatal flaw, using the various factors identified in Chapter 3. It is important to note that this study addresses issues and planning at a sub-regional level and it is therefore fairly high-level. More specific and detailed studies will be undertaken during the route refinement stage, together with the preliminary engineering design and EIA process that would be undertaken if the project would proceed.

The coast between Table Bay and Baboon Point is characterised by an open coastline exposed to a generally high energy wave regime and includes long stretches of sandy beach interspersed with rocky shores. The surface sedimentary geology of the low-lying areas around Saldanha consists mainly of calcretised and unconsolidated coastal and marine deposits; these are underlain by granite bedrock.

The study area has no unique biotic attributes that would distinguish them from the broader West Coast biogeographic province dominated by the high energy southwesterly swell regime. In contrast the more sheltered conditions within Saldanha Bay support species and communities that prefer calmer conditions. The shallow Langebaan Lagoon at the southern end of Saldanha Bay is a much warmer environment and its biota has many similarities to that of the South Coast Warm-temperate region. The whole of Langebaan Lagoon and the islands of Saldanha Bay lie within the West Coast National Park and this area is also designated as a wetland of international importance in terms of the Ramsar Convention.

Saldanha Bay and the islands in its environs provide roosting, feeding and breeding habitat for some 53 species of seabirds, eleven of which breed on the islands. Of particular importance for the proposed project are the endangered African Penguin, Cape Gannet and cormorants.

Twenty species of whales and dolphins have been recorded along the Cape West Coast of which five species have been observed within Saldanha Bay

The vegetation along the proposed transmission pipeline route (from a possible position along the western coast at St. Helena Bay to Saldanha bay to Cape Town via Atlantis and eventually to Paarl/Wellington and Stellenbosch) consists primarily of vegetation belonging to the Fynbos Biome. Azonal Vegetation types also form part of the vegetation of the study area.

The proposed gas transmission pipeline predominantly traverses natural and cultivated land, with the latter land use being the major cause of the loss of threatened vegetation types. It will also traverse built up areas in the vicinity of the targeted towns.

The proposed pipeline route crosses several rivers as well as a number of natural and artificial wetlands. River crossings are unavoidable when considering a linear development such as a gas pipeline. The majority of the river crossings for this project are classified as Critically Endangered, highlighting how extensively these river systems have been transformed, with very little of their length in a near natural state.

Palaeontological resources are scattered throughout the study area but the vicinity of Saldanha Bay (e.g. the Spreeuwal fossil site) and the Atlantis-Melkbosstrand area are the most sensitive. Archaeological resources are widely scattered can occur anywhere along the route, although the likelihood does vary depending on substrate and proximity to the coast, fresh water, food and stone resources. The coastal zone, particularly in the Melkbosstrand and Bloubergstrand areas, is the most sensitive. Significant Stone Age sites are generally unlikely to be encountered away from the coast, particularly along already disturbed servitudes. Historical archaeological sites are only likely to be encountered along the streets of the older built-up areas, like central Cape Town, Wellington, Paarl and Stellenbosch. Historical archaeological resources (e.g. Historical ruins) can be found anywhere in the study area but are generally located close to old houses or farm werfs.

Many ships have been lost in Saldanha Bay over the years. Further south, in the area of concern to the present study, the presence of shipwrecks remains unknown but possible.

The environmental sensitivity of the proposed LNG receiving terminal locations and the major risks for each section of the proposed route for the transmission and distribution gas pipeline to Atlantis, Cape Town, Stellenbosch, Paarl and Wellington were highlighted and alternatives proposed where appropriate. Recommended management actions are listed in Chapter 7 Conclusions and Recommendations.

LNG RECEIVING TERMINAL

The potential location(s) for the proposed land-based terminal have been informed by a series of constraints (i.e. biophysical, planning, safety, technical constraints) but also by the restrictions set on viable locations for the proposed jetty.

The sensitivity analysis of the Saldanha Bay area ranges from potentially no-go areas to medium sensitivity areas, with the majority of the environment being highly sensitive (Figure 1). The sensitivity analysis revealed that the only acceptable area for the location of the proposed land based LNG facility terminal is an area to the east of the iron ore jetty, extending from the coast towards the 4 km restriction zone inland (Figure 1, Section A) and an area at Salamander Point should negotiation with the Defence Force be successful (Figure 1, Section B).

Should there be the technically feasible option of building an LNG jetty to the south, and roughly parallel to the iron ore jetty, it may be necessary to route the cryogenic pipeline across the northern end of the Big Bay coastal buffer zone i.e. the feasibility of the entire LNG import operation depends on being able to do so (Figure 1, Section C). While any alteration of this buffer zone is not to be undertaken lightly the present planning status of the zone does not guarantee its long-term security and thus an offset agreement may provide a mutually acceptable option both in terms of conservation of the buffer zone and the viability of the LNG project. An option for consideration could be for the LNG developer to purchase the Big Bay coastal buffer zone and transfers it to the West Coast National Park in return for the ability to route the cryogenic pipeline across the portion closest to the TNPA property immediately south of the ore-berth.

Metocean studies have also been undertaken by the CSIR to evaluate the suitability of the various locations for the LNG receiving terminal. No major environmental constraints in relation to the proposed location of an FSRU offshore were identified at any of the proposed locations. Similarly, the study of the metocean conditions at these locations indicated that all are suitable for mooring FSRU vessels (CSIR a&b, 2014).

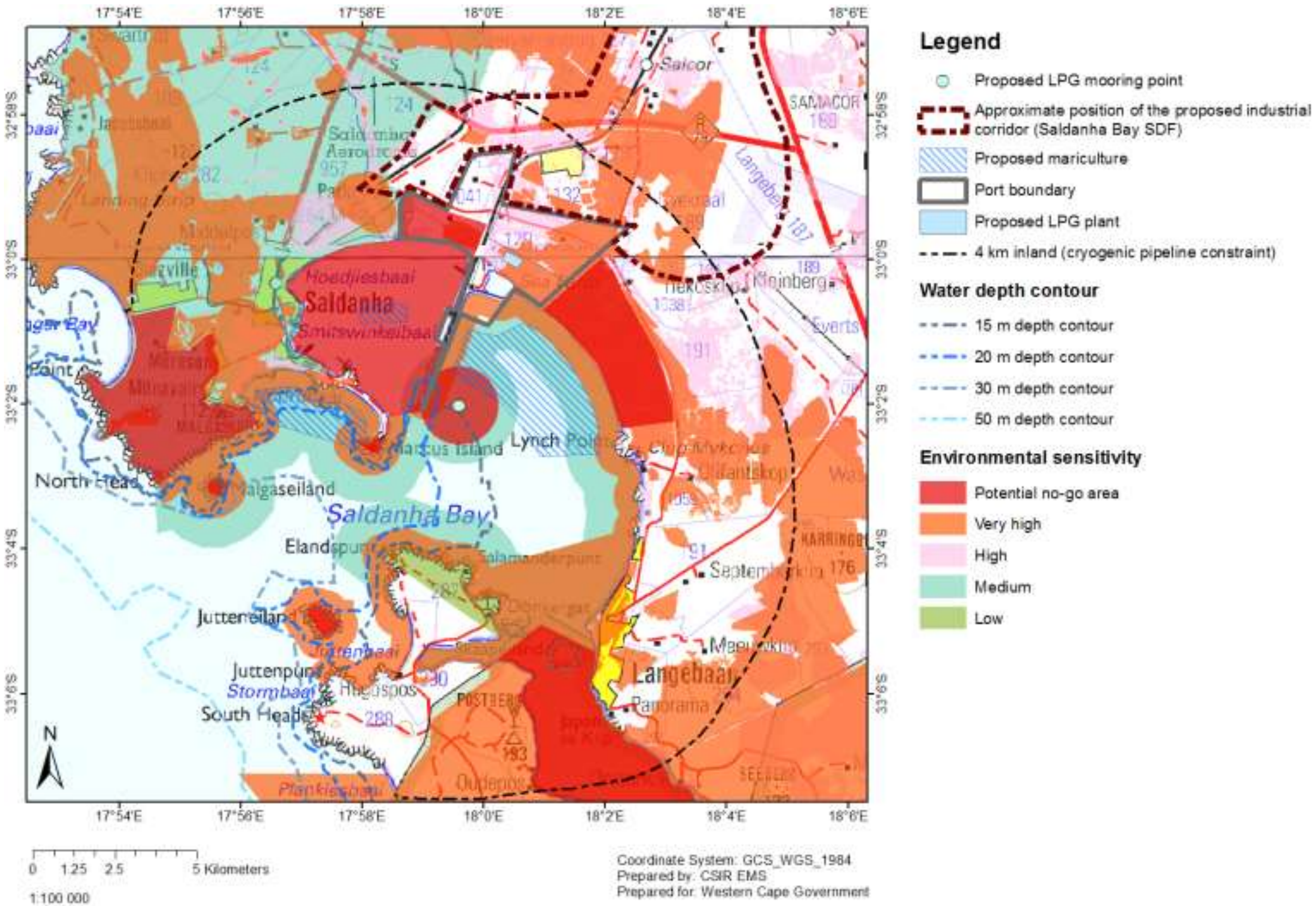

Figure 1 Environmental Sensitivity mapping for the location of a proposed LNG receiving terminal.

TRANSMISSION GAS PIPELINE

From a vegetation perspective, the proposed pipeline will have two major impacts: the inevitable change in the vegetation structure and composition after rehabilitation of areas where vegetation was removed during construction activities; and the exclusion of deeper-rooted flora may permanently alter the structure of the plant communities and their suitability as habitat for fauna.

The proposed pipeline route passes through a number of threatened vegetation types and terrestrial Critical Biodiversity Areas. Where the particular vegetation is considered threatened, especially in the Critically Endangered (CR) and Endangered (EN) classes, remnants in a natural or near-natural state should be avoided as far as possible. This also applies to CBAs as disturbances should be avoided wherever possible and the hindrances to the ability of plants and animals to disperse or move through these areas should be minimised. Each portion that is traversed will have to be justified and the cumulative impacts will be considered important in proposing possible alternative routes.

Sections of the route affecting agricultural land, i.e. crossing intensively irrigated lands and grazing land, could lead to broader socio-economic impacts on the smallholder farmers and mechanisms for compensating these farmers would have to be negotiated and agreed upon.

River crossings are unavoidable when considering a cross-country pipeline. Rivers rarely represent a constraint for the routing of a pipeline, unless these are associated with extensive wetlands or riverine forest belts. Several sensitive aquatic features identified as National Freshwater Ecosystems Priority Areas (FEPAs) - FEPA Rivers, FEPA Wetlands, Upstream Management Areas, FEPA Phase 2 Rivers and Fish Sanctuaries - may be affected by the proposed pipeline.

Generally, with the correct design and construction of the crossing of aquatic features (where these cannot be avoided) and appropriate restoration measures, the resultant potential impacts are anticipated to be acceptable.

Gas transmission pipeline from Saldanha to Cape Town via Atlantis

The environmental sensitivity along and in the vicinity of the proposed transmission pipeline between Saldanha Bay and Cape Town ranges from medium to potentially no-go areas, with the overall environmental sensitivity of the area anticipated to be *high* to *very high* (Figure 2).

The main concern along the proposed transmission line is the CBAs identified by the City of Cape Town BioNet. The CCT BioNet irreplaceable areas are distributed from the north of Atlantis to Cape Town. Due to their irreplaceable nature, these areas are regarded as ***potential no go*** areas and alternative routes have been proposed.

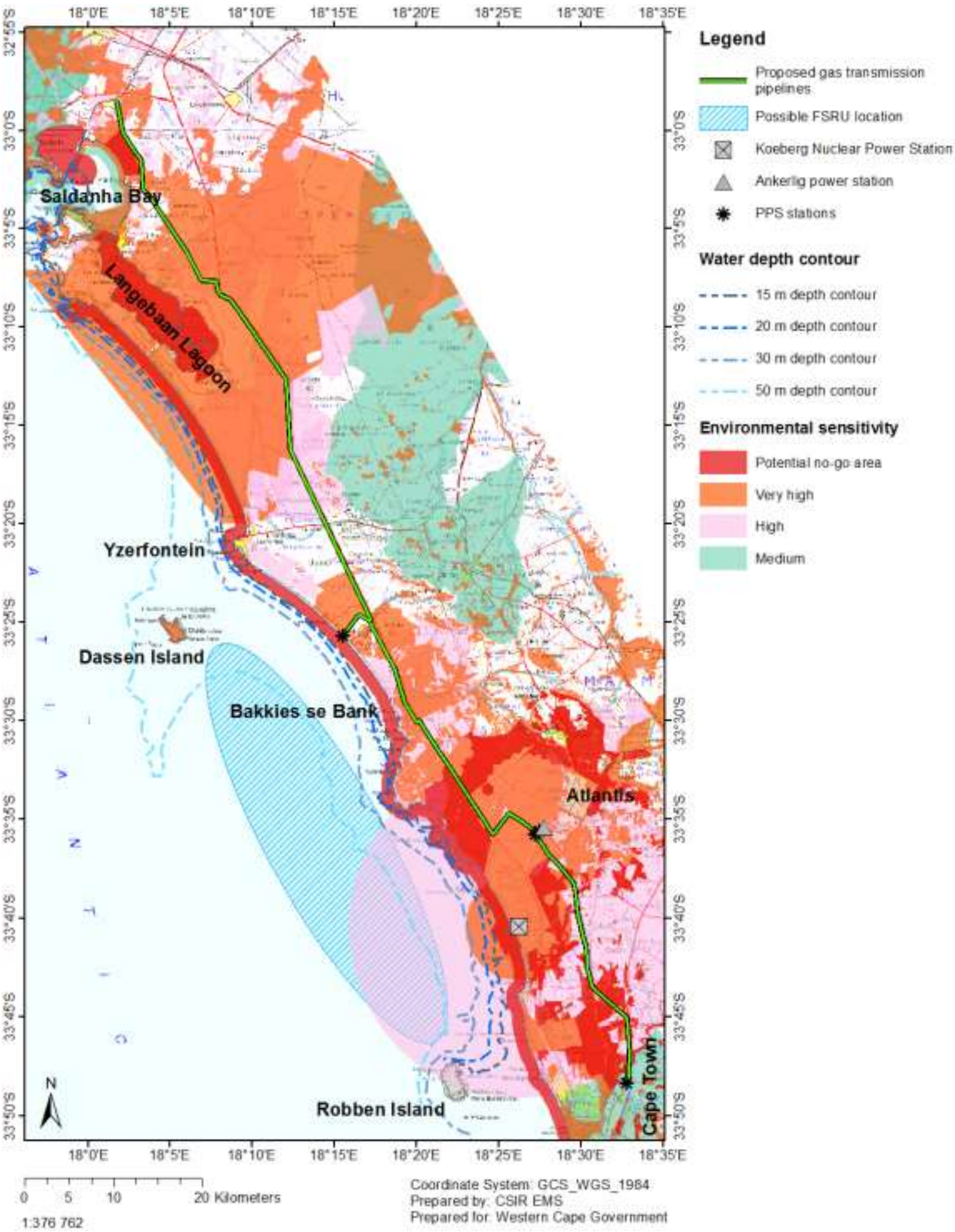

Figure 2 Sensitivity analysis of the proposed transmission pipeline between Saldanha Bay and Cape Town

Transmission pipeline route to Paarl/Wellington and Stellenbosch

The gas transmission pipeline between Cape Town and Paarl/Wellington will predominantly follow the N1 and between Cape Town and Stellenbosch the route will follow the Polkadraai/Adam Tas Road (R310). The areas that may be affected by the proposed gas transmission pipelines to Stellenbosch, Paarl and Wellington, is anticipated to have an overall sensitivity rating of *medium* (Figure 3). The area has been extensively transformed to viticultural and horticultural land-uses.

The main areas of concern are the CBAs identified by the City of Cape Town BioNet as irreplaceable areas which are ***potential no-go areas***. These areas mainly coincide with small, fragmented remaining patches of Swartland Renosterveld.

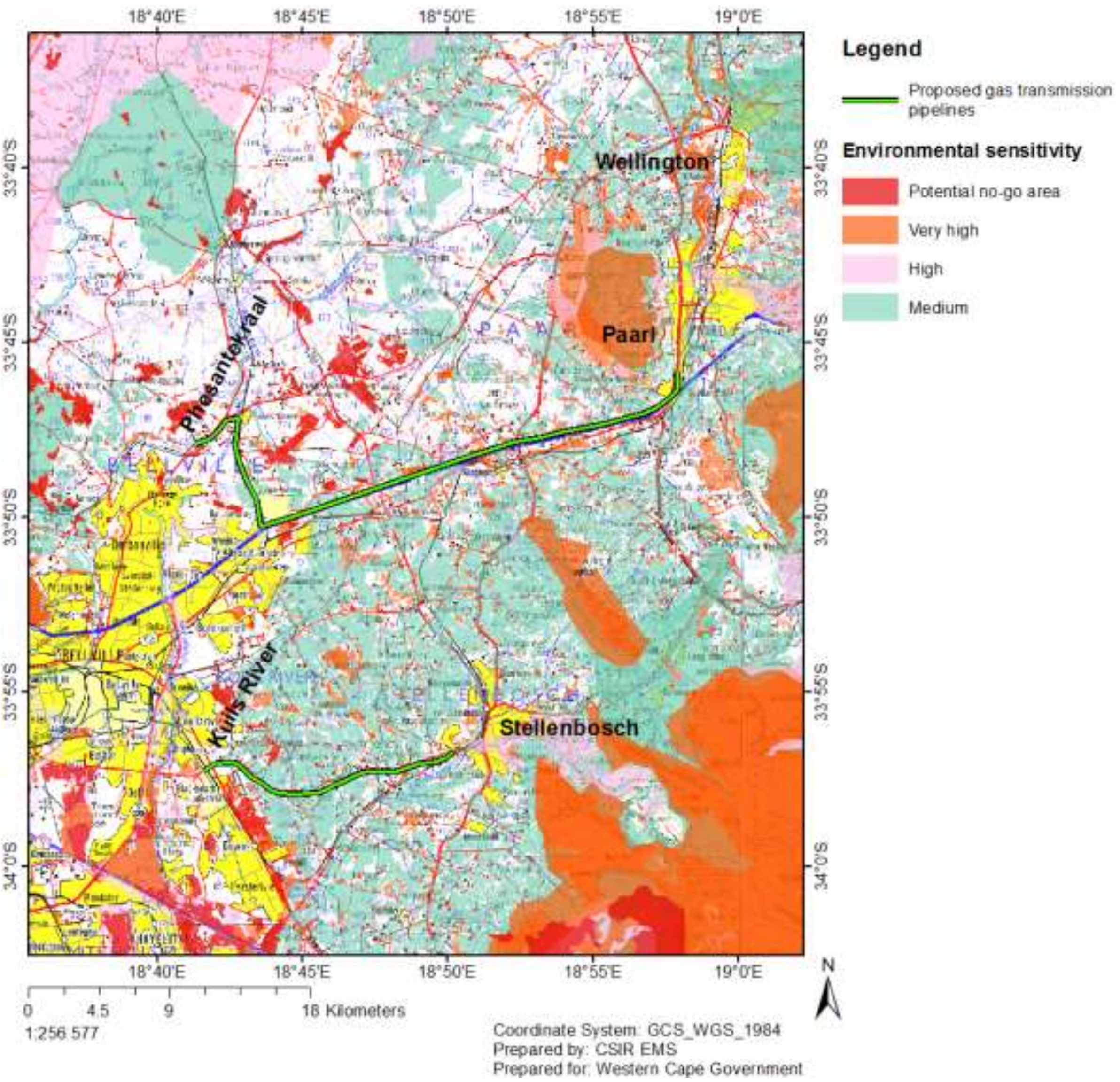

Figure 3 Sensitivity analysis of the proposed transmission pipeline between Saldanha Bay and Cape Town

DOMESTIC DISTRIBUTION PIPELINES

The distribution pipeline(s) in these areas are smaller and lower pressure gas lines. It is anticipated that the gas distribution pipelines supplying Atlantis, Melkbosstrand, Cape Town, Paarl, Wellington, Stellenbosch and Somerset West will not significantly adversely affect sensitive environments, as the pipelines are predominantly proposed to be constructed within urban built-up areas (Figure 4). All distribution pipelines would require detailed analysis per area to determine acceptability for surrounding developments and establish more detailed risk and safety constraints.

The main areas of concern remain patches of irreplaceable CBA areas throughout Cape Town (City of Cape Town BioNet) which may be affected by the gas distribution pipelines, in particular the section of the pipeline from Atlantis to Melkbosstrand which crosses remnant of Critically Endangered Atlantis Sand Fynbos, also identified as a CBA and ESA (CCT Bionet). These are regarded as ***potential no-go areas*** and an alternative route has been proposed.

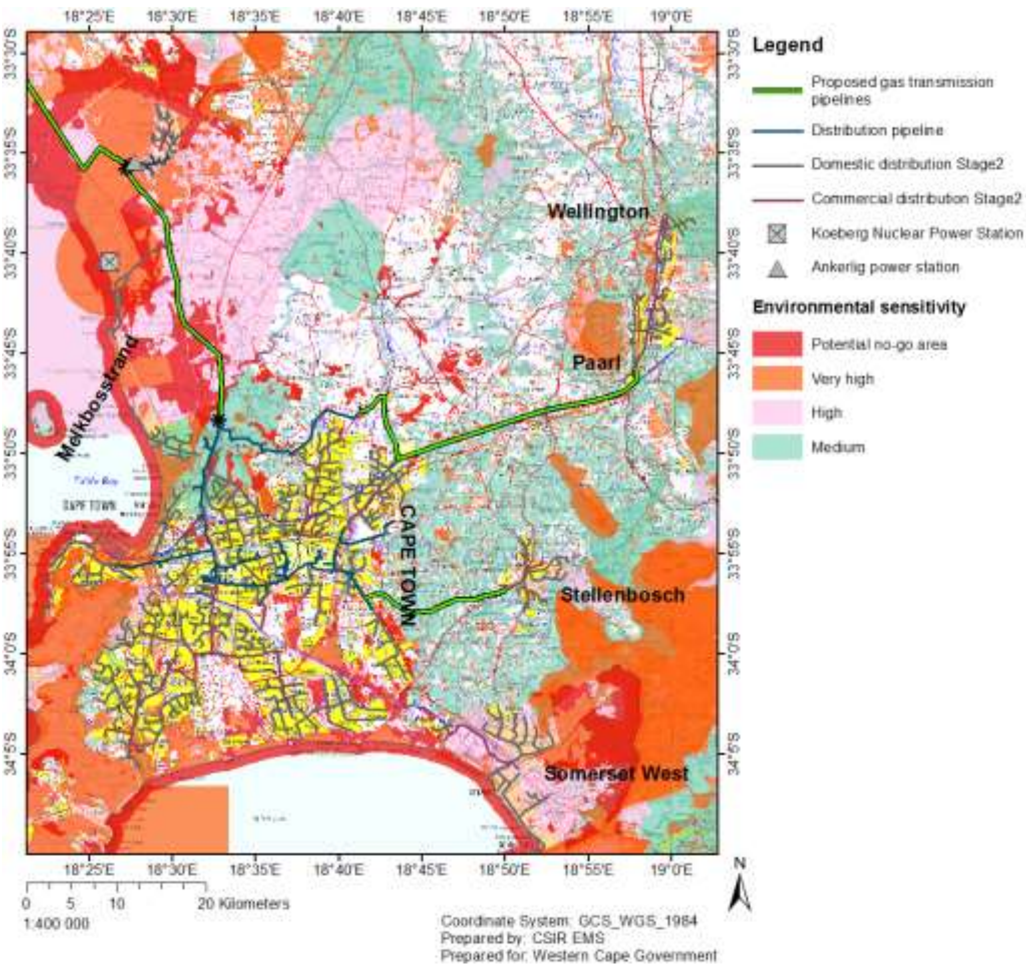

Figure 4 Sensitivity analysis of the proposed distribution pipeline network in Cape Town, Paarl/Wellington, Stellenbosch and Somerset West

ST. HELENA BAY CORRIDOR

The environmental sensitivity for the St. Helena Corridor generally ranges from *medium* to *very high* (Figure 5). The main issues in this section of the proposed pipeline route are the Berg River estuary and aquatic CBAs which are ***very high*** sensitivity areas.

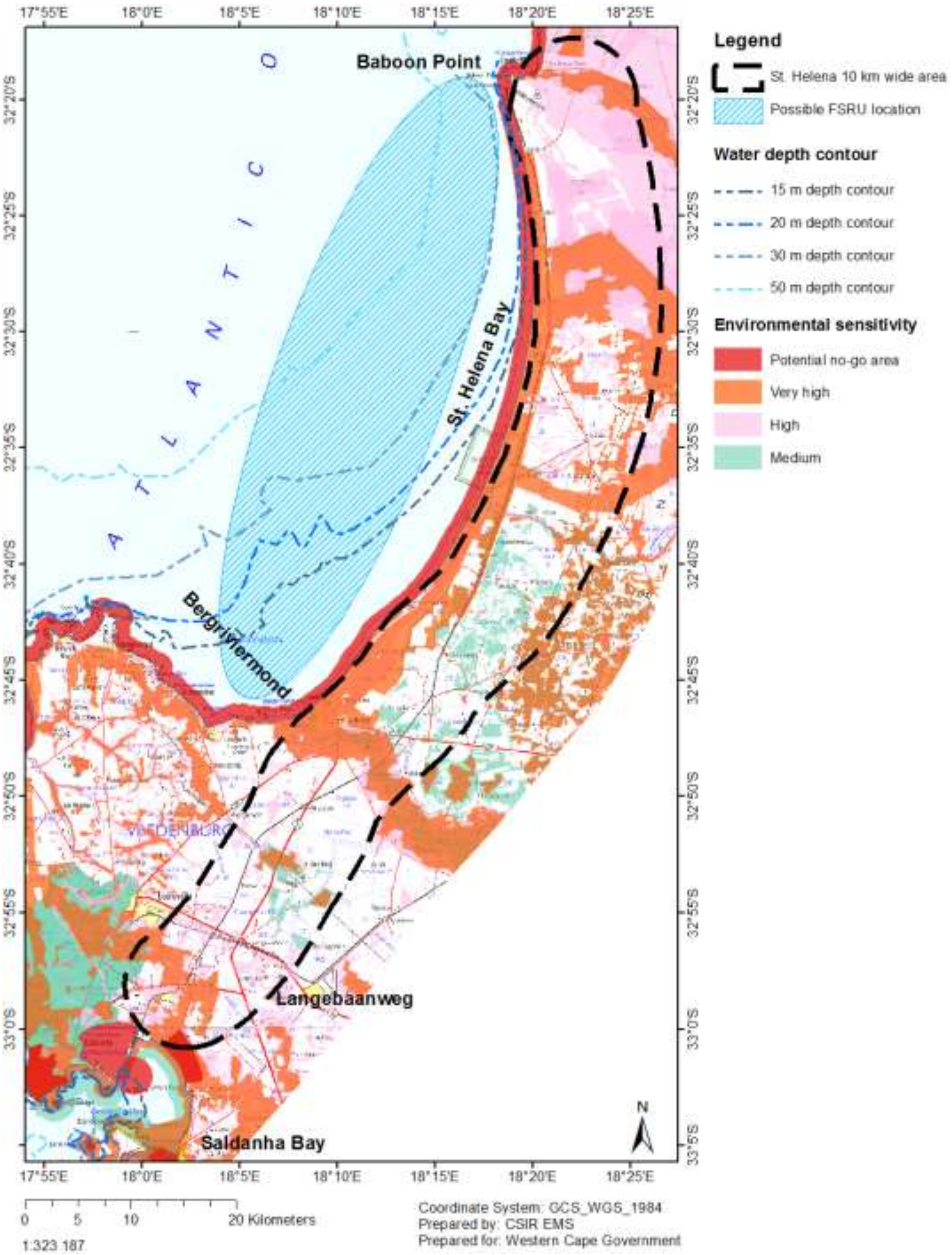

Figure 7.5 Sensitivity analysis of the proposed distribution pipeline within the St Helena Bay corridor

CONCLUSIONS

It should be feasible to route both the main high pressure pipeline and the subsidiary low pressure distribution pipelines while keeping the environmental impacts to the minimum possible. Because of the relatively coarse resolution of the available environmental data, extensive ground truthing of the vegetation along the proposed pipelines routes would be required to ensure the avoidance of sensitive areas as far as possible.

From a safety perspective, a literature search did not find any scientific relationship to the minimum distance between adjacent pipelines. Of most importance is the construction and maintenance of such pipelines, bearing in mind that third-party interference resulting in damaged pipelines with injuries and losses is the greatest cause of pipeline failures.

The following studies should be considered following this screening phase of the proposed project:

- Refinement of the proposed pipeline routing during the preliminary design to avoid where possible and minimise environmental and socio-economic impacts. Given the limited width of the proposed pipeline route (corridor), the risks identified as part of this screening study could be avoided/minimised via detailed botanical (including wetlands) survey.
  A detailed botanical survey at the proposed terminal location and along the proposed gas pipeline is recommended to be undertaken prior to the EIA stage in winter/spring to ensure that species are not dormant (e.g. geophytes) or are flowering. This will permit the various species to be positively identified and will allow the assessment of the actual botanical value of the proposed pipeline route and Saldanha terminal area and to identify any possible disturbed areas that could be utilised for the proposed LNG terminal.
- Metocean and geophysical studies to evaluate the suitability of these locations for the respective LNG importation method.
- Bathymetric study of Big Bay, within the Port of Saldanha to determine the amount of dredging required, if any, also for locating the best position for the heating water discharge pipeline.
- Proactive negotiation process with landowners which should recognise the prevalence of agricultural land for a large section of the proposed pipeline route. This is also necessary to ensure that access to private land will be granted during the operational phase of the project as to facilitate maintenance and repairs.
- Quantitative risk assessment for the proposed terminal and pipeline infrastructure
- A Phase 1 Archaeological Impact Assessment (AIA) is required as part of the EIA process and includes sampling and dating of archaeological deposits, and realignment of the pipeline route during the detailed design stage in order to avoid known archaeological sites. It is recommended, although not mandatory, to undertake this study prior to the EIA stage.

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Appendix 2: Risk assessment of the proposed importation and distribution of LNG into the Western Cape.

Appendix 3: Notes of workshop with key stakeholders held on 9 June 2014 at CSIR Stellenbosch.

GLOSSARY

ALARP	As low as reasonably practicable
BGIS	Biodiversity Geographical Information System
BioNet	Biodiversity Network (City of Cape Town Municipality)
CBA	Critical Biodiversity Area
CCT	City of Cape Town
CESA	Critical Ecological Support Area
CR	Critically endangered (vegetation types/terrestrial ecosystems)
DEA	Department of Environmental Affairs
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EN	Endangered (vegetation types/terrestrial ecosystems)
ESA	Ecological Support Area
FEPA	Freshwater Ecosystems Priority Areas
FSA	Fish Support Area
FSRU	Floating Storage and Regasification Unit
HDD	Horizontal Direct Drilling
IDP	Integrated Development Plan
KNPS	Koeberg Nuclear Power Station
LNG	Liquefied Natural Gas
LOA	Length Overall
LT	Least Threatened (vegetation types/terrestrial ecosystems)
MMTPA	Million Metric Tons Per Annum
MMSCD	Million Standard Cubic meters per Day

NEMA	National Environmental Management Act
NEMBA	National Environmental Management: Biodiversity Act
NFEPA	National Freshwater Ecosystem Priority Areas
NPA	National Protected Area
NPAES	National Protected Areas Expansion Strategy
PA	Protected Area
PAZ	Precautionary Action Zone (Koeberg Nuclear Power Station)
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
UPZ	Urgent Protective Action Planning Zone (Koeberg Nuclear Power Station)
VU	Vulnerable (vegetation types/terrestrial ecosystems)

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Environmental screening study for a proposed LNG terminal at Saldanha and associated pipeline infrastructures to Atlantis and Cape Town, Western Cape, South Africa.

Chapter 1: Introduction

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CHAPTER 1. INTRODUCTION

1.1. BACKGROUND AND NEED FOR THE PROJECT

The Western Cape Government is committed to advancing the Green economy. Within this context, the Green Economy Strategic Framework (adopted by the Western Cape Cabinet in March 2013) highlights the importation of natural gas and the provision of associated infrastructures as a key element of this economic development strategy. The importation of natural gas to the Western Cape as an alternative energy source partly fulfils the South African Government's objective of introducing natural gas into the economies of the Western Cape and Eastern Cape Provinces and contributes to the realisation of The National Gas Infrastructure Development Plan[3].

The Western Cape Government's Department of Economic Development and Tourism (DEDAT), through the Chief Directorate: Trade and Sector Development, commissioned a pre-feasibility study for the importation of natural gas to the Western Cape with specific focus on the Saldanha Bay – Cape Town corridor (Visagie, 2013). This study highlighted the dependency of the Cape West Coast region (Saldanha Bay – Cape Town corridor) on the importation of nearly all its energy requirements and the need for introducing an alternative affordable energy source to stimulate industrial growth and the associated commercial and social benefits it may bring. This region currently has no developed natural gas business and no established gas markets or any natural gas infrastructure for the offloading, storage, re-gasification, transportation or distribution of natural gas to any of the potential markets in the region. The establishment of such infrastructure will therefore classify as a greenfield gas infrastructure development.

The pre-feasibility study concluded that a project to import LNG to the region was potentially viable, and merited further investigation. As such, the CSIR was commissioned to undertake an environmental screening study for constructing a proposed 2 MMTPA LNG importation facility and associated gas pipeline infrastructure to Cape Town, Saldanha, Stellenbosch, Paarl and Wellington regions. LNG would be transported by sea in LNG carriers and would either be pumped via cryogenic pipeline as a liquefied gas to an onshore storage facility at Saldanha or to a FSRU vessel. The liquefied gas will be re-gasified on demand and will be distributed to identified markets in the Western Cape via a gas pipeline network. The investigation into the introduction of natural gas as a potential alternative energy feedstock to the region resulted in the identification of various market sectors which could be converted to natural gas as their primary energy fuel, i.e. gas-fired power generation, industrial markets and transport sector. Gas-fired power generation typically consumes large volumes of natural gas for its operations over a long period of time making it an ideal anchor for a greenfield gas development. (Visagie, 2013)

[3] Department of Energy - National Gas Infrastructure Development Plan, 2005

1.2. PREVIOUS STUDIES

The potential of importing natural gas to the Cape West Coast region has on several occasions been studied[4]. Studies by PetroSA (2007/8) and Gigajoule Africa (2010/11), both with the participation of Eskom, have assessed different permutations of importing LNG to the region as energy feedstock for gas-fired power generation and for industrial usage in the Saldanha Bay, Atlantis and Cape Town regions. These are the most recently known studies.

The study by PetroSA was based on the importation of LNG to a land-based terminal in the Port of Saldanha Bay to supply a newly constructed gas-fired power station situated near the Port of Saldanha Bay and identified markets in the Saldanha Bay, Atlantis, Cape Town, Paarl and Wellington industrial regions via a transmission and distribution pipeline network. The study was based on a single phase development where all necessary infrastructures would be constructed and commissioned simultaneously (Visagie, 2013).

The Gigajoule Africa study on the other hand was conducted in 2010/11 and based on the conversion of the existing Ankerlig power station near Atlantis to a gas-fired power plant as its key gas consumer. The basis of this study was the importation of LNG to an offshore LNG receiving terminal (FSRU) situated closest to the Ankerlig power station near Atlantis (approximately 8 kilometres offshore between Duynefontein and Yzerfontein) from where it would be pumped through a transmission and distribution pipeline network to the downstream markets in Saldanha Bay, Atlantis, Cape Town, Wellington and Paarl. This study adopted a phased development of the transmission and distribution pipeline network and associated infrastructure, with Phase 1 including transmission pipelines infrastructure necessary to supply the Ankerlig power station and the identified markets in Atlantis, Cape Town, Wellington and Paarl. Phase 2 comprised the extension of the pipeline and associated infrastructure at a later date to supply gas to the existing markets in Saldanha Bay which could be converted to natural gas. The proposed phased development was influenced by the size of the existing markets in Saldanha Bay, which was considered by Gigajoule Africa as currently marginal[5] to support the large additional costs required for extending the infrastructure necessary to deliver gas to Saldanha Bay (Visagie, 2013).

1.3. SCOPE OF WORK

The need for screening studies has emerged both in South Africa and internationally from the recurring problem of environmental and social issues not being addressed early enough in the development cycle. Usually, technical and financial planning is well advanced when the project is placed in the public domain as part of the EIA process, while environmental and social issues have not been appropriately considered. Accordingly, the ability of environmental factors/realities to influence the project strategically (e.g. consideration of site and technology alternatives) is limited and can result in the subsequent EIA process being largely an exercise in impact mitigation; or lead to the EIA

[4] Shell, Sasol, iGas, PetroSA, Forest Oil

[5] Gigajoule Africa – NERSA License Application for the Distribution and Trading of Natural Gas in the Cape West Coast Region (2010)

identifying fatal flaws that either prevent the project from proceeding or lead to substantial redesign and associated delays.

In South Africa, the latter consequence has led to the EIA process being labelled as a "green handbrake" on development. Furthermore, the lack of consideration of environmental and social issues early on in the development cycle may lead to unnecessary delays in the EIA process as a result of public opposition. Environmental screening studies endeavour to improve this situation by:

- Providing early identification of potential environmental and social "fatal flaws" or "show stoppers" which would influence subsequent more detailed feasibility studies and project engineering design.
- Providing recommendations of practical measures which can be incorporated into the early design and planning of the project that will result either in the avoidance of potentially significant negative environmental impacts or their mitigation to the extent that residual effects fall within acceptable limits; and the enhancement of positive aspects of the project.
- Enabling the project partners to investigate proactively and plan for the incorporation of these recommendations into the planning and design of the project prior to the commencement of the formal EIA process.
- Providing a basis for more detailed studies to address specific environmental and social issues that may require a greater level of understanding before proceeding to an EIA.
- Providing details on baseline studies that may need to be initiated early on in the development cycle so as to provide the basis for a defensible EIA. This is particularly relevant to greenfields projects in regions of Africa where there is very little environmental and social baseline information available.

The scope of this screening study includes:

- Consideration of biophysical and safety/risk issues, within the context of relevant legislation and using available databases and studies, for the following proposed activities:
    - Offshore LNG facility (FSRU vessel)
    - Onshore LNG storage and regasification facilities
    - Associated pipeline infrastructures to Atlantis, Cape Town, Paarl and Wellington.
- Consultation with key authorities and other organs of state with decision-making responsibilities with regards to this project, in order to identify key issues.
- In collaboration with the engineering team and where the current proposed route is deemed unacceptable, identification of pipeline alignment alternatives to be brought forward into the EIA stage;
- Desktop risk and safety screening assessment (risks identification and high level assessment);
- Provide mitigation measures to address any red flags and significant constraint;
- Identification of key environmental and safety risks and proposed mitigation measures;
- Recommendations for future project phases;
- Drafting of a Background Information Document (BID).

1.4. STRUCTURE OF THIS REPORT

This document consists of seven chapters dealing with various aspects of the environmental screening process. These chapters are arranged as follows:

Chapter 1: Provides an introduction to the project and environmental screening process;

Chapter 2: Provides background on the proposed project and details the key components of the project;

Chapter 3: Outlines the environmental screening approach and methodology;

Chapter 4: Provides a brief overview of the legal requirements relevant to the proposed project;

Chapter 5: Provides an environmental baseline description of the study area;

Chapter 6: Provides an overview of the results of the environmental and safety screening process and a discussion of the implications of these results. Detailed recommendations are also provided regarding the mitigation of the most significant risks;

Chapter 7: Summarises the findings of the environmental screening process, including key recommendations proposed to avoid identified fatal flaws and to improve identified environmental impacts, and proposals regarding the approach to the EIA process.

Appendix 1: Detailed mapping of the Stage 2 expansion of the commercial and domestic distribution pipeline network, and pipeline specifications.

Appendix 2: Risk assessment of the proposed importation and distribution of LNG into the Western Cape.

Appendix 3: Notes of workshop with key stakeholders held on 9 June 2014 at CSIR Stellenbosch.

1.5. ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations underpin the compilation of this report:

- In compiling this report, it is assumed that the data and other information submitted by Mr Johan Visagie (Energy Business) are accurate, unbiased and reliable.
- The CSIR study is based largely on available information and a half-day site visit to Saldanha (meeting with TNPA on 19 May 2014). The pipeline route has not been ground-truthed as part of this study.
- Given that this report informs internal project planning as part of the pre-feasibility stage of the project (i.e. high level environmental screening assessment) prior to a formal EIA process in terms of the EIA Regulations, no public consultation process was undertaken. A workshop was organised with key stakeholders on Monday 9th June 2014 to engage with relevant authorities at an early stage of the process and to address any fatal flaws that may have been identified by these key stakeholder. Should the Western Cape Government proceed with the

implementation of the proposed LNG terminal and associated transmission pipeline, stakeholder consultations will be undertaken as part of the EIA process.

- Very small non-perennial and dry river beds have not been included in the environmental screening evaluation of the proposed pipeline route, but will have to be taken into account in any further detailed environmental investigations (including the legislated EIA process) that may ensue from the current studies.
- It is assumed that the typically expected distribution of archaeological resources will apply throughout the study area, and that those resources located in the literature will be representative of archaeology and/or palaeontology in the vicinity. The fact that buried archaeological resources can occur in most parts of the landscape is a limitation, but away from the coast and river margins the risk of uncovering buried archaeological resources is assumed to be low.
- It is assumed, for safety reasons, that the final chosen pipeline layout would avoid built environment structures and road bridges.
- All safety distances mentioned in this report are preliminary and will need to be confirmed during more detailed studies (e.g. Quantitative Risk Assessment).
- The risk assessment undertaken by Riscom was based on conceptual designs and pipeline routing. 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 to Riscom.
- The risk assessment was based on the proposed wall thickness and did not assume that the use of code wall thickness would automatically result in a low risk.
- As the flaring designs have not been completed, the thermal radiation from flaring cannot be assessed.
- The risk assessment study excludes the following:
    - Assessment of natural events such as earthquakes and floods;
    - Assessment of ecological risk;
    - Review of an emergency plan;
    - Assessment of marine risk

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Chapter 2: Overview of the Project

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CHAPTER 2. OVERVIEW OF THE PROJECT

2.1. BACKGROUND

The LNG industry has an excellent safety record compared to refineries and other petrochemical plants (University of Houston Law Centre 2003). Worldwide there are 89 LNG liquefaction and export terminals, 93 import and regasification terminals and more than 300 LNG ships. The distribution of facilities in 2012 is illustrated in Figure 2.1. Approximately 120 million metric tons of LNG is handled every year. As of 2014, LNG has been safely delivered across the ocean for over 40 years. In that time there have been over 33 000 LNG carrier voyages, covering more than 60 million miles, without major accidents or safety problems either in port or on the high seas. Furthermore, LNG carriers frequently transit high traffic density areas.

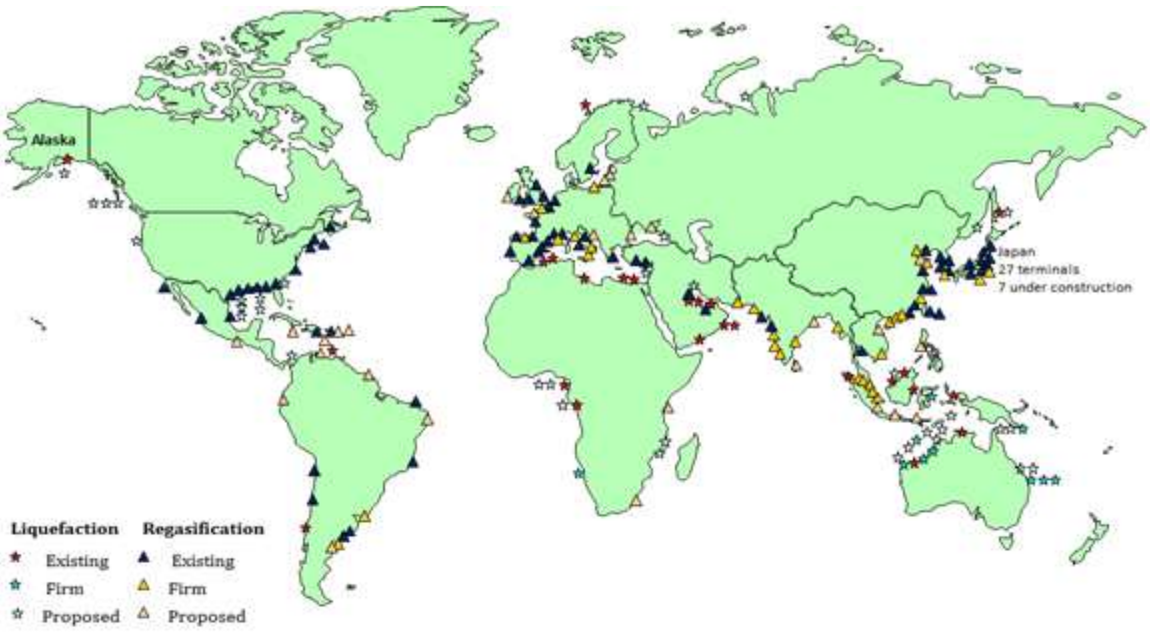

Figure 2.1: Global LNG terminals (Source: Maritime Executive, 2012).

2.2. KEY PROJECT COMPONENTS

The proposed natural gas importation facility and associated transmission and distribution pipeline network would involve the following components:

- A LNG receiving terminal: a permanent land-based terminal at Saldanha or a semi-submersible LNG receiving terminal (within the Port of Saldanha or offshore at 2 locations along the West Coast).

- A transmission and distribution gas pipeline networks to the downstream markets namely Cape Town, Stellenbosch, Paarl, Wellington and Saldanha.
- Pressure Protection and gas metering stations at distribution points.

The pipeline infrastructure for the land-based LNG receiving terminal will be constructed from the terminal to the downstream markets contemporaneously with the construction of the terminal.

The construction of the pipeline infrastructure for the offshore LNG terminal on the other hand would be considered in a phased manner where the first phase includes the transmission and distribution pipelines necessary to supply the existing industrial areas in Atlantis, the Ankerlig power station and the industrial markets in Cape Town, Stellenbosch, Paarl and Wellington and the second phase the extension of the pipeline infrastructure to include industries in Saldanha Bay.

Further description of these key components is provided below.

2.1.1 LNG Composition

A typical lean composition for LNG is given in Table 2.1.

Table 2.1 Typical composition for LNG

Constituent	Target Value	Lower Bound of Acceptability	Upper Bound of Acceptability
CH_4 Methane % Mol	92.60900	-10%	8%
C_2H_6 Ethane % Mol	4.54200	-10%	8%
C_3H_8 Propane % Mol	2.09000	-10%	8%
i-C_4H_{10} Iso Butane % Mol	0.31000	-10%	8%
n-C_4H_{10} Normal Butane % Mol	0.32600	-10%	8%
Iso Pentane % Mol	0.03900	-10%	8%
N_2 Nitrogen	0.08400	-10%	8%
GHV Mtu/Scf (±5%)	1096.46500	-10%	8%
Ave Density @ -160^{0}C	448.66500	-10%	8%
Wobbe Index MJ/m3 @15^{0}C	52.35500	-10%	8%

2.1.2 LNG Carrier Vessel

LNG carriers are vessels designed specifically for the transport of LNG. Key features of these vessels include: double hulls, cargo containment systems, cargo handling systems and steam-turbine propulsion systems fuelled with boil-off-gas from the cargo tanks. Modern LNG carriers are typically designed to transport 125 000 to 220 000 m^3 of LNG.

In the pre-feasibility study a vessel size of 125 000 m^3 Moss Rosenberg (Moss tanks) type containment system has been assumed to deliver LNG to a 138 000 – 145 000 m^3 FSRU. Moss tanks, which are load bearing, consist of either an aluminium or 9% nickel sphere welded into a vertical cylindrical skirt. Insulation consists of polyurethane foam applied to the entire outer surface of the sphere, and to part of the skirt, to control thermal stresses and limit heat leakage.

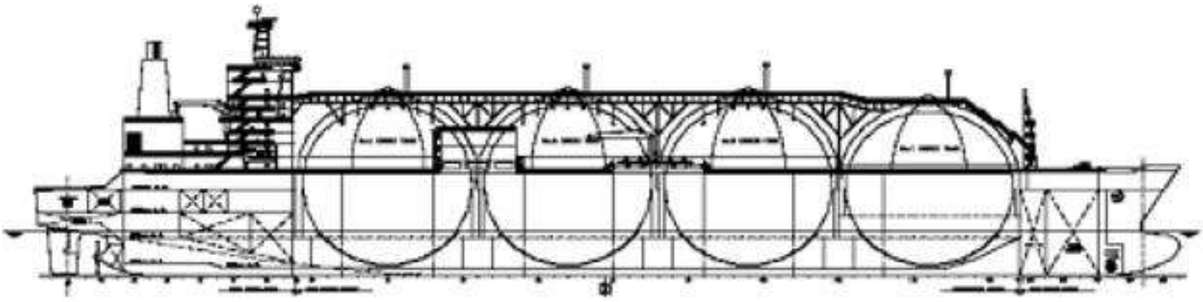

Figure 2.1 Moss Rosenberg Type LNG Carrier

2.1.3 LNG Receiving Terminal

The gas receiving terminal is the gateway for LNG to downstream markets. This study evaluates two LNG receiving terminal options and their respective transmission and distribution gas pipeline networks to the downstream markets namely;

- a permanent land-based LNG receiving terminal in the Port of Saldanha Bay (refer to section 2.1.3.1); and
- a submerged LNG receiving terminal within the Port of Saldanha and offshore (refer to section 2.1.3.2)

2.1.3.1 Onshore LNG receiving terminal

Since the introduction of large-scale LNG receiving facilities in the 1960's, the conversion of LNG into gas for injection into the pipeline grid has taken place at dedicated onshore receiving terminals. Regasification of LNG deliveries is the final component along the LNG value chain before on-selling of gas to consumers. These terminals generally comprised a jetty for offloading the LNG, LNG offloading arms and cryogenic piping to storage facilities, storage tanks to store the LNG in liquefied form, a re-gasification plant which vaporise the LNG to a gaseous state and pressure and metering facilities measuring the discharge of the gas into the pipeline network for transportation to off takers. It must be noted that the cryogenic pipeline from the LNG vessel to the storage facility is required to be located in an open trench and cannot be buried. The length of that section of pipeline should also be less than 4 km to avoid regasification of the liquid natural gas inside the pipeline.

The proposed onshore LNG receiving terminal in Saldanha Bay covers approximately 15 hectare and consists of 2 x 150 000m^3 storage tanks, a Submerged Combustion Vaporization (SCV) plant and ancillary infrastructures (Figure 2.2)[6]. The onshore facility would receive and store natural gas in the liquid form at -163°C, would convert it to a gaseous phase for transportion through mainline transmission and distribution pipelines to markets at various pressures.

The SCV consists of an indirect fired type heat exchanger with the burner and tube bundle contained within a single operating vessel. A water bath (potable water from shore) is heated by the submerged combustion burner and is used to vaporise LNG in the stainless steel tube heat exchanger. The produced steam vapour is routed to the bottom of the bath where it creates a highly turbulent motion within the tube bundle. The operation of the SCV is a function of the required outlet gas temperature and LNG flow rates required by the off takers. This duty can be controlled by means of a temperature controller. This system is very reliable and the main advantage is that there is no water discharge at sea.

The receiving terminal was originally proposed to be located in the northern section of the Port of Saldanha, along a quayside area near the new ship repair area (Tender document, ECON 3272/1 dated 28 February 2014). Following a meeting with TNPA on 19 May 2014 in Saldanha, Mrs Abigail Links (TNPA Port Planner) confirmed that the proposed location was not viable as this area has been earmarked by TNPA for logistic activities for the offshore industry. In addition, the current ROD for the Port of Saldanha reportedly only permits the development of light industry between Bayview Centre (TNPA offices) and the Bluewater Bay residential area (Mrs Abigail Links, personal communication, 19 May 2014).

The potential location(s) for the proposed land-based terminal will be informed by the screening study, through the mapping of opportunities and constraints.

Figures 2.3 depict the original proposed area where the LNG receiving terminal could be located.

[6] Note: For the proposed onshore terminal, the Open Rack Vaporizer will not be used.

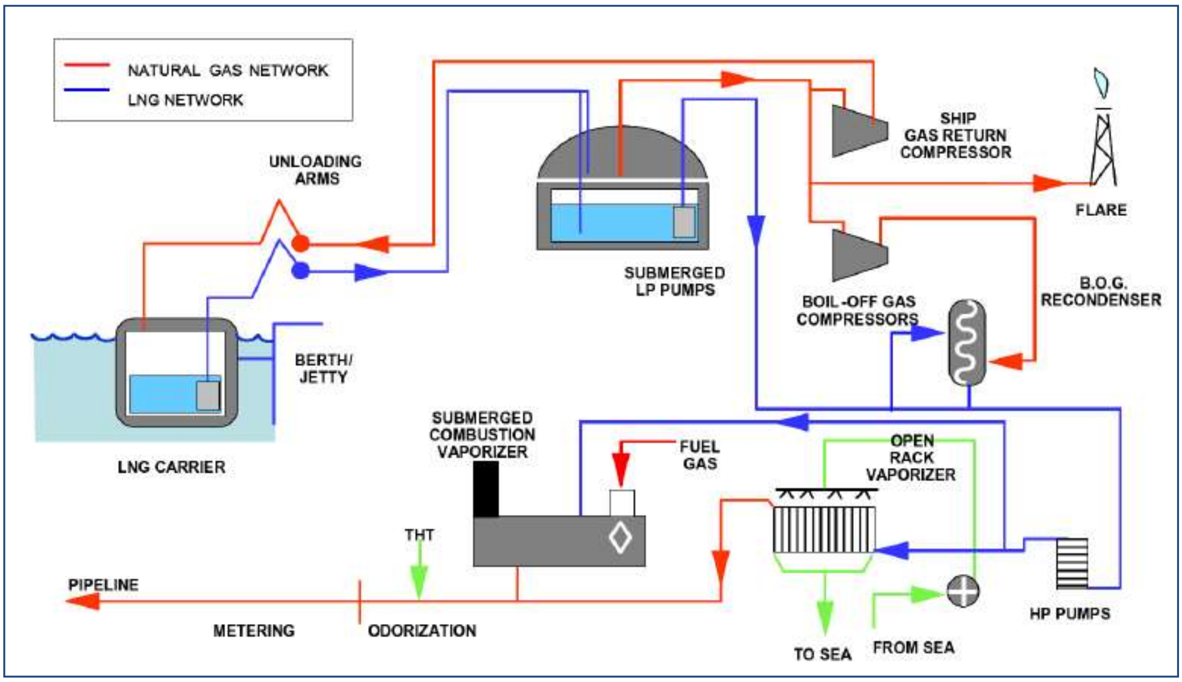

Figure 2.2 Flow diagram for the proposed LNG terminal at Saldanha Bay

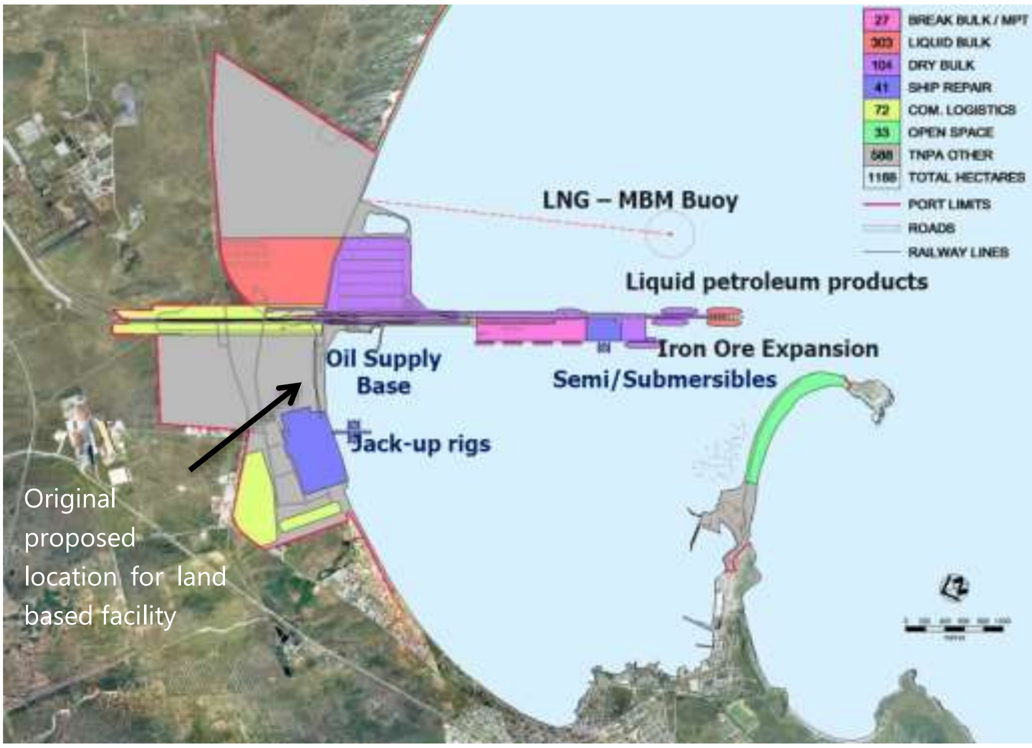

Figure 2.3 Original proposed location for the onshore LNG terminal at Saldanha Bay

2.1.3.2 Offshore LNG receiving terminal

The offshore Submerged LNG Receiving Terminal (including the proposed receiving terminal within the Port of Saldanha) comprises the supply of LNG via conventional, slightly modified, LNG shuttle tankers to a permanently moored Floating Storage and Re-gasification Unit (FSRU) where it would be stored, re-gasified, compressed to approximately 120 bar, transported to shore via an undersea pipeline and delivered to clients via a transmission and distribution pipeline network.

Typical ship specifications for a FSRU suited for operations in the harsh condition of the Cape West coast region will be predicated on a 138 000 – 160 000 m^3 storage capacity at minus 163˚C LNG (Table 2.2). The FSRU will be permanently stationed using a turret-mooring or spread-mooring system and thrusters. LNG will be transferred using a tandem loading system from the bow of an LNG shuttle carrier to the stern of the FSRU via flexible cryogenic hoses (Figure 2.4). For more benign or calm waters, the terminal would consist of a submerged demountable buoy, a flexible or turret marine riser and a submerged mooring system to which the buoy is attached and the FSRU is moored. In this case, LNG transfer from the ship to the FSRU would occur side by side. The latter option is assessed by the CSIR as part of the assessment of marine environmental conditions for the LNG ship and transfer operations within the Port of Saldanha (CSIRa, 2014).

Table 2.2 FSRU Vessel Dimensions

Vessel Dimensions	
Capacity	5 Moss tanks; 138 000 m^3
LOA	304.9 m
Beam	43.5 m
Draft	11.5 m
Class	DNV

Figure 2.4 LNG transfer from a supply vessel (on the left) to a FSRU (on the right), using the tandem system (Golar Bluewater, 2011)

Re-gasification

The vessel previously proposed by Golar/Bluewater for the Cape West Coast LNG Importation, the Golar Grandia, operates a closed-looped regasification system which includes a Submerged Combustion Vaporiser. Saturated low-pressure steam is used as the heating medium for re-gasification with a maximum flow of gas from the unit at 7.0 million m^3/d (in a pressure range of 57–98 bar), which equates to roughly 2 MMTPA of LNG. The plant can be turned down to 10% of its maximum flow.

The plant, which is built into a single compact skid, is arranged in three trains each capable of delivering 50% of the maximum required gas flow to ensure a high level of production flexibility, operability and redundancy. Each of the re-gasification trains is fed by a high-pressure booster pump that draws LNG from a common suction drum. LNG is fed to the suction drum by cargo pumps in the storage tanks.

The re-gasification unit is located on the open deck at the bow of the vessel to maximise the distance from the accommodation. The FSRU control system covers the control and monitoring of the re-gasification plant and other main FSRU functions, notably the emergency-shutdown and fire-and-gas detection systems.

Figures 2.5-2.6 and Table 2.3 show the key components and general arrangement of the FSRU.

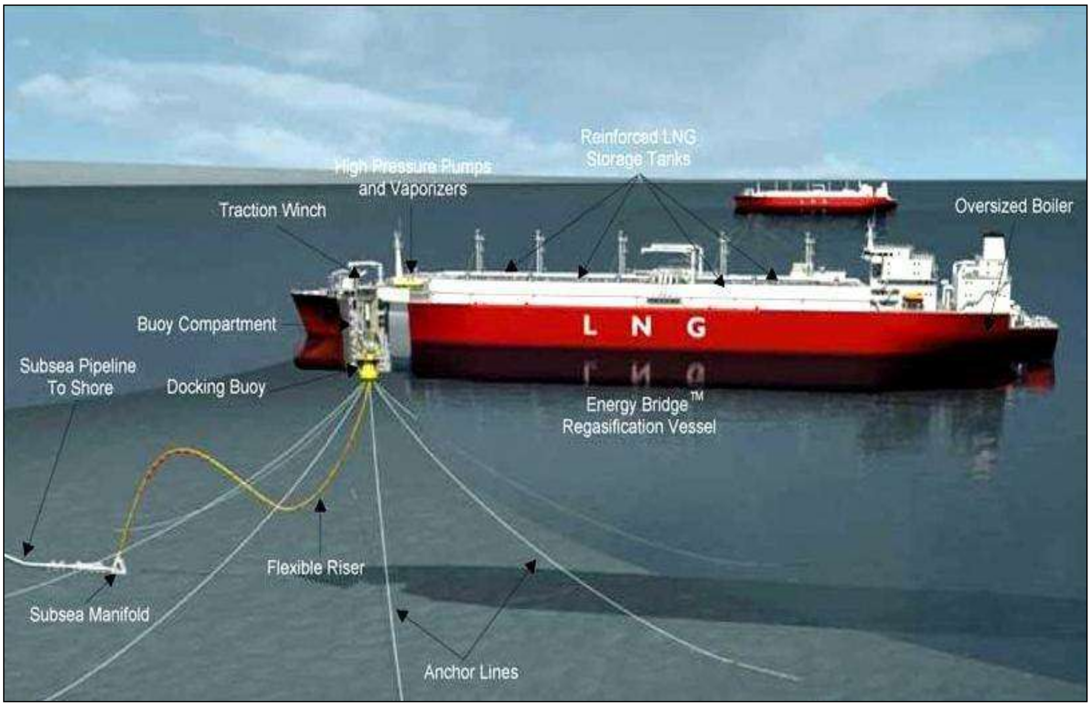

Figure 2.5 Example of a typical floating storage and regasification unit (FSRU) (Golar Bluewater, 2011)

Table 2.3 General arrangement of the FSRU

General Arrangement	
Regasification unit	Closed loop (3 trains; 1 standby; 360 MMSCD)
Loading	Bluewater tandem loading system
Mooring	Turret system in >~30m depth
Stationing	Permanent / All types of weather / Thruster
Aviation	Helicopter landing capability

Figure 2.6 Example of a regasification unit on board of a FSRU

FSRU classification standards

It is the role of international organisations such as DNV to provide classification systems that can be used to demonstrate that a given ship, plant or structure complies with defined rules and standards, especially those concerning safety. DNV released Classification Notes for Regasification Vessels No. 61.3 in June 2008. These define classification notations REGAS-1 and REGAS-2 and are intended to supplement the well-established DNV rules and standards for LNG gas carriers. REGAS-1 is the safety standard for on-board re-gasification plants intended for occasional use in connection with cargo discharge. It lists the basic standards for the vessel and calls for risk-based hazard identification (HAZID) and hazard operability (HAZOP) studies to be performed. REGAS-2 applies to re-gasification units designed for continuous operation. To achieve this notation, all the rules and standards contained in REGAS-1 must be complied with; in addition, the vessel must be subject to a full quantitative risk assessment (QRA) exercise carried out by an independent party.

Proposed locations for the FSRU

The terminal options as per the Tender document (3272/1 date 28 February 2014) included the following main locations:

- Offshore locations:
    - Between Robben Island and Dassen Island;
    - In Jutten Bay, at the entrance of Saldanha Bay; and
    - In the southern sector of St Helena Bay.

- Port of Saldanha Bay:
  - An area south of the planned iron ore expansion project for ship-to-ship transfers of LNG (within Small Bay) (Figure 2.7).

CSIR met with TNPA on 19 May 2014 in Saldanha. Following this meeting, it was confirmed that the proposed location of the FSRU within Small Bay was not a viable option (Mrs Abigail Links, TNPA Port Planner, Personal comment) due to the fishing communities and the various mariculture activities present in this area. Mrs Links also confirmed that the high pressure gas pipeline from the FSRU to shore would not be allowed to be sited on the sea bed across Small Bay, as for safety reasons, it is prohibited to install a pipeline across the current entry channel.

The offshore location in Jutten Bay, at the entrance of Saldanha Bay was also discarded due to unsuitable sea and ship handling conditions.

The following areas have therefore been assessed for the location of a FSRU as part of this environmental screening study:

- Offshore locations (Figures 2.8 a & b):
  - Option 1: Between Robben Island and Dassen Island; and
  - Option 2: In the southern sector of St Helena Bay, between Baboon point and the Berg River mouth.

- Port of Saldanha Bay (Figure 2.9):
  - Option 3a: An area north of Salamander Point, just outside the military restricted zone, within Big Bay.
  - Option 3b: An area within Big Bay, to the east of the LPG receiving terminal under construction

CSIR is also assessing the marine environmental conditions for the LNG ship and transfer operations within the Port of Saldanha and along the West Coast (CSIRa & b, 2014).

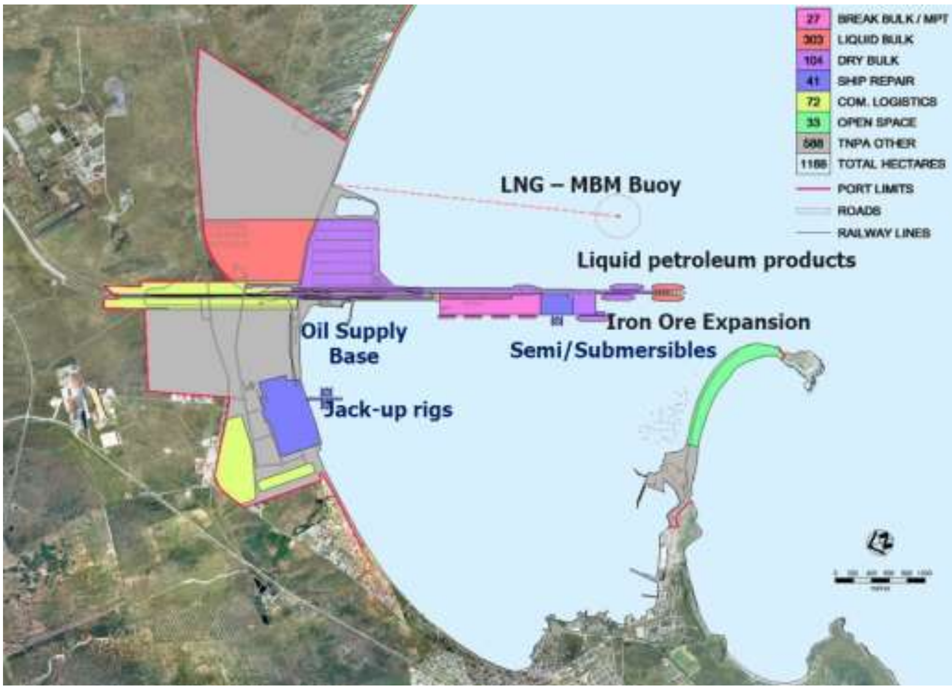

Figure 2.7 Proposed original location for the LNG FSRU (LMG-MBM Buoy) within the Port of Saldanha

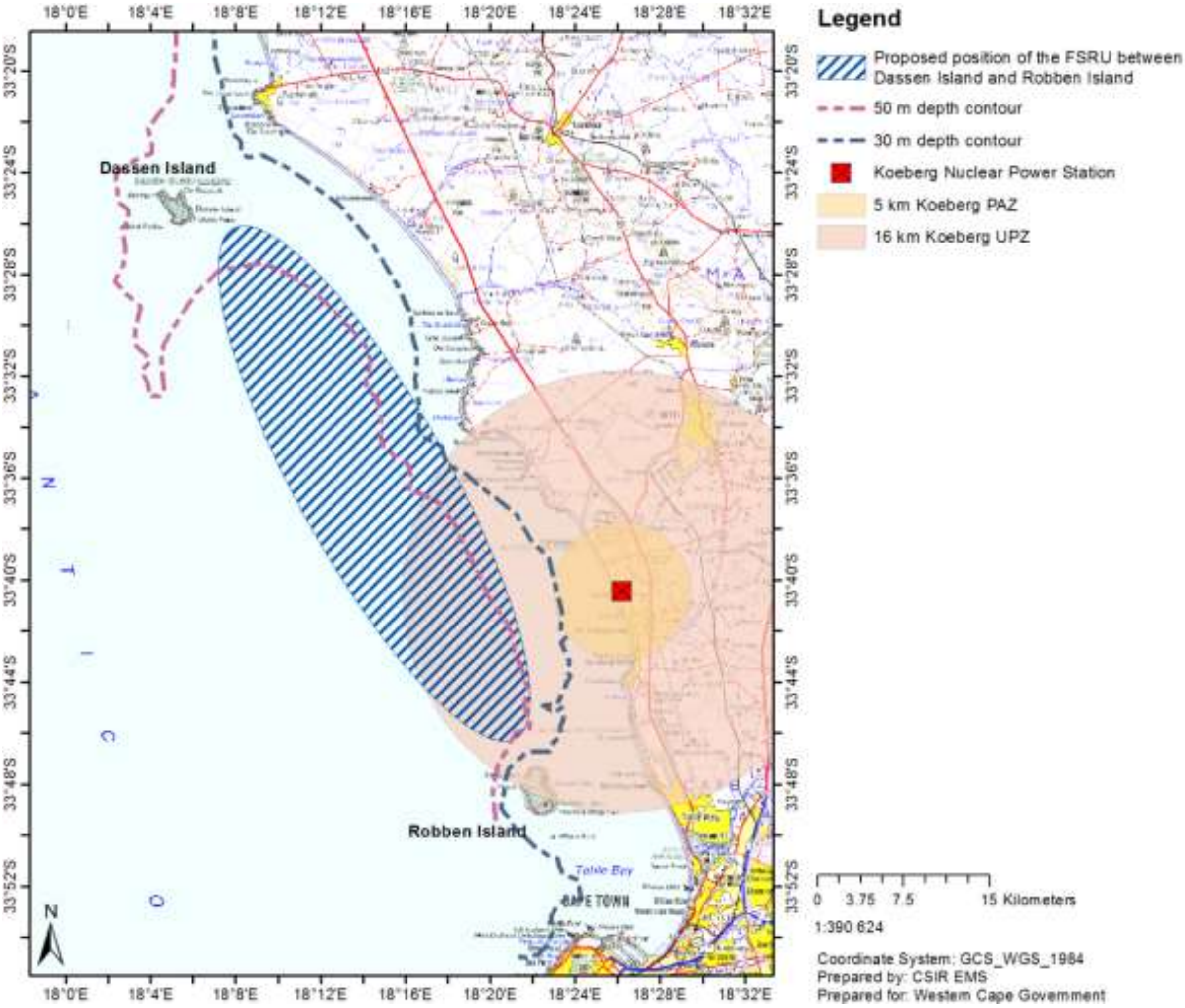

Figure 2.8a Proposed offshore location for the FSRU, between Robben Island and Dassen Island (Option 1)

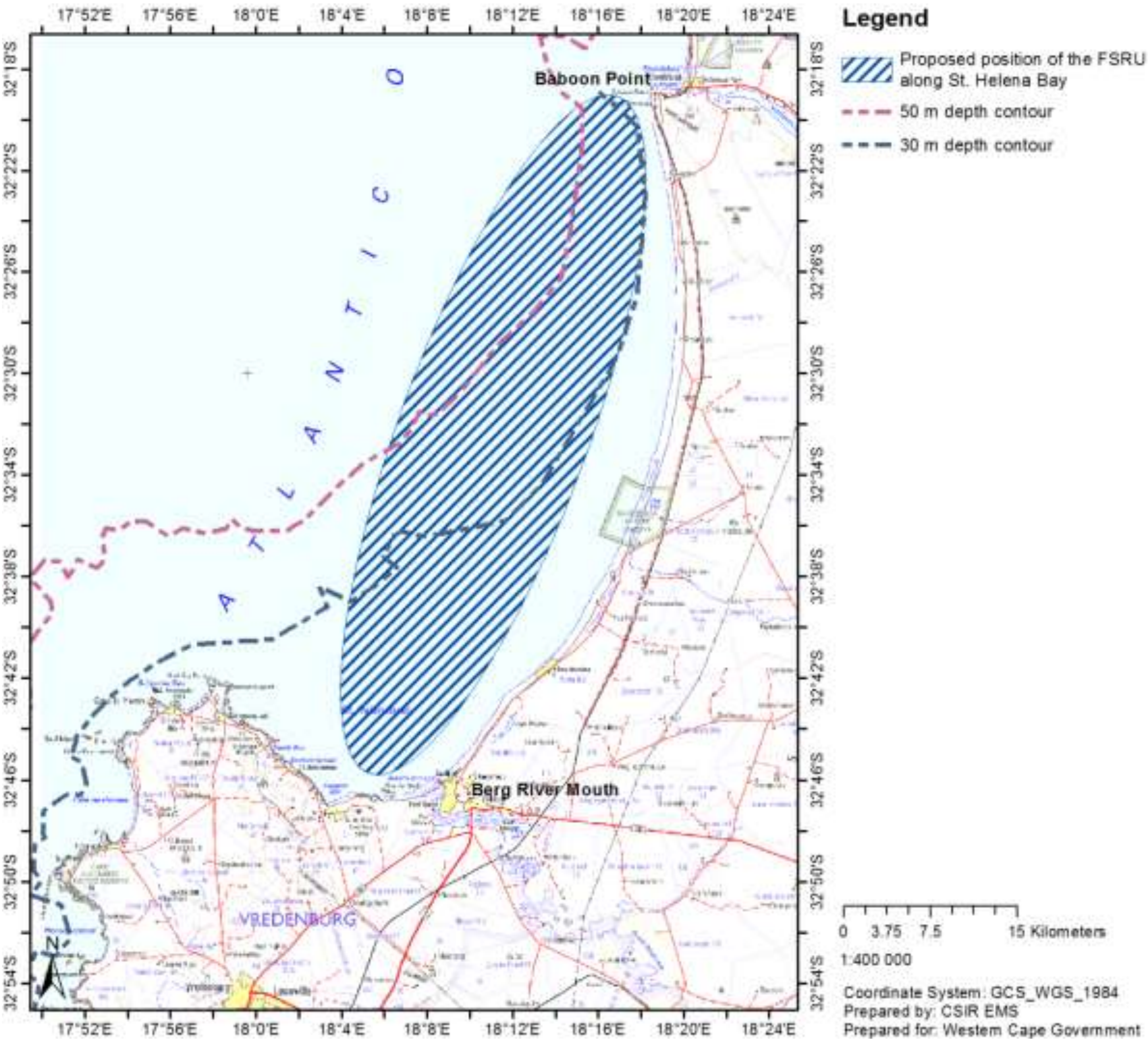

Figure 2.8b Proposed offshore location for the FSRU, southern section of St Helena Bay (Option 2)

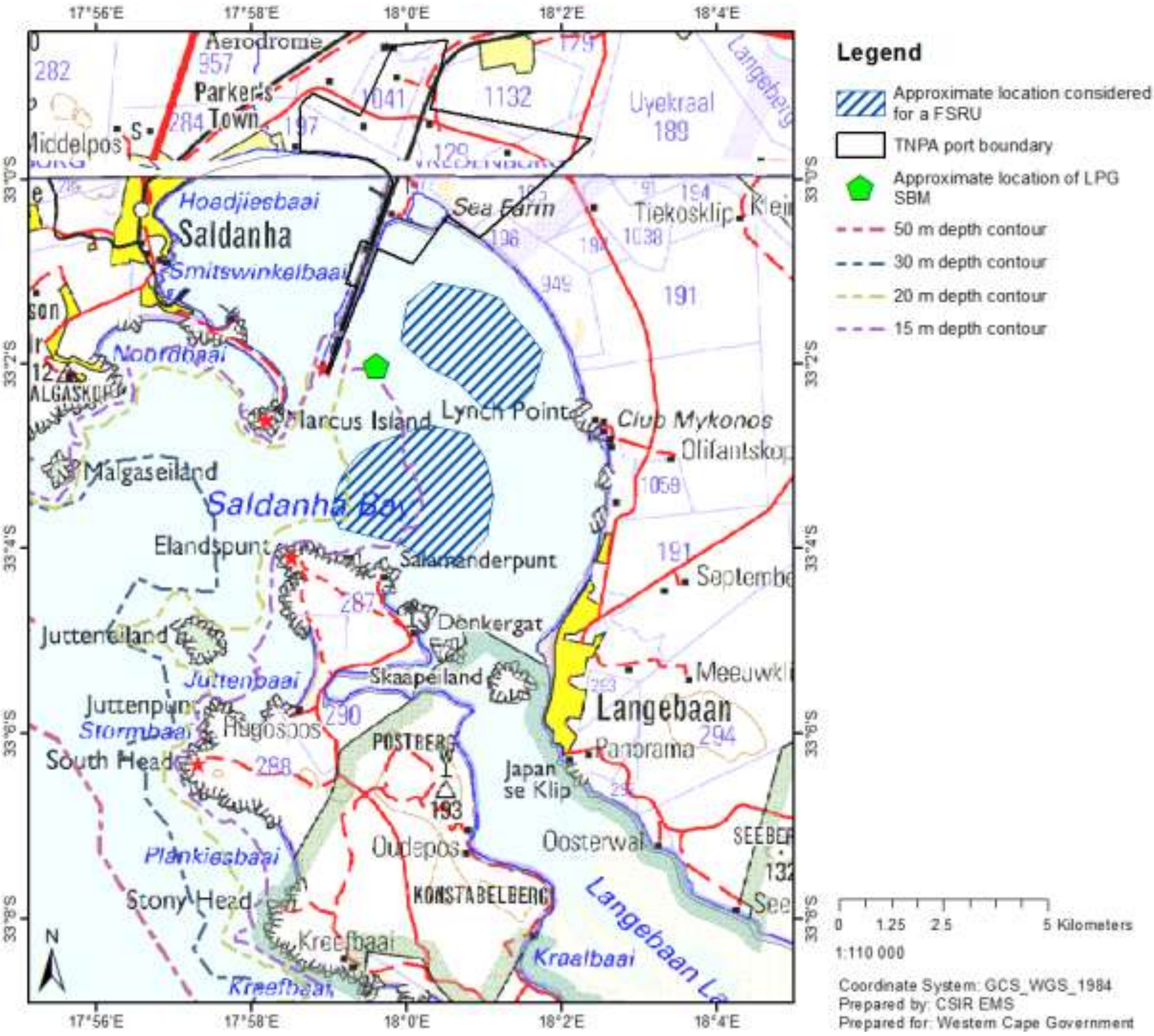

Figure 2.9 Proposed location for the FSRU north of Salamander Point, within Big Bay, Port of Saldanha (Options 3a&b)

2.1.4 Transmission and Distribution Pipeline

The study includes the design of an onshore transmission[7] and distribution[8] pipeline network for transporting the imported natural gas from the LNG receiving terminal to identified markets. Annual offloading of LNG volumes to Ankerlig, Cape Town, Stellenbosch, Paarl and Wellington areas will amount to approximately 89 MMGJ (≈1.7 MMTPA) or an equivalent 277 MMScfd with a recompressed average inlet transmission pipeline pressure of 100 – 120 bar. This throughput may increase to 4 MMTPA if additional

[7] High pressure, large bore, cross country pipelines
[8] 2–15 bar pipelines supplying the clients

customers and/or suppliers join the project. Distribution pipelines will operate at 2-15 bar, with branches off to client at a pressure of 1-2 bars.

Where necessary along the pipeline route, scraper stations (i.e. pig receiving and launching stations) and mainline valves will be constructed above ground. These stations are used to clean the pipeline and monitor the condition of the pipeline. Pressure reduction and metering stations are also planned to be installed along the proposed pipeline (where necessary) and at the customers battery limits.

The width of the pipeline Construction Right of Way (CRoW) will be kept to a minimum. The general philosophy is that the pipeline will be buried with a cover of at least 1m to the top of the pipe, and up to 1.5 m cover when crossing ploughed areas and vineyards, and will follow existing servitudes as far as possible. The cryogenic pipeline from the vessel to the land-based facility cannot be buried and will run above ground on trestles over the coastal dune belt. Where necessary, a permanent servitude with a width of about 6 m will be registered upon completion of the construction and installation of the pipeline. The exact dimensions will be confirmed during later phases of the project.

It is a well-established fact that the proximity of high-voltage (above 88 kVa) electrical power lines and electrical DC-traction rail lines pose a potential source of damage to steel pipelines, due to the effects of AC- or stray-current induced corrosion. Sufficient consideration should be given during the refinement of the route to establish an optimal balance between limiting environmental impacts by following existing infrastructure and ensuring the long-term integrity of the pipeline. The pipeline will be designed for a 30 to 50 years life expectancy.

2.1.4.1 Land-based Receiving Terminal

The transmission pipeline from a land-based terminal in the Port of Saldanha Bay includes the transmission and related infrastructure necessary for transporting natural gas to industries in Saldanha Bay, the Ankerlig power station near Atlantis, the Atlantis industrial area and the industrial areas of Cape Town, Stellenbosch, Paarl and Wellington. The transmission pipeline comprises 116 kilometres of high-pressure pipeline and associated infrastructure from the LNG terminal in the Port of Saldanha Bay to Atlantis and Milnerton.

2.1.4.2 Off shore Submerged Receiving Terminal – Option 1

In the case of an offshore LNG receiving terminal located between Dassen Island and Robben Island, the transmission pipeline and related infrastructure necessary for transporting natural gas to industries in Saldanha Bay, the Ankerlig power station near Atlantis, the Atlantis industrial area and the industrial areas of Cape Town, Stellenbosch, Paarl and Wellington will be developed in two phases (Figure 2.10):

- Phase 1 includes the construction of the transmission pipelines from the offshore submerged receiving terminal to Atlantis and Milnerton. The pipeline comprises an offshore section of approximately 8 kilometres[9] from the terminal to shore where it ties into an onshore transmission

[9] Note that this distance would vary depending on the exact location of the proposed FSRU

pipeline network at a landfall position between Duynefontein and Yzerfontein. The transmission pipeline runs along existing Eskom, road and Transnet pipeline servitudes for 34 kilometres to Atlantis and another 27 kilometres to Milnerton from where the gas is distributed through the respective pipeline distribution networks to the identified industries.

The distribution pipelines (Stage 1) necessary to supply the identified markets within the Cape Town metropolis, Paarl and Wellington areas comprise approximately 105 kilometres of low-pressured pipeline of varying diameters. The pipeline network mainly follows existing roads within the various industrial areas along the road verges to ensure minimum reparation to road, rail and other municipal infrastructure. In Atlantis the distribution pipeline into the region's industrial hub comprises approximately 8 kilometres of low-pressure pipeline along existing road verges.

- Phase 2 comprises a 62 kilometres extension of the transmission pipeline from Phase 1 (i.e. from the intersection of the on-land pipeline section from the offshore terminal and the pipeline section to Atlantis) to a City Gate which is a transmission pipeline end terminal with pressure protection and supervisory control and data acquisition facilities in Saldanha Bay. The pipeline route follows the road servitude along the N7 road and existing Transnet pipeline and Eskom servitudes connecting Atlantis and Saldanha Bay.

  The distribution network to mainline industries in the Saldanha Bay region and adjacent smaller industries comprises 13 kilometres of distribution pipelines along existing road and municipal servitudes (Figure 2.11).

The next stage (Stage 2 - 10 year plan) would include the expansion of the commercial distribution network and the introduction of a domestic supply network (Figures 2.11 and 2.12). Maps for the various proposed distribution networks (Stage 1) are included in Appendix 1.

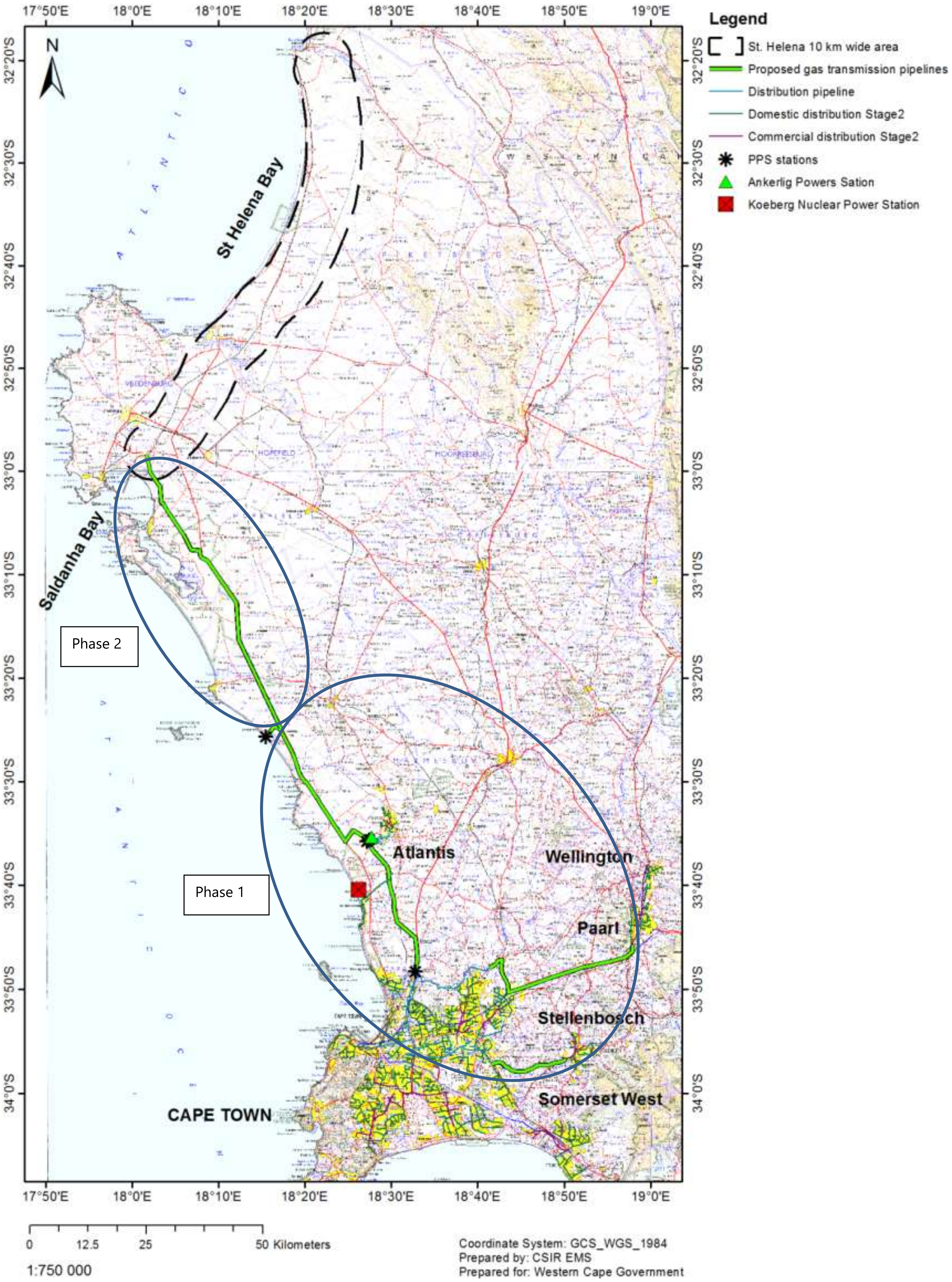

Figure 2.10 Proposed pipeline routing from Saldanha to Cape Town, Paarl, Wellington and Stellenbosch regions

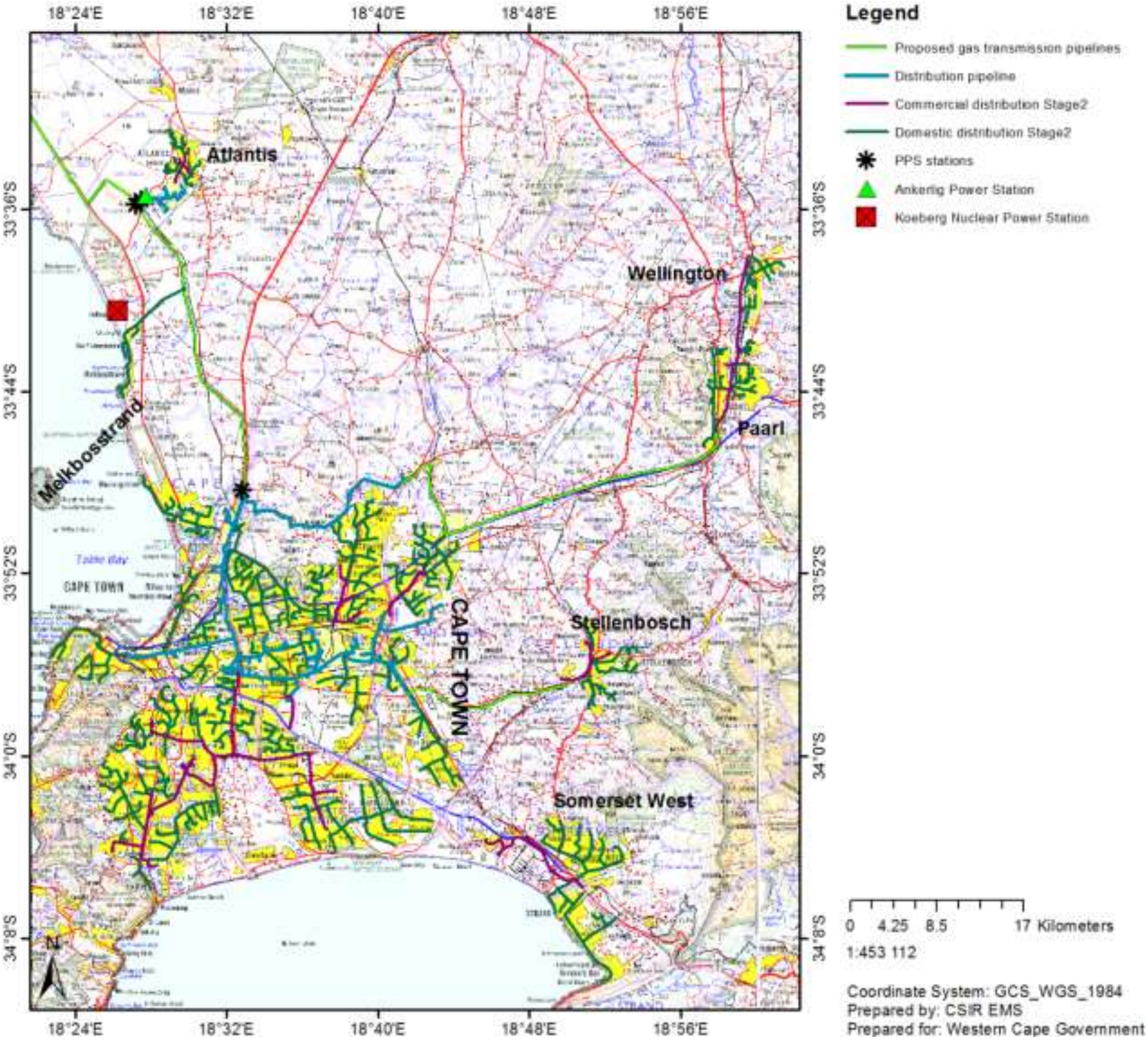

Figure 2.11 Expansion of the commercial and domestic (Stage 2) distribution pipeline network to Cape Town and surroundings

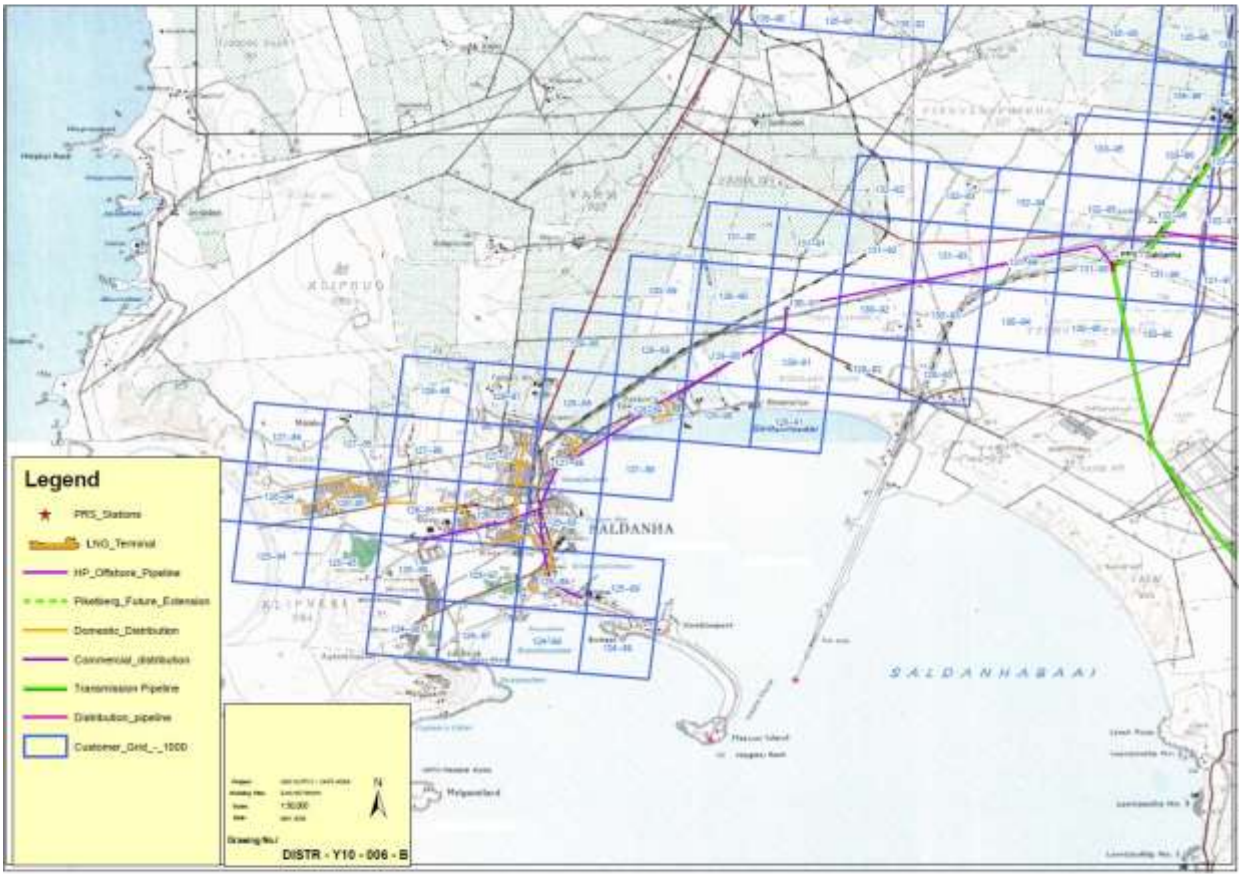

Figure 2.12 Expansion of the commercial (Phase 2, Stage 1) and domestic (Stage 2) distribution pipeline network to Saldanha

2.1.4.3 Submerged Receiving Terminal located in St Helena Bay (Option 2) and within the Port of Saldanha (Option 3)

The transmission pipeline network for transporting natural gas to industries in Saldanha Bay, the Ankerlig power station near Atlantis, the Atlantis industrial area and the industrial areas of Cape Town, Stellenbosch, Paarl and Wellington would not be developed in phases. It would be constructed from the terminal to the downstream markets contemporaneously with the construction of the terminal.

The proposed transmission and distribution pipeline routes are similar to these discussed in sections 2.1.4.1 and 2.1.4.2, with the exception of the transmission pipeline from St Helena Bay to Saldanah for Option 2 and the section of pipeline from the proposed FSRU location within the Port of Saldanaha Bay to the proposed transmission line running from Saldanha to Cape Town (Figure 2.9) for Option 3.

Given that no route has been provided from St Helena Bay to Saldanha bay, a 10 km corridor (Figure 2.13) has been assessed in terms of sensitivity and no go areas.

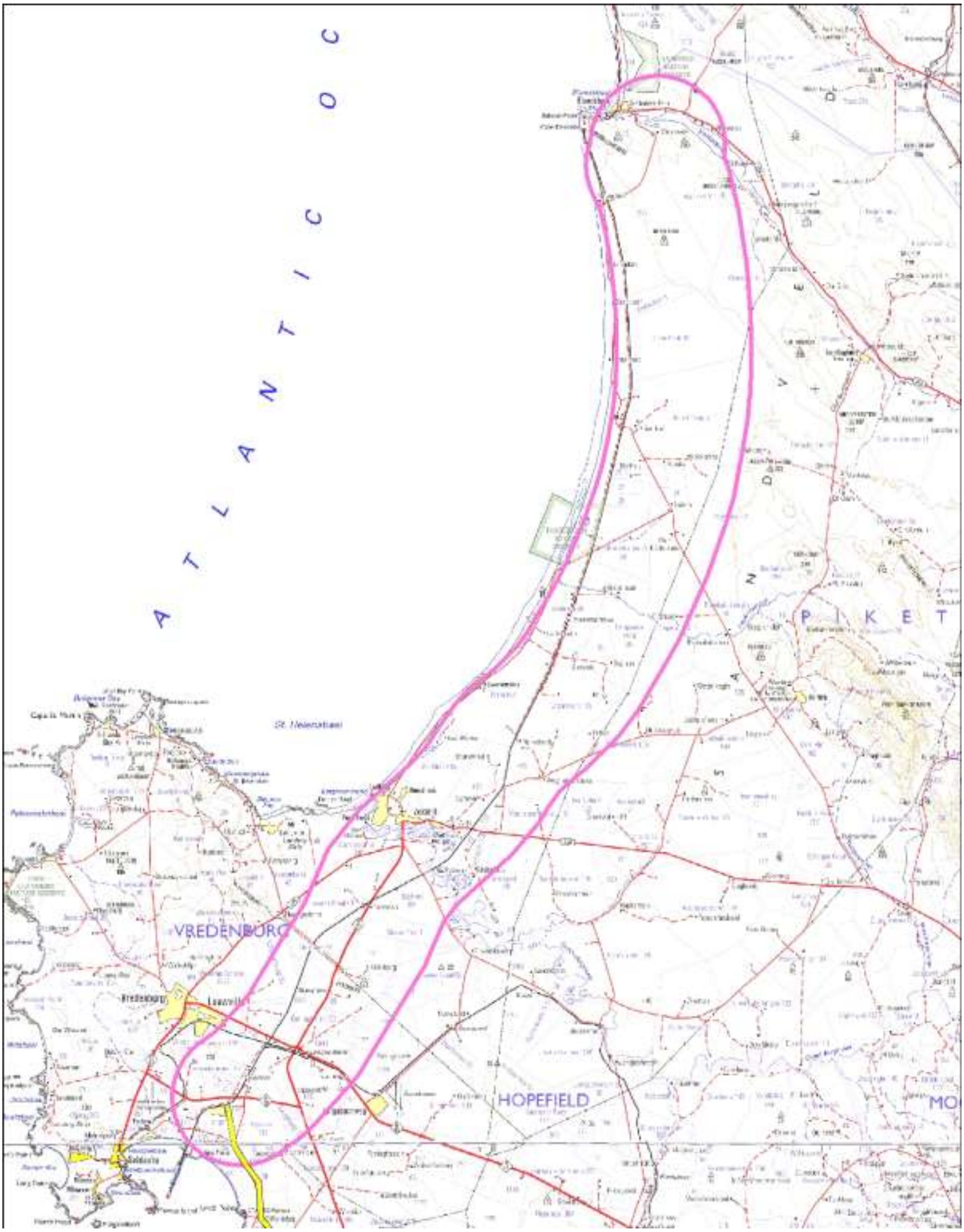

Figure 2.13 10 km wide corridor assessed for a proposed pipeline from St Helena Bay to Saldanha

2.1.4.4 Pipelines specifications

Table 2.4 and Figure 2.14a&b depict the technical specifications of the proposed transmission pipeline. The pressure range and pipeline diameter from the FSRU to clients is shown graphically in Figure 2.13b. As can be seen, the pressure would be reduced at the various pressure protection stations from 120 bar to 100 bar and again to 48 bar with the distribution pipelines operating at 2-15 bar. The pressure would be reduced further at the client's site to a pressure of 1-2 bar. The proposed distribution pipeline specifications are presented in Appendix 1.

The flow rate of gas through the pipelines would be related to the pressure and diameter of the pipeline which would ultimately determine the capacity of the pipeline. This is particularly relevant when determining the maximum flow rate from a pipeline rupture. The maximum flow rate in the pipeline was given as 440 628 Nm^3/h, which equates to 95.5 kg/s using the average molecular mass of LNG as 17.5 kg/kg·mol (derived from the composition of LNG).

Design Code

The proposed pipeline design code would be based on ASME B31.8 (1999) amongst others. The full set of codes and specifications can be found in Appendix 1.

The ASME B31.8 deals with gas transmission and distribution piping systems, prohibits designs and practices known to be unsafe and contains warnings where caution but not prohibition is warranted. The code includes specifically:

- EN 12308 outlines suitability testing of gaskets designed for flanged joints used on LNG piping;
- Reference to acceptable material specifications and component standards, including dimensional and mechanical property requirements;
- Requirements for design of components and assemblies;
- Requirements and data for evaluation and limitation of stresses, reactions and movements associated with pressure, temperature change and other forces;
- Guidance and limitations on the selection and application of materials, components and joining methods;
- Requirements for the fabrication, assembly and installation of piping;
- Requirements for examination, inspection and testing of piping;
- Procedures for operation and maintenance that are essential to public safety;
- Provisions for protecting pipelines from external and internal corrosion.

Table 2.4 Transmission Pipeline – Phase 1

Cape Town Transmission Pipeline Network				
Material	***Diameter (mm)***	***Wall thickness (mm)***	***Length (m)***	***Max Pressure (barg)***
API5L X65	323	11	26815	50
API5L X65	508	18	1543	120
API5L X65	508	18	33573	120

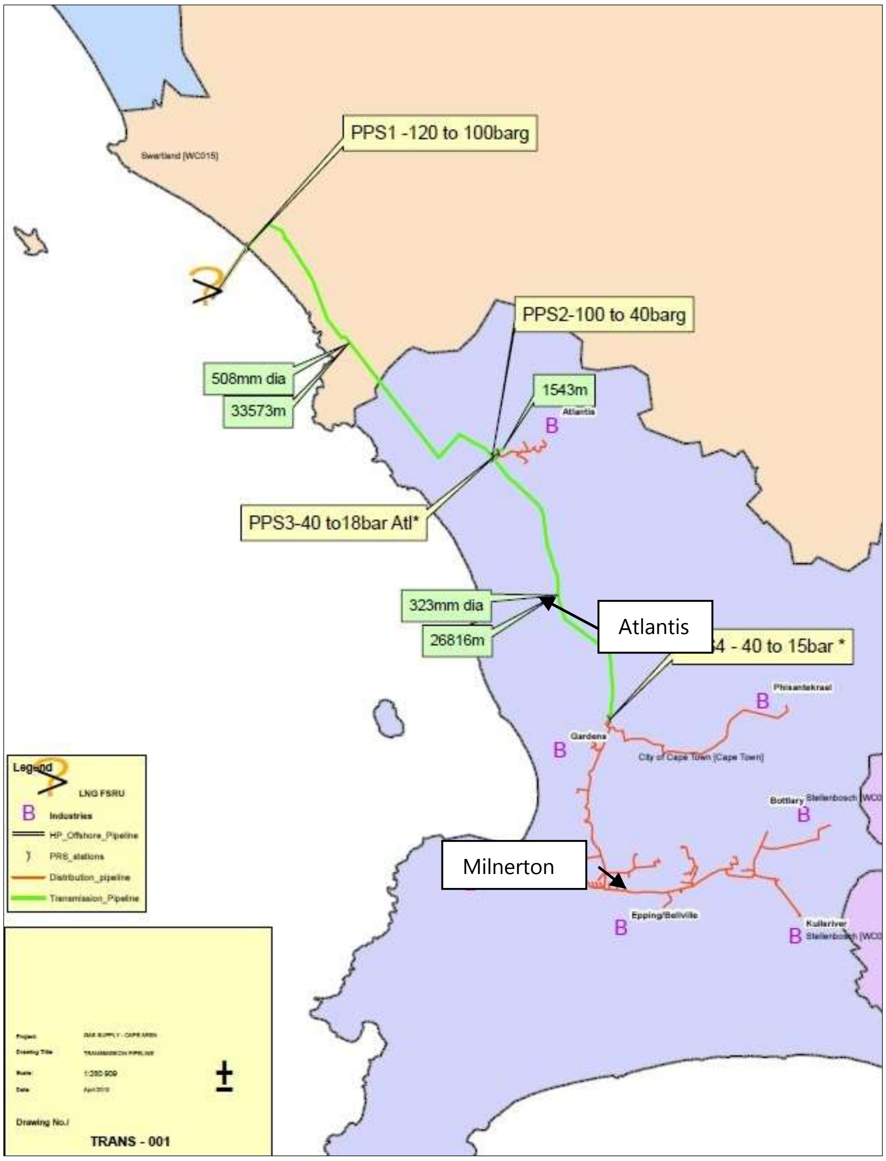

Figure 2.14a Technical specifications for the proposed Phase 1 transmission pipeline

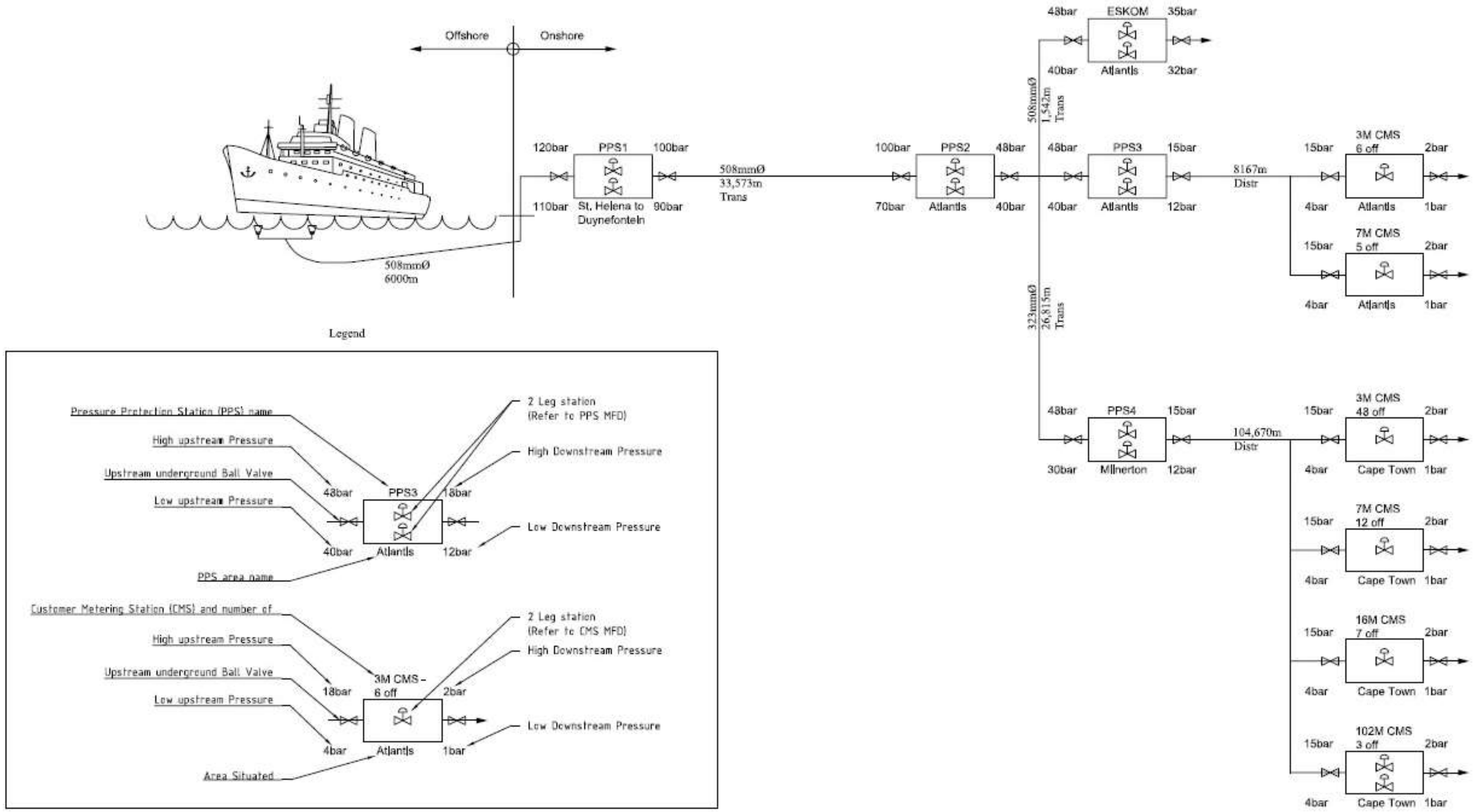

Figure 2.14b: Transmission and distribution pipelines showing pipeline sizes and associated pressure

2.1.5 Process Waste Generation and Air emissions

Domestic waste will be disposed of via the Local Authority. Typical liquid waste that would be generated at the land-based facility or on the FSRU includes limited waste oils and office sewage effluent which would either be directed to the local sewage treatment facility in the case of the land-based terminal or treated according to MARPOL regulations and South African legislation in the event of a FSRU. Waste oils from compressors will be disposed of via a reputable hazardous waste contractor.

Given that the regasification unit operates as a closed-loop system, there will be no cooled water discharge at sea, but the system generates CO_2 emissions due to the burning of gas for heating purposes. However, when natural gas is burned for power generation, SO_2 emissions are negligible and CO_2 emissions area reduced significantly compared to other fuels such as coal and fuel oil (CEE, 2006).

Limited amount of natural gas will be vented via a vent stack during commissioning of the facility and in the unlikely event of a malfunction of the terminal; and power for the ancillary facilities and the cryogenic LNG storage tanks for the land-based terminal option will be sourced from the ESKOM grid. Additional air emissions are therefore expected to be negligible.

2.1.6 Safety Standards

The International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) provides an international standard for the safe transport by sea in bulk of liquefied gases and certain other substances. This international standard prescribes the design and construction standards of ships involved in such transport so as to minimize the risks to the ship, its crew and to the environment, having regard to the nature of the products involved.

Strict port procedures and operations such as minimum tug requirements, limitations due to weather conditions and the establishment of exclusion zones all limit the potential for collision with other vessels. The following exclusion zones are indicators for an LNG facility[10] (Mrs Abigail Links, TNPA Port Planner, Email dated 04 April 2014). Safety distances will be assessed and confirmed following a more detailed quantitative risk assessment.

- 500m ahead, 200m abeam and astern of a transiting LNG carrier as it moves along shipping channels.
- 250m safety zone around the load out berth when unoccupied by a carrier.
- 250m commercial shipping safety zone around the load out berth when loading operations are occurring.
- 1 000m public exclusion safety zone around the load out berth when loading operations are occurring.

[10] These indicators have been sourced from the TNPA LNG Strategy

- 50m each side of the cryogenic pipeline.
- 500m from storage facility to the site perimeter boundary.
- 250m clearance zone to other hazardous industry inventory from the LNG processing plant.
- 1 000m clearance zone to residential areas.

Western Cape Government
BETTER TOGETHER.

Environmental screening study for a proposed LNG terminal at Saldanha and associated pipeline infrastructures to Atlantis and Cape Town, Western Cape, South Africa.

Chapter 3: Approach and Methodology

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CHAPTER 3. APPROACH AND METHODOLOGY

3.1. APPROACH

In response to the Western Cape Government's tender (ECON 3272/1 dated 28 February 2014) and in order to achieve the aims of the environmental screening assessment, the CSIR team adopted the following conceptual approach:

- At a coarse level, map the potential environmental opportunities and constraints for the location of a proposed LNG reception terminal and for the proposed gas pipeline as identified by Mr Johan Visagie (Energy Business) on behalf of the Western Cape Government.
- Identify whether there are any "fatal flaws" from an environmental and risk and safety perspective. A "fatal flaw" is typically defined as an impact that ***could*** have a "no-go" implication for the project (i.e. may lead to the project not receiving environmental authorisation), unless there is opportunity for the project design to avoid/mitigate this impact effectively. For example, this could apply when the project is predicted to not comply with legislated standards or guidelines.
- Where key issues and potential fatal flaws have been identified along the proposed gas pipeline, identify alternatives for the problematic sections.
- Present the findings of the study in a concise Environmental Screening Report which can be used by the Western Cape Government for internal decision making and to inform any future project phases.
- Compile a background information document for used during the EIA phase.

An assessment of project alternatives is a requirement of the EIA Regulations. The screening study assesses a number of alternatives for the LNG receiving terminal (FSRU versus a land-based facility) and where required, alternative routing of the proposed pipeline for sections where key issues of potential fatal flaws are identified, are presented. A detailed comparative assessment of these alternatives will only be investigated during the EIA once the routing alternatives have been agreed upon.

The "no-go" alternative is the option of not constructing the proposed LNG project. The no-go alternative will need to be assessed during the EIA if it is established that potential negative impacts associated with the development would be of high significance, to the extent that it might be undesirable for the development to proceed. The consequences the "no-go" alternative that will be considered will include failure to fulfil the South African Government's objective of introducing natural gas into the economies of the Western Cape and Eastern Cape Provinces. Should the project not proceed, the Cape West Coast region (Saldanha Bay – Cape Town corridor) will continue being highly dependent on the importation of nearly all its energy requirements and will miss the opportunity of introducing an alternative affordable energy source to stimulate industrial growth and the associated commercial and social benefits it may bring.

3.2. METHODOLOGY

Within the context of the conceptual approach the following key tasks were identified and are detailed below:

3.2.1 Project inception meeting

The purpose of the project inception meeting was to:

- Confirm the Terms of Reference and any additional inputs/information needed for the study;
- Obtain additional project background information from the Western Cape Government, including additional information on the proposed LNG receiving terminal options, and on existing and planned pipeline routing;
- Identify the key stakeholders to consult with as part of the Environmental Screening Study; and
- Confirm the study approach, communication protocols, reporting requirements and schedule.

3.2.2 Desktop study

The environmental screening study mainly comprised a desktop analysis. The desktop study involved the identification of environmental and safety issues and criteria relevant to the proposed locations for the LNG receiving terminal and the proposed transmission and distribution pipeline network.

The expertise of the CSIR team, together with available published information, was used to assess whether or not the local environment was likely to pose any special constraints or impediments to the project. As part of the screening study and at an early stage of the project, CSIR consulted with key stakeholders (i.e. Meeting with Mrs Ms Abigail Links, Port Planner, Transnet National Port Authorities on 19th May 2014 and Workshop with key stakeholders on 9th June 2014) to discuss potential fatal flaws and key issues related to the proposed project and to clarify any concerns that they may have at this early stage. Notes of the workshop held on 9th June 2014 are included in Appendix 3.

This study focussed on the biophysical environment, mainly impacts on ecology, in particular rivers, wetlands and vegetation types within the study area, and its interactions with land-use practices and other factors. It also considered risk and safety issues related to the proposed project. The nature of a screening study and the size of the study area involved, i.e. a LNG terminal at Saldanha and a complex gas pipeline network to Cape Town and surrounding area, necessitate a focus on environmental and safety features and aspects that would constrain the study, which are appropriate at this scale.

Essentially, this means that the focus is primarily on biodiversity at a vegetation type or habitat level, with the most suitable data being at the level of vegetation types. Datasets on the populations of some threatened species and their localities are available but are known to be incomplete. An in-depth field trip with detailed biodiversity surveys was not part of the scope of this study. The distribution of the populations of these species is typically patchy and highly localised which means that it is very likely that the pipeline route may have to be adjusted to avoid these populations when the routes are assessed in detail during the EIA stage. All the most recent and detailed data on vegetation types and their status, conservation planning and priorities, and land-cover was gathered with a view to identifying the areas to avoid, if possible, and minimising the impact on the remaining natural vegetation, especially where the vegetation types were considered threatened.

3.2.3 Risk assessment study

A high level risk assessment study was conducted by Riscom with the aim of quantifying the risks to the public and to determine acceptability of the risks identified.

As an approved inspection authority (AIA), Riscom uses the methodologies and criteria described in the internationally recognised CPR 18E (Purple Book) and RIVM (2009) as documentation with which conformance can be measured. This is a requirement of accreditation and implies that similar results should be obtained by independent risk assessors compliant to the aforementioned documents. Furthermore, CPR 18E (Purple Book) and RIVM (2009) are legal requirements for conducting quantitative risk assessments (QRAs) in the Netherlands and forms the basis of the commercially available software. In addition, the Major Hazard Installation (MHI) regulations (No 692 dated July 2001) give instructions to the installation owner regarding the requirements for the risk assessment but do not give the methodologies and criteria that must be used for such studies.

The risk assessment process is summarised with the following steps:

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

The meteorological conditions at Langebaanweg and Cape Town, as measured by the South African Weather Service, were used as the basis of wind speed, direction and atmospheric stability for the risk assessment.

Further details on the approach and methodology used for the risk assessment can be found in Appendix 2.

3.2.4 Heritage resources study

A desktop study covering potential impacts on heritage resources was also undertaken by Dr Jayson Orton (ASHA Consulting) and the following approach was used:

- A survey of available literature was carried out to assess the general heritage context into which the development would be set. This literature included published material, unpublished commercial reports and online material. The latter is sourced largely from the South African

Heritage Resource Information System (SAHRIS) and includes the recently released 'palaeomap' (see http://www.sahra.org.za/map/palaeo).

- The subsurface nature of the proposed pipeline development dictates that the primary impacts of concern are palaeontological and archaeological. The report therefore focuses most strongly on these aspects of heritage. However, temporary impacts to other (above ground) aspects of heritage may well occur during construction so these too are reviewed.
- Jaco Boschoff of IZIKO South African Museums was consulted for advice regarding impacts to maritime archaeology.

3.2.5 Environmental screening assessment

An important aim of undertaking feasibility studies for a proposed project is to establish whether or not there are any aspects of the development that are either technically flawed or have the potential to give rise to unacceptable environmental consequences (ecological, social, economic, etc). In the context of this study, these are defined as potential 'fatal flaws'.

During this screening process, various factors have been used to characterise the environmental constraints and key issues associated with the proposed facility and pipeline. These factors are based on previous screening studies undertaken by CSIR for gas pipelines.

The environmental sensitivity of the LNG terminal location and the various affected sections of the proposed pipeline were assessed on a nominal scale of low, medium, high, very high and no go/potential fatal flaw, using the various factors identified in Sections 3.2.3.1 to 3.2.3.3. The definitions of the various rating are described in Table 3.1. During the sensitivity evaluation process, the CSIR team applied the precautionary principle and where there were uncertainties regarding the likely rating of the sensitivity, a more conservative approach was used.

It is important to note that this study addresses issues and planning at a sub-regional level and it is therefore fairly high-level. More specific and detailed studies will be undertaken during the route refinement stage, together with the preliminary engineering design and EIA process that would be undertaken if the project would proceed.

Table 3.1 Environmental sensitivity rating definition

Environmental Sensitivity rating	Definition
Potential Fatal Flaw (NO GO area)	Irreversible and unacceptable alteration of the natural systems, patterns or processes.
Very High	Extremely severe alteration of natural systems, patterns or processes.
High	Severe alteration of natural systems, patterns or processes.
Medium	Notable alteration of natural systems, patterns or processes.
Low	Negligible alteration of natural systems, patterns or processes.

3.2.5.1 Potential Fatal Flaws/No Go areas

National Parks and Provincial Nature Reserves

National Parks declared in terms of the National Parks Act (57 of 1976) and Nature Reserves declared in terms of the relevant provincial conservation ordinances, e.g. in the Western Cape this would be the Nature and Environmental Conservation Ordinance (No 19 of 1974). These areas have been considered as potential no go areas for the proposed gas pipeline. However, in the event of the proposed pipeline following an existing servitude through a park, it would be regarded as a very high sensitive area instead.

Very High Sensitive habitats

This will be based on the National Biodiversity Assessment (NBA) which includes consideration of the CAPE, SKEP and STEP bioregional mapping. Critically endangered, Endangered, Vulnerable and least threatened are being used as classes as defined by the IUCN. Critically Biodiversity Areas (CBA's), including the City of Cape Town Biodiversity Network will also be considered.

Ecosystems which are listed as being critically endangered (CR) and are also classified as CBAs, NPAs or areas identified by local municipality and authority conservation strategies as sensitive / no-go areas (such as CCT BioNet irreplaceable areas), have been identified as constituting a potential fatal flaw. It is, however, essential to note that the scale of the NBA limits the level of detail and the resolution of the mapping so that the information obtained from spatial databases should be ground-truthed in order to confirm the actual condition of the landscape. Assessment at a finer scale will require accordingly finer scaled data.

Declared or protected wetlands

Wetlands that have been declared or proposed as Ramsar sites (e.g. Verlorenvlei) or have some other level of protected status (e.g. Rietvlei Wetland near Table View is a Protected Natural Environment). South Africa has 17 Ramsar sites.

Core areas of biosphere reserves

This refers to the core area of designated biosphere reserves in terms of UNESCO's Man in the Biosphere (MAB) Programme. Out of the four recognised South African Biosphere Reserves, the only one that is relevant is the West Coast Biosphere Reserve. The same rating as for the National Parks and Provincial reserves apply for core areas of biospheres.

Declared heritage areas of landscapes

These would be areas declared in terms of the previous National Monuments Act or the National Heritage Resources Act (No 25 of 1999). It is recognised that there will be few if any officially declared areas, e.g. the Cape Winelands Cultural Landscape. In addition to declared areas, any other areas along the route that can be identified and are known to be sensitive would be considered.

Conflict with Town Planning

In instances where the proposed project is in conflict with the relevant planning policies and/or planned land-use, these locations were considered as no go areas, leading to a potential fatal flaw (e.g. Small Bay hosts mariculture rafts and lay up areas for diamond mining vessels. For these reasons, TNPA (Mrs Abigail Links Personal communication, 19 May 2014) advised that an LNG discharge facility could not be accommodated in Small Bay. Similarly, Saldanha Bay Municipality confirmed that the land located to the south of the Port of Saldanha is not earmarked for industrial development (Saldanha Bay SDF, 2011). The municipality plans to maintain the Big Bay coastal belt as a natural high conservation value buffer between the industrial area at the ore terminal and the recreation/residential areas south of Lynch Point (L Gaffley, Chief Town Planner Saldanha Bay Municipality, pers. comm.)

3.2.5.2 Environmental Sensitivity rating Criteria: Natural Environment

Sensitive habitats

This will be based on the National Biodiversity Assessment (NBA) which includes consideration of the CAPE, SKEP and STEP bioregional mapping. Critically endangered, Endangered, Vulnerable and Least threatened are being used as classes as defined by the IUCN. The presence of threatened vegetation types is an indicator for greater environmental sensitivity. Impacts on the least threatened category can be mitigated by following best practices in environmental management and are therefore considered to be of low sensitivity.

- Critically endangered (CR): Very High Sensitivity. It is extremely important to note that traversing CR ecosystems may turn out to be a *fatal flaw* after specialist inputs. All such cases will require discussions with the relevant authorities after field assessments.
- Endangered (EN): High Sensitivity
- Vulnerable (VU): Medium Sensitivity
- Least threatened (LT): Low Sensitivity

It is, however, essential to note that the scale of the NBA limits the level of detail and the resolution of the mapping so that the information provided in this assessment must be ground truthed as part of future studies. Assessment at a finer scale will require accordingly finer scaled data.

The sensitivity rating as described above may however increase based on the occurrence of CBAs, and NPAs, as well as the consideration of other conservation plans- and priorities, including the City of Cape Town Biodiversity network.

Regional water resource

Regional water resources are large water bodies forming part of the potable or irrigation water supply network in the affect areas, e.g. Voëlvlei Dam, Theewaterskloof Dam, Berg River Dam etc. These publicly owned resources would pose a significant obstacle to the pipeline. Moreover, give the strategic nature of these water resources, disruption to supply during either the construction or operational phase is unlikely to be acceptable. These are considered to have a high to very high environmental sensitivity.

River crossings

The NBA provides for a River Ecosystem Status of critically endangered, endangered, vulnerable and least vulnerable. These crossings have been assessed to be of low to medium sensitivity. The proposed pipeline also crosses river FEPA and Phase 2 rivers FEPA areas which are considered in the sensitivity analysis as high and medium sensitivity environments respectively.

This is applied for major rivers and, as far as possible, for perennial rivers. Non-perennial and dry river beds have not been included in detail in the screening assessment of the proposed pipeline route, but will have to be taken into account in any further detailed environmental investigations (including the legislated EIA process) that may ensue from the current studies.

It must be noted that the proponent may require a Water Use Licence from the Department of Water Affairs if any activities are within 32 m of a waterbody/watercourse or if the proposed pipeline route crosses a watercourse.

Wetlands

At the screening level it is acknowledged that not all the wetlands can be identified due to the complicated nature of wetlands, especially in the Fynbos Biome. Only existing databases will be utilised to identify wetlands. Additional, small and localized wetlands could be identified during the route determining stage of the proposed pipeline and would be addressed then. Specifically in this regard, the opportunity will be provided during the EIA to ensure that all wetlands along the proposed route have been identified. Wetlands were considered to be of very high sensitivity and it must be noted that the proponent may need to apply for a Water Use Licence from the Department of Water Affairs if any activities are within 32 m of a waterbody.

It is extremely important to note that traversing wetlands may however turn out to be a fatal flaw after specialist inputs. All such cases will require discussions with the relevant authorities after field assessments. The sensitivity rating as described above may however increase based on the occurrence of aquatic CBAs.

Heritage Resources

Archaeological resources would not be regarded as a fatal flaw (unless they fall within a known site) since the level of detail available at this stage would not be sufficient to pick up these sites. Furthermore, this may well be effectively avoided or minimised by an EIA route refinement or construction phase mitigation issue.

Areas sensitive to visual scarring

Visual scarring will depend on a range of factors, e.g. topography, viewshed, erosion potential etc. It is assumed that areas disturbed by the installation of the pipeline will be rehabilitated timeously after the trenches have been back-filled so that the sensitivity will mostly be low for the pipeline construction. No service roads will be required.

Visual scarring would therefore mainly apply to the proposed land-based LNG facility but there is at least one section where it would be highly visible and this is discussed in the screening assessment (Chapter 6).

3.2.5.3 Environmental sensitivity Criteria: Social Environment

Conflict with Town Planning
The IDP, SDF and Draft EMF of the Berg River, Saldanha Bay, Swartland, Drakenstein, Stellenbosch and City of Cape Town municipalities were reviewed during the screening assessment. Any impact, not considered as a fatal flaw, but which are in clear contradiction with the above-mentioned planning frameworks and plans will be regarded as being high to very high environmental sensitivity.

In instances where the proposed project could potentially be in conflict with the relevant planning policies or where rezoning and/or servitude expansion might be required; a medium sensitivity rating is given. If no conflict with existing planning policies is identified; a low sensitivity rating is applicable.

Deep-rooted crops
This criterion essentially covers orchards and vineyards, which cannot be replanted over the pipeline since their roots could potentially cause damage to pipeline infrastructure. Additionally, this criterion relates specifically to the permanent loss of existing deep-rooted crops and the permanent exclusion of the pipeline servitude from cultivation of these crop types. These areas are therefore anticipated to be of medium sensitivity.

Shallow-rooted crops
Agricultural land cultivated with annual and dryland crops, as well as irrigated planted pastures are mainly characterised by shallow roots that will not affect the below-ground pipeline infrastructure. These crops may also be easily restored and replanted following construction / maintenance and are predicted to be areas of low sensitivity.

Plantations
The primary impact of the proposed development on plantation resources is the loss of existing trees and the permanent exclusion of the pipeline servitude, where applicable. This loss would be restricted primarily to the damage done to the soil during excavation and to the reinstatement of the pipeline trench. Depending on the nature of the plantation, the sensitivity of the area will range from low to medium.

Tourism
Visual impacts associated with the proposed LNG facility may impact current and future tourism ventures.

3.2.6 Risk and Safety Criteria

In order to establish the impacts following an accident, it is necessary first to estimate: the physical process of the spill (i.e. nature of release, rate and size); the spreading of the spill; the evaporation from the spill; the 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.

The second step is then to estimate the consequences of a release on humans, fauna, flora and structures. This merely illustrates the significance and the extent of the impact in the event of a release. The consequences would be due to toxic and asphyxiant vapours, thermal radiation from fires or explosion overpressures. The consequence modelling gives an indication of the extent of the impact for selected events and is used primarily for emergency planning. A consequence that would not cause irreversible injuries would be considered insignificant, and no further analysis would be required. Table 3.2 describes the thermal radiation levels (pool fires, jet fires and flash fires) and the overpressures to be determined.

Table 3.2: Thermal radiation levels

Thermal Radiation Intensity (kW/m^2)	Limit
4	***Level that glass can withstand, preventing the fire entering a building, and that should be used for emergency planning.***
10	Level that represents the 1% fatality for 20 seconds of unprotected exposure and at which plastic and wood may start to burn, transferring the fire to other areas.
35	Level at which spontaneous ignition of hair and clothing occurs, with an assumed 100% fatality, and at which initial damage to steel may occur.
0.03	Critical overpressure causing windows to break
0.1	***10% of the houses being severely damaged and a probability of death indoors equal to 0.025 (no lethal effects are expected below 0.1 bar overpressure on unprotected people in the open)***
0.3	Structures being severely damaged and a probability of death equal to 1.0 for unprotected people in the open
0.7	An almost entire destruction of buildings and 100% fatality for people in the open

The consequence modelling addresses the impact of a release of hazardous materials without taking into account the probability of occurrence. This merely illustrates the significance and the extent of the impact in the event of a release.

The third step is therefore to determine the risk, taking into consideration the likelihood of various incidents to occur, including failure frequencies and ignition probabilities. The maximum individual risk (MIR) parameter is determined and the frequency of fatality is calculated for an individual who is presumed to be present at a specified location.

The evaluation of the acceptability of the risks is extended to the ALARP criteria of the UK Health and Safety Executive that covers land use based on the determined risks (HSE, 2011). In contrast to the employees in a plant, who may be assumed to be healthy, the adopted exposure assessment applies to an average population group that also includes sensitive subpopulations.

The three zones are defined as follows: the inner zone (greater than $1x10^{-5}$ fatalities per person per year); the middle zone ($1x10^{-5}$ fatalities per person per year to $1x10^{-6}$ fatalities per person per year);

and, the outer zone ($1x10^{-6}$ fatalities per person per year to $3x10^{-7}$ fatalities per person per year). The risks decrease from the inner zone to the outer zone as shown in Figures 3.1 and 3.2.

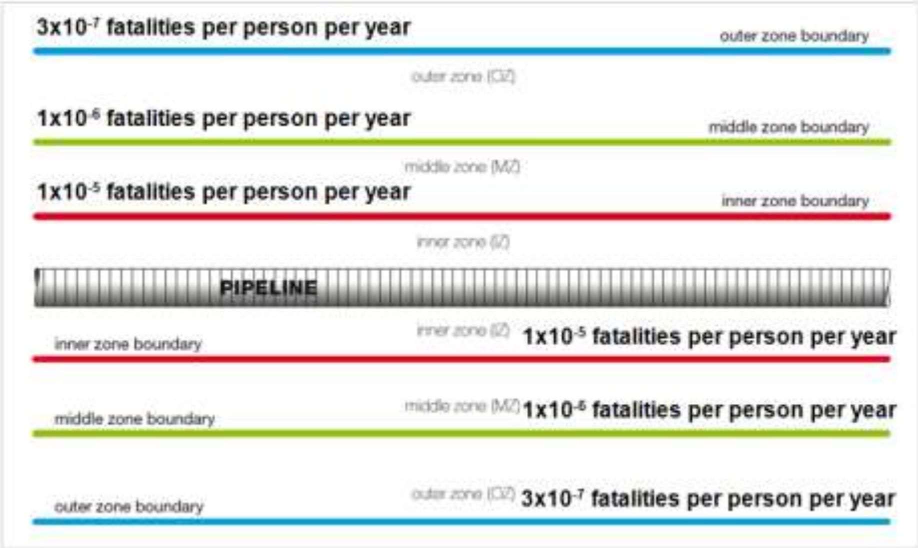

Figure 3.1: Town-planning zones for pipelines

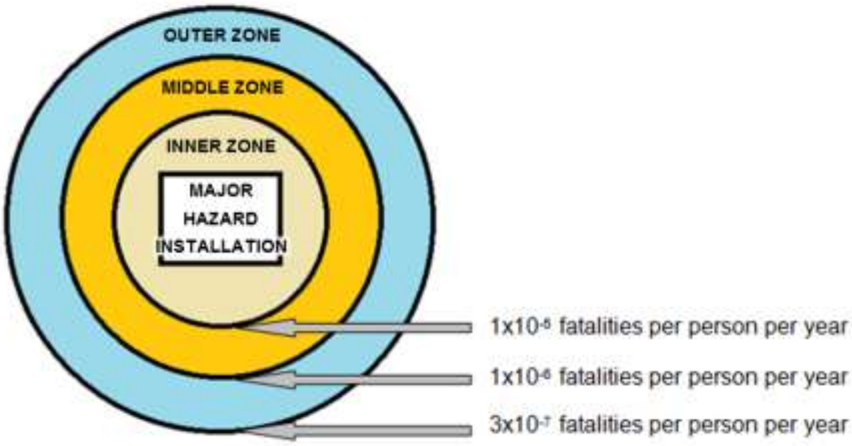

Figure 3.2: Town-planning zones

Once the zones are calculated, the HSE (UK) methodology then determines whether a development in a zone should be categorised as 'advised against' (AA) or as 'don't advise against' (DAA), depending on the sensitivity of the development, as indicated in Table 3.3. There are no land-planning restrictions beyond the outer zone.

Table 3.3: Land-use decision matrix

Level of Sensitivity	Development in Inner Zone	Development in Middle Zone	Development in Outer Zone
1 - Workers who have been advised of the hazards and trained accordingly	DAA	DAA	DAA
2 - General public at home and involved in normal activities	AA	DAA	DAA
3 - Vulnerability of members of the public	AA	AA	DAA
4 - large examples of Level 2 and of Level 3	AA	AA	AA

3.3. CSIR TEAM

The CSIR has been appointed by the Western Cape Government to undertake an environmental screening study and assist in identifying issues and possible fatal flaws. The approach of the CSIR study is to utilise a small expert team with extensive general knowledge on environmental impacts related to gas pipelines. The environmental screening team which was involved in the Process is listed in Table 3.4.

Table 3.4: CSIR Environmental Screening Team

Paul Lochner	**CSIR**	**Project Leader (EAPSA Certified)**
Annick Walsdorff	CSIR	Project Manager
SPECIALIST TEAM		
Dr David Le Maitre	CSIR	Advisor on terrestrial and aquatic ecology
Pat Morant	CSIR	Marine and coastal environment
Dr Jayson Orton	ASHA Consulting	Heritage assessment
Luanita van der Walt	CSIR	GIS specialist and terrestrial ecology
Surina Brink	CSIR	Aquatic ecology assessment
Rudolph du Toit	CSIR	Social assessment and town planning
Mike Oberholzer	Riscom Ltd	Qualitative risk and safety assessment

Western Cape Government

BETTER TOGETHER.

Environmental screening study for a proposed LNG terminal at Saldanha and associated pipeline infrastructures to Atlantis and Cape Town, Western Cape, South Africa.

Chapter 4: Overview of Applicable Legal Requirements

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CHAPTER 4. OVERVIEW OF APPLICABLE LEGAL REQUIREMENTS

National, provincial and municipal legislation as well as various policy and guidelines will be applicable to the proposed project and would need to be considered during the development and design of the project. A broad outline of the environmental legislation applicable to the project is outlined below:

4.1. NATIONAL LEGISLATION

4.1.1 The Constitution of the Republic of South Africa (Act no. 108 of 1996)

South African law, including environmental law, is strongly influenced by the Constitution (No. 108 of 1996). Chapter 2, Section 24 (a) states that:

"Everyone has the right -

a) To an environment that is not harmful to their health or well-being; and
b) To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that
    i. Prevent pollution and ecological degradation;
    ii. Promote conservation; and
    iii. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

This section within the Constitution of the Republic of South Africa forms the basis of the environmental framework and management in South Africa.

4.1.2 The National Environmental Management Act (Act no. 107 of 1998)

NEMA is the primary piece of environmental management legislation in South Africa. It has as its primary objective to make provision for cooperative governance by establishing principles for decision making on matters affecting the environment, on the formation of institutions that will promote cooperative governance and on establishing procedures for coordinating environmental functions exercised by organs of state as well as to provide for matters connected therewith (Government Gazette 1998).

NEMA provides regulation on the management of the environment, but it also provides the ethical principles which should inform environmental management. Accordingly, port expansion activities will either trigger the NEMA regulations for an EIA process or, at the very least, its ethical principles will need to be considered as a guide to development within the constraints of what the environment can permit on a sustainable basis.

Section 30 of the NEMA act deals with the control of emergency incidents where an "*incident*" is defined as an "*unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed*".

The act defines "*pollution*" as *"any change in the environment caused by:*

(i) *Substances;*

(ii) *Radioactive or other waves; or*

(iii) *Noise, odours, dust or heat…*

Emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or wellbeing or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future… "

"*Serious*" is not fully defined but would be accepted as having long lasting effects that could pose a risk to the environment or to the health of the public that is not immediately reversible.

This is similar to the definition of a Major Hazard Installation as defined in the Occupational Health and Safety Act (OHS Act) 85 of 1993 and its Major Hazard Installation (MHI) regulations.

Section 28 of NEMA makes provision for anyone who causes pollution or degradation of the environment being made responsible for the prevention of the occurrence, continuation or reoccurrence of related impacts and for the costs of repair of the environment. In terms of the provisions under Section 28 that are stated as:

"Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped…"

4.1.3 The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)

The Act provides for the protection and conservation of ecologically viable areas representative of South Africa's biodiversity and its natural landscapes and seascapes. It distinguishes between several categories of protected area: special nature reserves, national parks, nature reserves, and protected environments. Protected areas can be declared on state-owned land or through contractual agreements with private or communal landowners. In other words, protected areas are not necessarily managed by government.

Section 48A ''Restriction of activities in marine protected areas" states the following:

(1) Despite any other legislation, no person may in a marine protected area—

(a) fish or attempt to fish;

(b) take or destroy any fauna or flora;

(c) undertake any dredging or extraction of sand, rock, gravel or minerals unrelated to any activities referred to in section 48(1);

(d) discharge or deposit waste or any other polluting matter;

(e) in any manner which results in an adverse effect on the marine environment, disturb, alter or destroy the natural environment or disturb or alter the water quality or abstract sea water;

(f) carry on any activity which may have an adverse effect on the ecosystem of the area;

(g) construct or erect any building or other structure on or over any land or water within such a marine protected area;

(h) carry on marine aquaculture activities;

(i) engage in bio-prospecting activities;

(j) sink or scuttle any platform, vessel or other structure; or

(k) undertake mineral exploration, and production of petroleum and other fossil fuels.

4.1.4 The 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 National Environmental Management Act, 1998; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; the establishment and functions of a South African National Biodiversity Institute; and for matters connected therewith.

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

The integrated coastal management promotes the use of defensible scientific information in conjunction with the principles of cooperative governance in order to achieve sustainable coastal development. Successful ICM is often characterised by extensive public consultation and democratic decision-making, a concept that is also entrenched in the Constitution of South Africa, a theme which also runs throughout the ICM Act.

4.1.6 National Water Act (Act 36 of 1998)

The National Water Act, provides the legal framework for the effective and sustainable management of our water resources. The Act was published in 1998 with the aim of fundamentally reforming the past laws relating to water resources which were discriminatory and not appropriate to South African conditions. Central to the National Water Act is the recognition that water is a scarce and precious resource that belongs to all the people of South Africa. It also recognises that the ultimate goal of water resource management is to achieve the sustainable use of water for the benefit of all South Africans. The Act aims to protect, use, develop, conserve, manage and control water resources as a whole, promoting the integrated management of water resources with the participation of all stakeholders.

4.1.7 The National Heritage Resources Act (Act no. 25 of 1999)

The National Heritage Resources Act (NHRA) aims to promote the effective management of the national estate, and to promote communities to conserve their legacy so that future generations may also be able to experience it. The Act's goal is to introduce an integrated and interactive system of the management of national heritage resources. The Act protects a variety of heritage resources as follows:

- Section 34: structures older than 60 years;
- Section 35: palaeontological, prehistoric and historical material (including ruins) more than 100 years old;
- Section 36: graves and human remains older than 60 years and located outside of a formal cemetery administered by a local authority; and
- Section 37: public monuments and memorials.

Following Section 2, the definitions applicable to the above protections are as follows:

- Structures: "any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith";
- Palaeontological material: "any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace";
- Archaeological material: a) "material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures"; b) "rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation"; c) "wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation"; and d) "features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found";
- Grave: "means a place of interment and includes the contents, headstone or other marker of such a place and any other structure on or associated with such place"; and
- Public monuments and memorials: "all monuments and memorials a) "erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government"; or b) "which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual."

While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list "historical settlements and townscapes" and "landscapes and natural features of cultural significance" as part of the National Estate. Furthermore, Section 3(3) describes the reasons a place or object may have cultural heritage value.

Section 38 (1) (Heritage resources management) of the NHRA, states that any person who intends to undertake a development which exceeds 5000m^2 in extent or 300m in length must notify the responsible heritage resources authority, the South African Heritage Resources Agency (SAHRA) or the relevant provincial heritage agency, Heritage Western Cape. Furthermore, in terms of Section 34 (1) of the NHRA, no person may alter or demolish any structure or part of a structure which is older than 60 years without receiving approval from the relevant heritage resources authority.

There would be no heritage permit requirements for implementation of this project. At present the Department of Heritage Western Cape is in a transition phase whereby permits that were required by mitigating palaeontologists and archaeologists under Section 35 of the NHRA are being done away with because commenting occurs under Section 38 and HWC is not the decision-making authority. An application will still need to be made in order for HWC to capture the information required before the mitigation might proceed. At present such permits are only in the name of the contracted palaeontologist or archaeologist and have no bearing on the outcome of any decision relating to the project – they would only be issued to the consultant post-authorisation if and when pre-construction mitigation is required. Therefore, if any archaeological or palaeontological sites do require mitigation, the archaeologist and/or palaeontologist will need to obtain the relevant permit / clearance from HWC.

4.1.8 National Ports Act (Act no. 12 of 2005)

The mainstay of the South African ports regulatory framework is the National Ports Act (Act 12 0f 2005) which creates a comprehensive institutional, operational and regulatory framework for port development and management. All development within the Port of Saldanha will be subject to the regulation of the National Ports Act.

The objects of this Act are to-

Promote the development of an effective and productive South African ports industry that is capable of contributing to the economic growth and development of our country:

a) Establish appropriate institutional arrangements to support the governance of ports;
b) Promote and improve efficiency and performance in the management and operation of ports;
c) Enhance transparency in the management of ports;
d) Strengthen the State's capacity to-
e) Separate operations from the landlord function within ports;
f) Encourage employee participation, in order to motivate management and
g) Facilitate the development of technology, information systems and managerial expertise through private sector involvement and participation; and

h) Promote the development of an integrated regional production and distribution system in support of government's policies.

This proposed project clearly falls under the National Ports Act as per the definition of the act below:

" ...*'**port terminal**' means terminal infrastructure, cargo-handling equipment, sheds and other land-based structures used for the loading, storage, transhipment and discharging of cargo or the embarkation and disembarkation of passengers...* "

The National Ports Act states that Transnet is responsible for the land development as well as the health and safety of people within the ports area.

4.1.9 The Occupational Health and Safety Act No. 85 of 1993 and Major Hazard Installation Regulations

The Occupational Health and Safety Act and its associated Major Hazard Installation (MHI) Regulations (July 2001) require employers, self-employed persons and users, who have on their premises, either permanently or temporarily, a MHI or a quantity of a substance which may pose a risk that could affect the health and safety of employees and the public, to conduct a risk assessment in accordance with the legislation.

The OHS Act shall not apply in respect of:

" a) A mine, a mining area or any works as defined in the Minerals Act, 1991 (Act No. 50 of 1991), except in so far as that Act provides otherwise;

b) Any load line ship (including a ship holding a load line exemption certificate), fishing boat, sealing boat and whaling boat as defined in Section 2 (1) of the Merchant Shipping Act, 1951 (Act No. 57 of 1951), or any floating crane, whether or not such ship, boat or crane is in or out of the water within any harbour in the Republic or within the territorial waters thereof, (date of commencement of paragraph (b) to be proclaimed.), or in respect of any person present on or in any such mine, mining area, works, ship, boat or crane. "

While the OHS Act has made provision for excluding the application of the act on shipping activities, Clause 78 (see below) of the Government Notice 255 Ports Rules (March 2009) requires compliance of the OHS Act and its regulations.

"78. Occupational health and safety legislation

All persons, including service providers, terminal operators, drivers of transport vehicles, employers, lessees and visitors within port limits, must comply with the provisions of any legislation relating to occupational health and safety matters, including the Merchant Shipping Act No. 57 of 1951, the Occupational Health and Safety Act No. 85 of 1993 and its regulations, the Maritime Safety Regulations of 1994, the IMDG Code and the National Road Traffic Act No. 93 of 1996. "

4.1.10 Major Hazard Installation Regulations

The Major Hazard Installation (MHI) regulations (July 2001) published under Section 43 of the Occupational Health and Safety Act (OHS Act) require employers, self-employed persons and users who have on their premises, either permanently or temporarily, a major hazard installation or a quantity of a substance which may pose a **risk** (our emphasis) that could affect the health and safety of workers and the public to conduct a risk assessment in accordance with the legislation. In accordance with legislation, the risk assessment must be done by an approved inspection authority (AIA), which is registered with the Department of Labour and accredited by the South African Accreditation Systems (SANAS), **prior to construction of the facility**.

Similar to Section 30 of NEMA as it relates to the health and safety of the public, the MHI regulations are applicable to the health and safety of workers and the public in relation to the operation of a facility and specifically in relation to sudden or accidental major incidents involving substances that could pose a risk to the health and safety of workers and the public.

It is important to note that the MHI regulations are applicable to the risks posed and not merely the consequences. This implies that both the consequence and likelihood of an event need to be evaluated, with the classification of an installation being determined on the risk posed to the employees and the public.

The notification of the MHI is described in the regulations as an advertisement placement and specifies the timing of responses from the advertisement. It should be noted that the regulation does not require public participation.

The regulations, summarised in Appendix 2, essentially consist of six parts, namely:

1. The duties for notification of a Major Hazard Installation (existing or proposed), including:
   a. Fixed;
   b. Temporary installations;
2. The minimum requirements for a quantitative risk assessment (QRA);
3. The requirements for an on-site emergency plan;
4. The reporting steps for risk and emergency occurrences;
5. The general duties required of suppliers;
6. The general duties required of local government.

4.1.11 Pressure Equipment Regulations

These regulations apply to the design, manufacture, operation, repair, modification, maintenance, inspection and testing of pressure equipment, with a design pressure equal to or greater than 50 kPa with view of health and safety.

4.2. MUNICIPAL PLANS AND FRAMEWORKS

4.2.1 Integrated Development Plans (IDPs)

The proposed facility and pipeline distribution network will be constructed across various municipal juridical areas and therefore requires cognisance and alignment to the relevant IDPs. IDPs are developed by district and local municipalities and have a lifespan of 5 years. IDPs include a Development Plan and details projects that should be undertaken within the 5 years to ensure that the development objectives of the municipality are met. Any project that is proposed within the municipality should be in line with the IDP of the municipality in which the project occurs.

4.2.2 Spatial Development Frameworks (SDFs)

The Municipal Systems Act 2000 (Act 32 of 2000), explains the purpose of an SDF as the provision of general direction to inform decision-making on an on-going basis, with the aim of creating integrated, sustainable and habitable regions, cities, towns and residential areas. The SDF is a key document within the IDP and gives effect to the goals and objectives set within an IDP.

4.3. LNG CODES AND STANDARDS

The codes and standards proposed for this project are given in Appendix 1. However, no codes or standards have been specifically related to LNG. European standards relating to LNG are listed as follows:

- EN 1160 outlines installations and equipment for liquefied natural gas (general characteristics of liquefied natural gas);
- EN 1473 installations and equipment for liquefied natural gas (design of onshore installations);
- EN 1474 outlines installations and equipment for liquefied natural gas, Part 1: design and testing of loading and unloading arms; Part 2: design and testing of LNG hoses; Part 3: design and testing of offshore LNG transfer systems;
- EN 1532 outlines installations and equipment for liquefied natural gas(ship to shore interface);
- EN 12065 outlines testing of foam concentrates designed for generation of medium and high expansion foam and of extinguishing powders used on LNG fires;
- EN 12066 outlines testing of insulating linings for LNG impounding areas;
- EN 12308 outlines suitability testing of gaskets designed for flanged joints used on -LNG piping;
- EN 12838 outlines suitability testing of LNG sampling systems;
- EN 13645 outlines design of onshore installations with a storage capacity between 5 t and 200 t.

EN 1473 is the most comprehensive of the European standards and is intended to be used for large onshore LNG installations. The purpose and application of this EN standard is to give guidelines for the design, construction and operation of all onshore liquefied LNG installations including those for the liquefaction, storage, vaporisation, transfer and handling of LNG.

The standard used in the US follows:

- NFPA 59Aoutline the standard for the production, storage and handling of liquefied natural gas (LNG).

4.3.2 SANS 347 Categorisation and Conformity Assessment Criteria for all Pressure Equipment

This standard specifies the criteria to be used for the categorization and conformity assessment of pressure equipment (metallic and non-metallic) for use by but not limited to the manufacturer, users, certification bodies and approved inspection authorities. This standard is also applicable to the certification, re-certification, modification or repair of pressure equipment (metallic and non-metallic), as defined by the relevant statutory regulations for pressure equipment. In Annex A of SANS 347:2012, there is a schedule of health and safety standards approved by the Department of Labour. Application of the selected health and safety standards in their entirety becomes mandatory under the provisions of the PER.