THE PROPOSED DEVELOPMENT OF PHASE 2 OF THE TETRA NATURAL GAS PROJECT NEAR VIRGINIA IN THE FREESTATE PROVINCE

LANDSCAPE & VISUAL IMPACT ASSESSMENT REPORT

OCTOBER 2022

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ENVIRONMENTAL PLANNING AND DESIGN

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1 INTRODUCTION

1.1 GENERAL

In 2012, a Production Right (Ref: 12/4/1/07/2/2) was granted which spans approximately 187 000 hectares for the development of natural gas (Helium and Methane) production operations around the town of Virginia in the Free State Province. Within the approval of the Production Right, the 2010 Environmental Management Programme (EMPr) was approved which is applicable to a large portion of the Production Right area.

The activities in the Production Right include:

- Continued exploration activities;
- Drilling and establishment of further production wells throughout the entire production area (260 production wells);
- Installation of intra-field pipelines throughout the entire production area (~500km);
- Installation of boosters and main compressors; and
- Central gas processing plant (not approved in the original EIA and approved EMPr).

On 21 September 2017, the Department of Mineral Resources and Energy (DMRE) issued an integrated environmental authorisation ("Cluster 1 EA") (reference: 12/04/07) to Tetra4 in terms of the NEMA. The Cluster 1 EA (as amended by Cluster 1 EA amendments dated 26 August 2019 and 1 September 2020) authorises the development of "Cluster 1" of the Project.

Tetra4 now wishes to expand the natural gas operations, to be located within the approved production right area and around the Cluster 1 project. Cluster 2 gas production activities are now under consideration.

This Landscape and Visual Impact Assessment Report forms part of the Environmental Impact Assessment process that is being undertaken for the proposed Tetra4 Cluster 2 proposal which consists of and extension of the existing Phase 1 Gas Field and Production Plant.

The Environmental Impact Assessment process is being undertaken by Environmental Management Services (Pty) Ltd.

1.2 PROJECT LOCATION

The proposed Cluster 2 development will take place over approximately ~25 000ha. This area overlaps with Cluster 1 which is approximately ~17 000ha

The approximate geographic coordinates of the centre of the proposed Phase 2 development area are;

South	28^0	09'	52.31"
East	26^0	44'	11.01"

No site alternatives are under consideration, however there is flexibility in the development layout to take account of physical and social environmental factors.

Refer to Map 1, Project Area and Map 2 for an indication of how the currently proposed Project Cluster 2 area relates to the authorised Cluster 1.

1.3 BACKGROUND OF SPECIALIST

Jon Marshall (Pr. LArch, CMLI, Dip LA) qualified as a Landscape Architect in 1978. He has been a Chartered Member of the Landscape Institute (UK) since 1986. He is also a registered Landscape Architect and has extensive experience of environmental impact assessment in South Africa.

During the early part of his career (1981 – 1990) he worked with Clouston (now RPS) in Hong Kong and Australia. During this period he was called on to undertake visual impact assessment input to numerous environmental assessment processes for major infrastructure projects. This work was generally based on photography with line drawing superimposed to illustrate the extent of development visible.

He worked in the United Kingdom (1990 – 1995) for major supermarket chains including Sainsbury's and prepared CAD based visual impact assessments for public enquiry for new store development. He also prepared the VIA input to the environmental statement for the Cardiff Bay Barrage for consideration by the UK Parliament in the passing of the Barrage Bill (1993).

His more recent VIA work in Africa (1995 to present) includes a combination of CAD and GIS based work for a new international airport to the north of Durban, new heavy industrial operations, overhead electrical transmission lines, mining operations, a number of commercial and residential developments as well as numerous renewable energy projects.

VIA work undertaken during the last eighteen months includes assessments for several proposed tourism developments in National Parks, numerous solar power projects, as well as two wind energy projects.

A brief CV is attached as **Appendix I** for information.

1.4 BRIEF AND RELEVANT GUIDELINES

The brief is to determine the sensitivity of the affected landscape and review the possible nature of landscape and visual impacts that the proposed project could result in and specifically to;

- Characterise the affected landscape;
- Identify potential sensitive landscapes and receptors that may be impacted by the proposed facility and the types of impacts that are most likely to occur; and
- Provide sensitivity mapping identifying 'No-Go' areas, and areas for development that will minimise landscape and visual impacts.

Work has been undertaken in accordance with the following guideline documents;

a. The Government of the Western Cape Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (Western Cape Guideline), which is the only local relevant guideline, setting various levels of assessment subject to the nature of the proposed development and surrounding landscape, and

b. The Landscape Institute and Institute of Environmental Management and Assessment (UK) Guidelines for Landscape and Visual Impact Assessment which provides detail of international best practice (UK Guidelines).

Refer to **Appendix II** for the Western Cape Guideline.

This specialist report and assessment has been undertaken in accordance with Appendix 6 of the EIA Regulations, as amended (GN No. 326 of 7 April 2017).

1.5 LIMITATIONS AND ASSUMPTIONS

The following limitations and assumptions should be noted:

A site visit was undertaken over a two day period (21st and 22nd February 2022).

The timing of photography was planned to ensure that the sun was as far as possible behind the photographer to ensure that as much detail as possible was recorded in the photographs.

GIS data sets used in the assessment are either available on line to the public or have been sourced from relevant government departments.

Photographs were taken with a Canon EOS M50 camera fitted with a 22mm lens.

The following GIS data sets were used in undertaking and presenting the assessments:

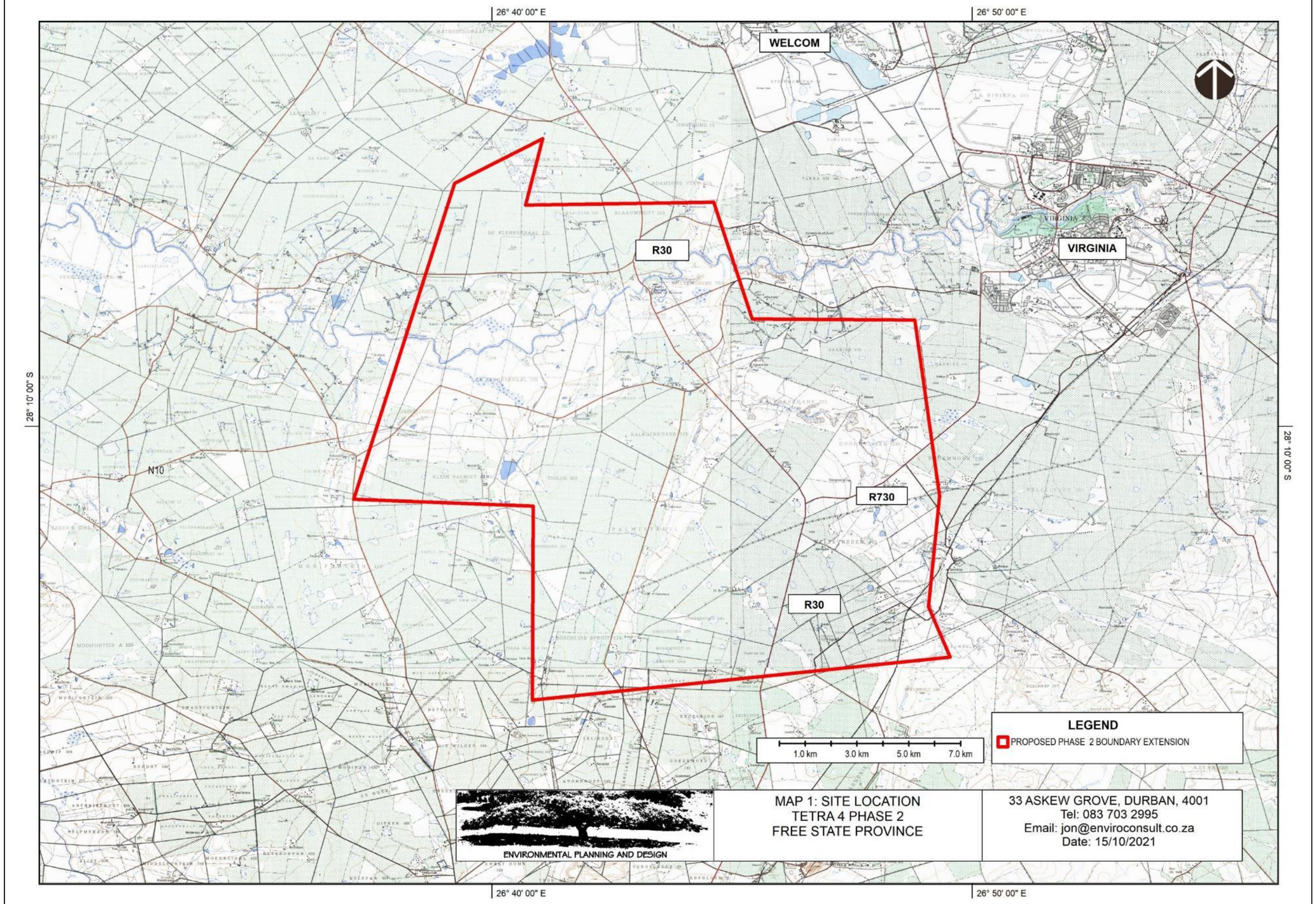
DATA SET	SOURCE	YEAR
South Africa Protected Areas Database (SAPAD)	Department of Environmental Affairs	2021
SRTM Worldwide Elevation Data	CIAT-CCAFS	2018
World Imagery	ESRI	2009 (updated 2021)
SA NLC (National Land Cover)	Department of Environmental Affairs	2018
1:50,000 raster mapping	Chief Directorate National Geo-Spatial Information of South Africa	Unknown
South African rivers in drainage region ALL	Department of Water Affairs	2012
Free State Cadastral	Chief Surveyor-General, Department of Rural Development and Land Reform	August 2021 (last updated)
Update of vegm2009	South African National Biodiversity Institute	2015
South Africa /Lesotho Roads	Open Street Map	2014

Visibility of the proposed facilities has been assessed using the Global Mapper Viewshed tool.

The majority of data sets have been used for assessment context. These have largely been sourced from government departments. Whilst these have been mainly mapped at national scale they were found to be largely sufficient to provide context for the assessment. Where additional detail was required, such as the location of local roads and homesteads, this was mapped on site and / or captured from online mapping.

The visibility assessments were based on terrain data that has been derived from satellite imagery (STRM Worldwide Elevation Data). This data was originally prepared by NASA and is freely available on the CIAT-CCAFS website (http://www.cgiar-csi.org). This data has been ground truthed using a GPS as well as online mapping. This is the key data on which the definition of possible affected landscapes and receptors was based and is considered sufficient for this purpose.

Calculation of visibility is based purely on the Digital Elevation Model and does not take into account the screening potential of vegetation or other development.


26° 40' 00" E
26° 50' 00" E
28° 10' 00" S
WELCOM
R30
VIRGINIA
N10
R730
R30
LEGEND
PROPOSED PHASE 2 BOUNDARY EXTENSION
1.0 km
3.0 km
5.0 km
7.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 1: SITE LOCATION
TETRA 4 PHASE 2
FREE STATE PROVINCE
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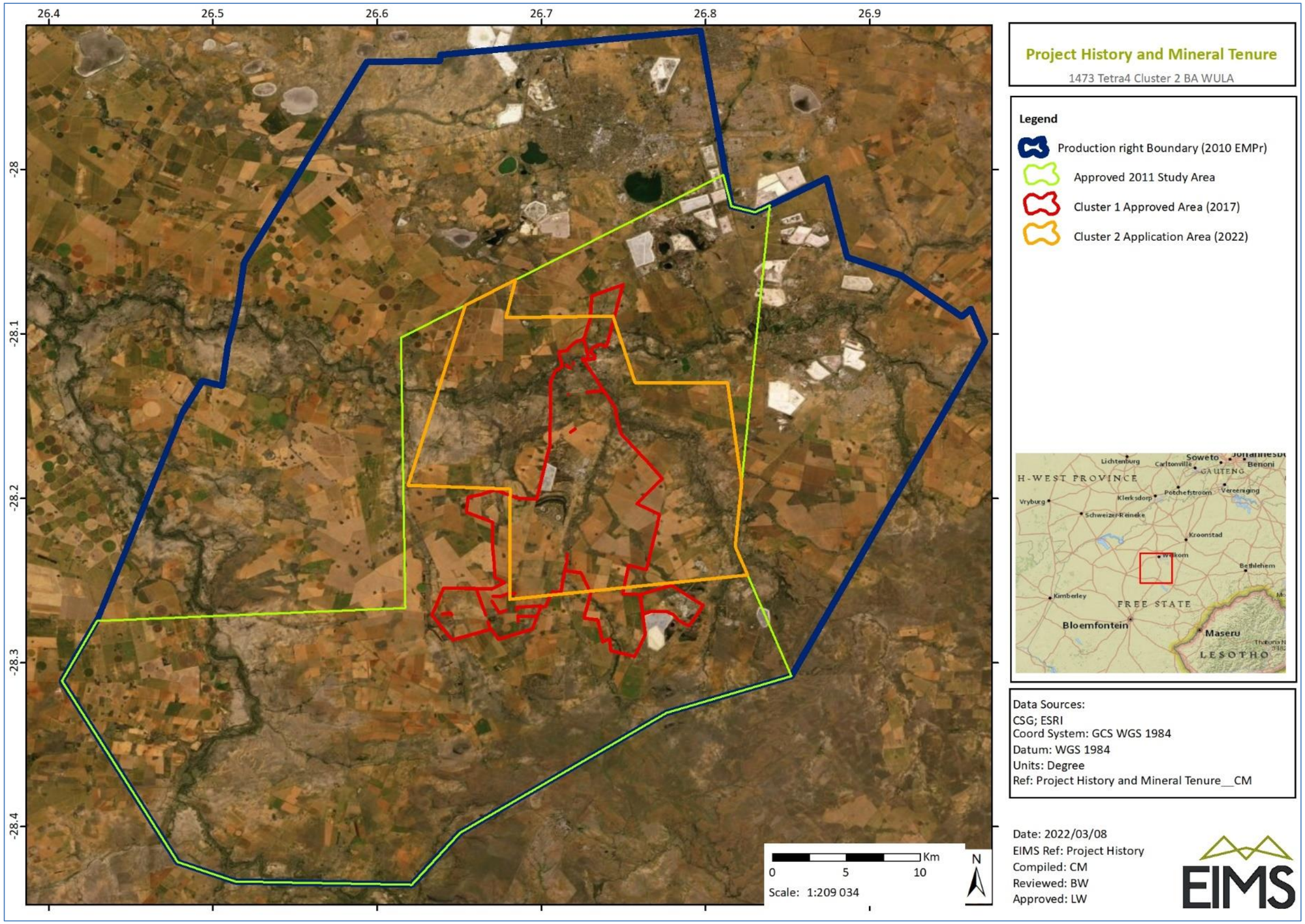


MAP 2 – AUTORISED CLUSTER 1 AND PROPOSED CLUSTER 2

2. PROJECT DESCRIPTION

A detailed project description is included within EIMS documentation. Extracts from the detailed project description that relate to either location or description of elements that could contribute to landscape and / or visual impact are included in this document.

2.1 PROJECT OVERVIEW

Gas production encompasses the exploration for gas resources with specific focus on existing geological fractures followed by the extraction of gas through production wells. From the production wells, a gas gathering network of pipes, booster stations, metering stations, pigging stations and compressor stations transports the gas to the LNG/LHe Plant where gas processing, storage and distribution is undertaken.

Tetra4 is authorized to develop the following as part of Cluster 1:

- 19 wells;
- A CNG / Helium gas production plant; and
- Interconnecting pipelines.

This section of the project is nearing completion and is soon to be commissioned.

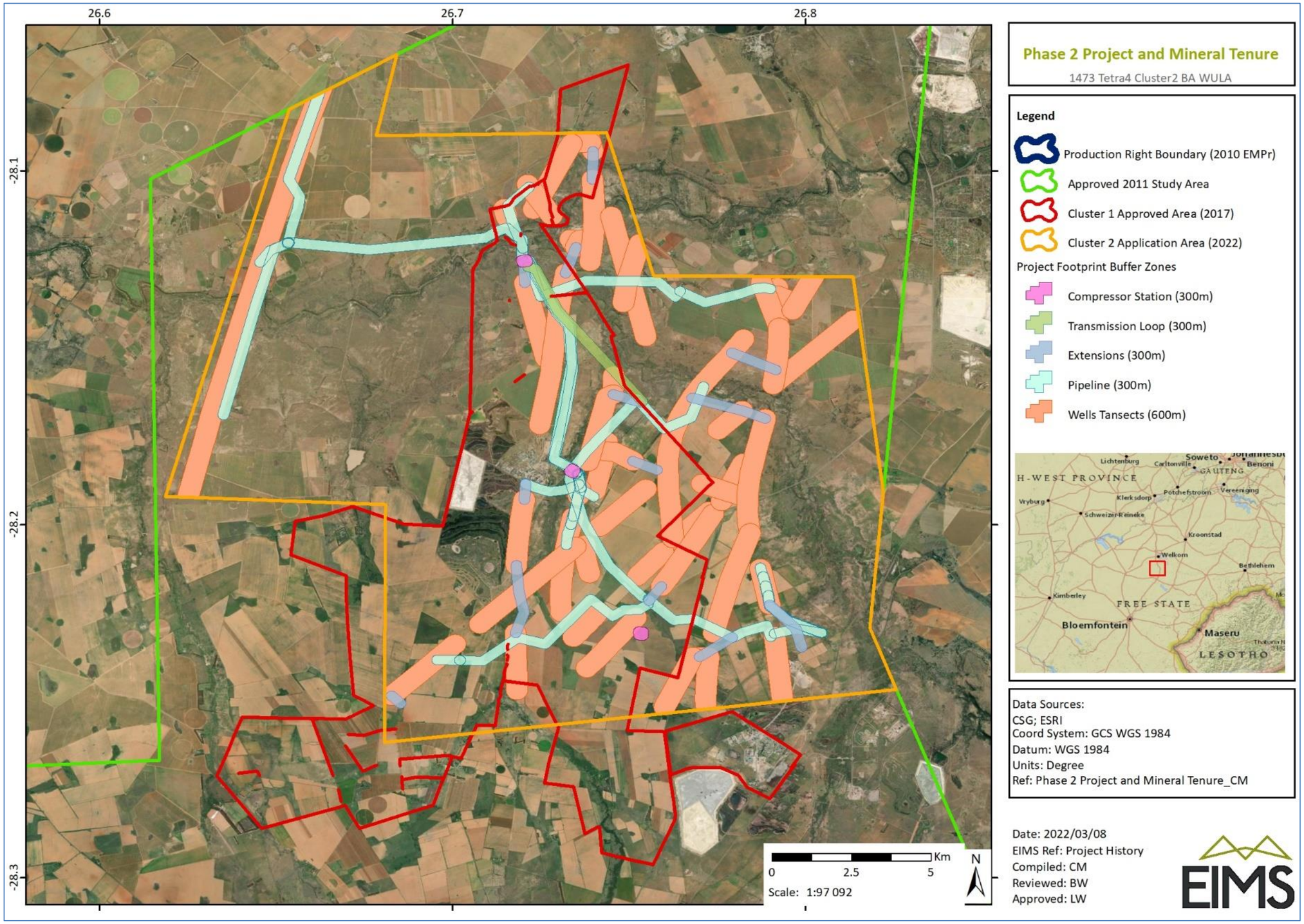
The planned Cluster 2 expansion to the existing approved production activities will involve up to 300 new production wells, gas transmission pipelines and associated infrastructure, 3 compressor stations and an additional new combined Liquid Natural Gas (LNG) and Liquid Helium (LHe) plant ("LNG/LHe Plant") and associated infrastructure, as well as powerlines as part of the Cluster 2 expansion of the Project in order to meet the future production requirements.

Because the final layout will be subject to the well location which will be subject to how exploratory drilling intercepts the gas bearing fault lines, the exact location of the various elements can not be confirmed. In order to accommodate the necessary layout flexibility therefore, buffer areas within which the necessary infrastructure will be developed have been defined.

The following buffer widths are considered:

- Wells – 600m;
- Compressor Stations – 300m;
- Pipelines – 300m; and
- Transmission Loop – 300m.

The Cluster 2 study area and infrastructure buffer zones are presented overleaf.



MAP 3 –CLUSTER 2, PROJECT FOOTPRINT AND BUFFER ZONES

2.2 EXPLORATION BOREHOLES AND WELLS

Exploration wells will be drilled and, if successful, converted into production wells. As the exact location of exploration well drilling cannot be identified at this stage, this study has followed the approach of assessing well corridors (600m wide or 300m on either side of known target fault lines). Exploration drilling entails the use of a truck, trailer or skid mounted percussion or diamond drill rig to drill to varying depths (~380m to ~880m) along known fault lines in order to strike the gas reserve.

A drilling rig will be used to sink exploration boreholes. These may be vertical or inclined boreholes subject to the relative location of the anticipated fault line.

In the event that an exploration borehole proves unsuccessful it will be sealed and cased and the area rehabilitated. In the event that an exploration borehole proves successful it will be converted into a production well and added to the network of gas producing wells for Cluster 2.

Due to low gas pressures in the wells, groups of ~10 wells will be included as an inlet to a booster station to provide vacuum suction. The booster stations will be connected via pipelines to centralised infield reciprocating gas compressor stations.

Three compressor stations are proposed (CS1, CS2 and CS3). An alternative location is under consideration for CS3.

The drilling operation during exploration will disturb an area of approximately 50m x 50m.

When developed, the production well footprint will cover an relatively small area.

Production wells will be placed within a secured precast well chamber with manhole for access. Minimal mechanical infrastructure will be placed within the precast well chamber other than the wellhead, connecting pipeline, an isolation valve and sample point. The surface infrastructure for the manhole would be 1,4m x 1,1m and the manhole surface height will be 0,25m.

Wells will not require fencing and will not be lit.

PLATE 1 – TYPICAL AREA OF DISTURBANCE FOLLOWING DRILLING OF EXPLORATION BOREHOLE
Image sourced from EIMS

PLATE 2 – TYPICAL CLUSTER 2 WELL INSTALLATION
Image sourced from EIMS

2.2 PIPELINES

Due to low gas pressures in the wells, groups of ~10 wells will be included as an inlet to a booster station to provide vacuum suction. The booster stations will be connected via pipelines to centralised infield reciprocating gas compressor stations. Pipelines will

be a combination of high-pressure steel as well as low-pressure high-density polyethylene (HDPE) and is installed at a minimum depth of 1.5m below the plough line. The pipeline will be installed using a back-actor and TLB. Where piping (e.g. for the compressors and driers) will be brought to surface, a 110 mm steel piping of approximately 10 m – 30 m will be utilised instead.

Servitude corridors will be maintained free of woody plants in order to prevent disturbance by root growth and ensure access by Tetra4 personnel for regular inspection and infrequent maintenance.

Pipelines will be marked with concrete markers and will have inspection chambers at strategic locations for testing and pipeline maintenance.

Low point drains will also be installed as required. These are comprised of inspection chambers that allow for maintenance.

PLATE 3 – TYPICAL PIPELINE SERVITUDE
Image sourced from EIMS

PLATE 4 – LOW POINT DRAIN
Image sourced from EIMS

2.3 GAS INLINE STATIONS

In order to transport gas via pipelines from the wellheads to the Plant, various inline infrastructure is required to monitor, measure and control gas flow through the pipelines and this includes booster stations, pigging stations and compressor stations.

Localised inline gas booster stations will be installed for each cluster of 7-10 wells which will feed pressurised gas via pipelines from the production wells to the compressor stations. The booster stations will occupy an area of approximately 10 m x 14m and a total of 28 booster stations may be constructed.

Inline pigging stations are installed to allow for regular cleaning and inspection of the pipelines. The pigging stations allow for insertion of probes or cleaning pigs (plugs) at regular intervals in order to perform regular maintenance.

PLATE 5 – VIEW OF EXISTING CLUSTER 1 PIGGING STATION
Image sourced from EIMS

PLATE 6 – VIEW OF EXISTING CLUSTER 1 COMPRESSOR STATION
Image sourced from EIMS

2.4 COMBINED HELIUM AND LIQUID NATURAL GAS PLANT

Feed gas from the centralised reciprocating infield compressor stations will be discharged into the combined LNG/LHe Plant. The LNG/LHe facility is a modularized facility to convert the Feed Gas into LNG, LHe and to provide fuel gas for future power generation. The power generation will be a separate project and is not included in this application process.

The Cluster 2 LNG/LHe Plant will be constructed directly adjacent to the Cluster 1 plant which is currently under construction on the remaining extent of the farm Mond Van Doornrivier 38.

The LNG and LHe products will be loaded to trucks for distribution to users.

The LNG/LHe plant comprises of the following process units:

- Gas Treatment and Boosting System;
- Helium Separation Unit;
- Gas Liquefaction System;
- LHe Storage (~2x100m^3);
- LNG Storage (~11x300m^3); and
- LHe and LNG loading bays.

The area occupied by the proposed Cluster 2 LNG/LHe plant in the operational phase is approximately 9ha while additional areas are required during the construction phase for various contractor laydown areas, offices, parking, etc. Approximately 19.9Ha will be required for various laydown areas of which approximately 10.3Ha will be temporary for use during the construction period only and 9.6Ha will be permanent.

PLATE 7 – EXISTING PHASE 1 TETRA 4 COMBINED HELIUM AND LIQUID NATURAL GAS PLANT

As the plant is operational 24 hours a day, lighting will illuminate the facility throughout hours of darkness.

The tallest elements within the proposed facility are likely to be in the order of approximately 16m high. The buildings will be approximately 10m high.

2.5 POWER SUPPLY

For the Cluster 2 LNG/LHe Plant, electrical power will be obtained from a new dedicated overhead powerline. A new 132kV dual loop-in-loop-out powerline of approximately 4km in length to the Theseus-Oryx 132kV Line will be required and will likely be a 247 (double circuit) tower structure (FIGURE 1). Figure 1 indicates that the proposed 132kV power line towers will be in the order of 31.15m high.

The proposed powerline will feed into a new 40MVA substation at the LNG/LHe Plant. This proposed 132kV power line will be constructed in the powerline corridor.

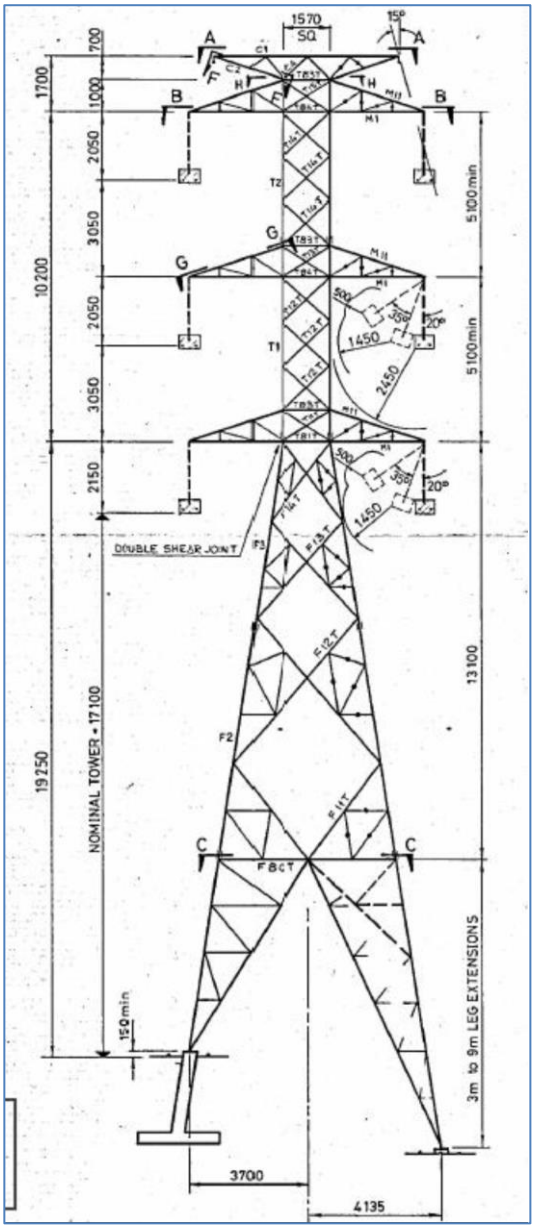


FIGURE 1: 247 TOWER OUTLINE DRAWING

The compressor stations will require a medium voltage substation connection from existing Municipal/Eskom lines (6.6kV/3.3kV switchboard to a 400V switchboard). The

booster stations will require 220V (low voltage) and will be powered by either solar PV, LNG generator or municipal pole mounted transformers.

3 DESCRIPTION OF RECEIVING ENVIRONMENT AND POSSIBLE RECEPTORS

3.1 THE STUDY AREA

The study area is comprised of the area over which the proposed development may be visible.

The Approximate Limit of Visibility (ALV) is dictated by height and visual mass of the proposed development, surrounding landscape and built features such as vegetation, ridgelines and buildings as well as the curvature of the earth.

As the terrain is relatively flat, the vegetation relatively low and existing built elements few and far between, the height of the highest proposed elements and the earth's curvature have been used to set the initial study area.

Whilst final layout information was not available due to the possibility of layout adjustment as indicated in Section 4, in order to define an **initial study area**, it was assumed that, the tallest elements on site will be in the order of 10m high with and Approximate Limit of Visibility of 11.3km.

The initial study area was therefore set at a distance of 11.3km from the proposed site boundary (indicated in red on map 2).

The initial study area was used purely to focus on site survey and data capture work. It is not envisaged that impacts will extend over the entire area, it is however considered to be a sufficient study area to ensure that all likely impacts will fall within it.

3.2 LANDSCAPE CHARACTER

Landscape Character is a composite of a number of influencing factors including:

- Landform and drainage;
- Development and landuse; and
- Vegetation patterns.

From the initial desk top exercise and a subsequent site visit the following characteristics have been identified.

3.2.1 LANDFORM AND DRAINAGE

Topography is comprised of a generally flat landform that is bisected by shallow valleys.

There are three main perennial water courses that cross the proposed development area. They include the Sand River and two of its tributaries, the Doring and Bosluisspruit. Valley slopes are relatively steep rising in the order of 30m from the edge of water course channels.

The landform outside the valley system gently rises to the north and south from the Sand river channel. Gradients generally vary from 1:60 to 1:200.

In visual terms, the undulating landform provides limited screening ability. Should development be located on the minor ridgelines and higher areas this is likely to increase visibility whereas within the valley systems visibility is likely to be limited.

Refer to Map 4 (Landform and Drainage).

PLATE 8 – RELATIVELY FLAT AND GENTLY UNDULATING LANDFORM

PLATE 9 – SHALLOW SAND RIVER VALLEY

3.2.2 LAND COVER

Land cover can broadly be divided into three categories, including:

- Cultivation which occurs largely on the higher, flatter areas of the study area above the minor valleys.
- Natural areas which are generally located within the valley systems. Vegetation is comprised of indigenous grassland which is the natural vegetation type. However, much of this landcover type has been invaded by woody species much of which is comprised of invasive weed species; and

- Major mining operations are highly conspicuous throughout the development area due to extensive stockpiles and infrastructure;
- Settlement that occurs in the form of isolated and small groups of agricultural related homesteads. There are no major areas of settlement within the development area.

Local roads in the area include:

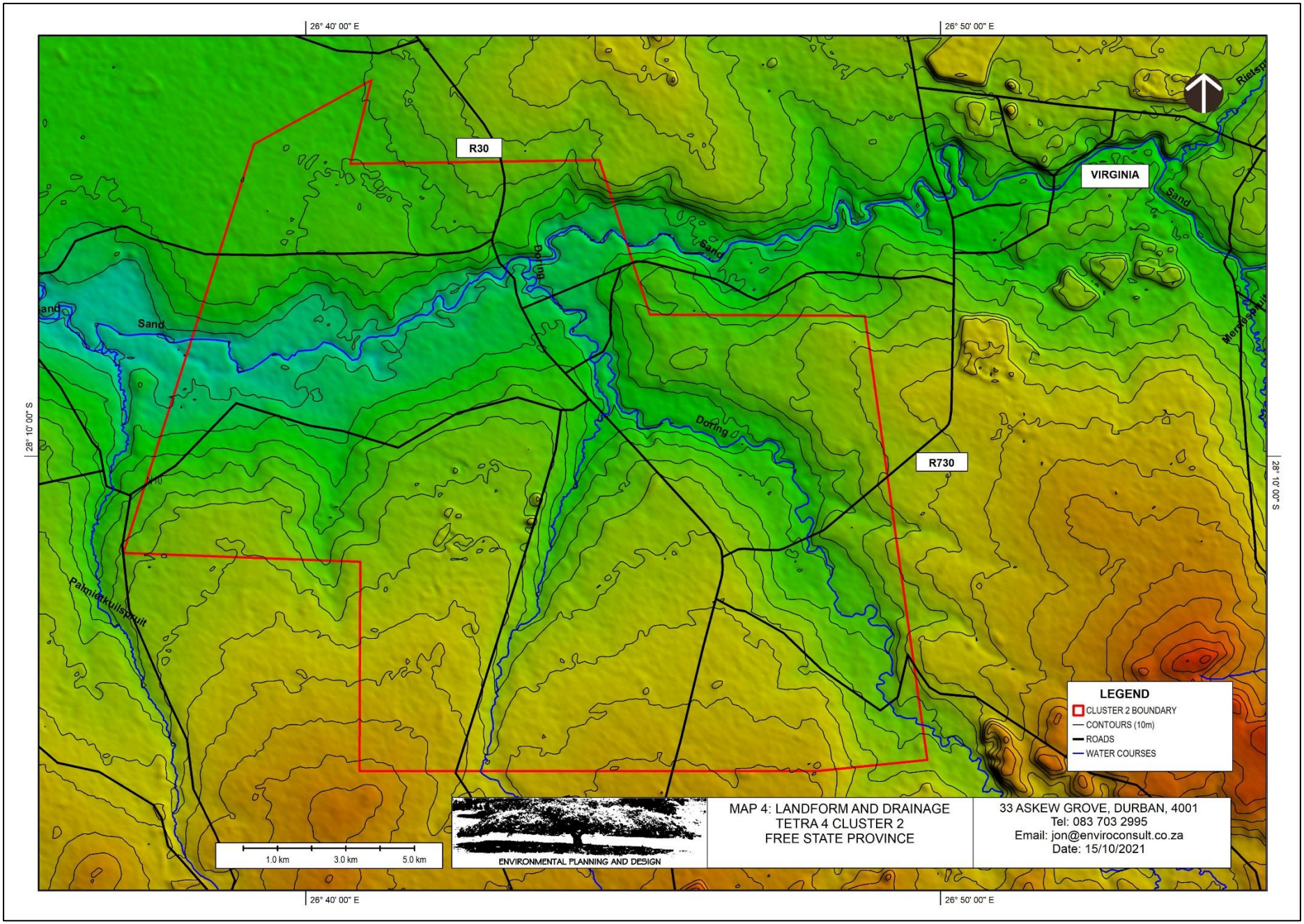
- The R30 and R730 both of which pass through the development area and links Virginia and areas to the north with Theunissen and Branfort to the south. These are both busy local distributors that appear to be largely used by local people and business related traffic including traffic associated with local mines;
- The R710 which links Virginia and Welkom with Bultfontein to the west. Like the R30 and R730, the R710 also appears to be used largely by local people and business related traffic. The R710 does not pass through the proposed development area, at its closest it runs approximately 8.5km to the north; and
- The R73 which links Virginia with the N1 and Winburg to the south east. . Like the R30 and R730, the R710 also appears to be used largely by local people and business related traffic. The R73 does not pass through the proposed development area, at its closest it runs approximately 7.2km to the east.
- A number of unsurfaced local roads that largely service the immediate rural community and mining operations. These roads generally run in an east - west direction providing links with the generally north – south running more major roads.

Electrical infrastructure including Eskom's Leander Perseus 1 and Perseus Theseus 1 high voltage (400Kv) overhead power lines are a common sight in the area.

There are no protected areas within the proposed Phase 2 project area. The H. J. Joel Private Nature Reserve is located approximately 1.2km to the south east and the Thabong Game Ranch is located approximately 14.8km to the north-east of the proposed project area. Both of these protected areas are gazetted Nature Reserves.

Refer to Map 5, Landcover.

PLATE 10, CULTIVATION WHICH OCCURS LARGELY ON THE HIGHER, FLATTER AREAS


26° 40' 00" E
26° 50' 00" E
28° 10' 00" S
R30
R730
VIRGINIA
Sand
Sand
Sand
Doring
Doring
Palmietkuilspruit
Rietspruit
Merriespruit
LEGEND
CLUSTER 2 BOUNDARY
CONTOURS (10m)
ROADS
WATER COURSES
1.0 km
3.0 km
5.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 4: LANDFORM AND DRAINAGE
TETRA 4 CLUSTER 2
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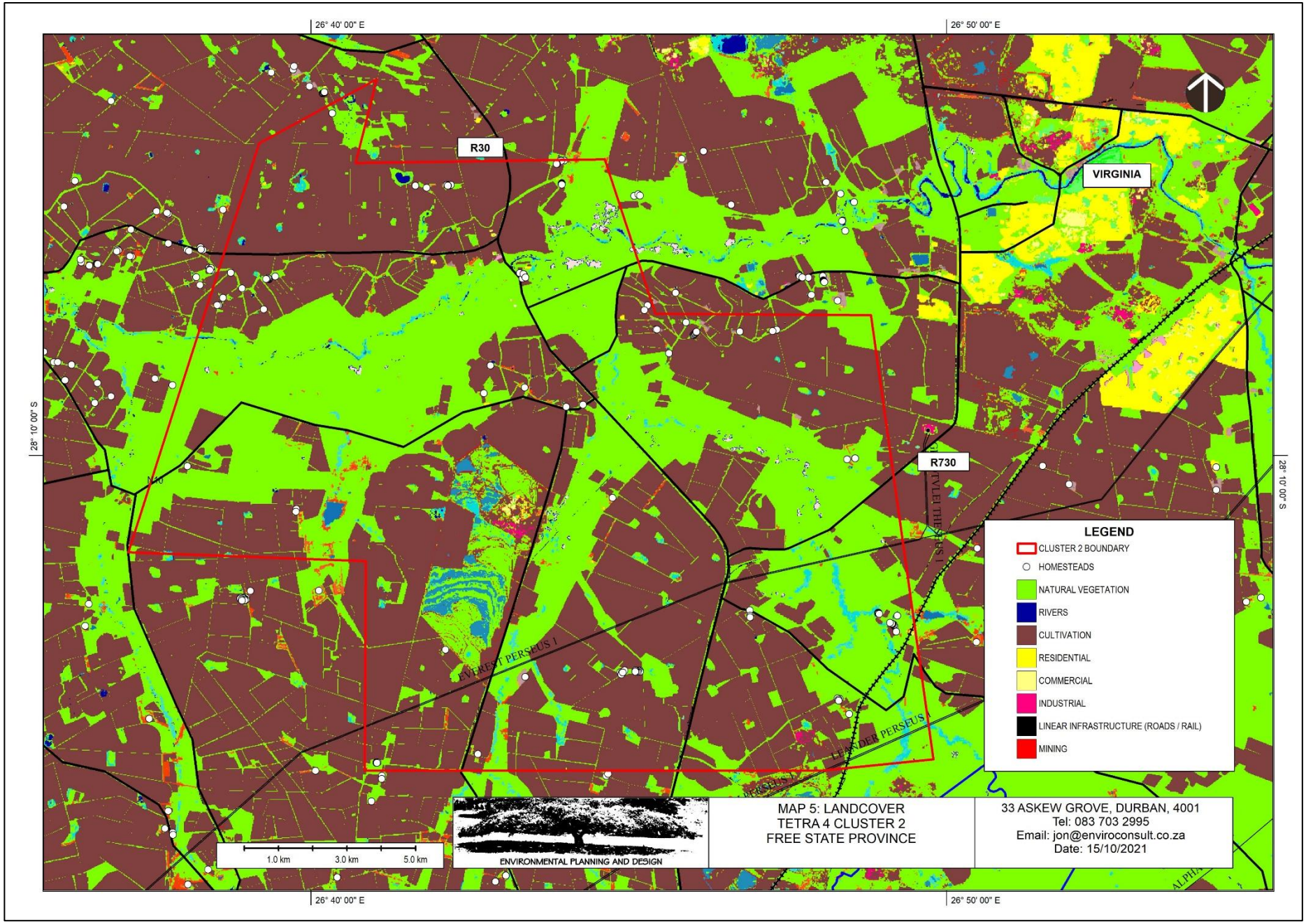
26° 40' 00" E
26° 50' 00" E
28° 10' 00" S
R30
VIRGINIA
R730
N70
EVEREST PERSEUS 1
LEANDER PERSEUS 1
LEGEND
CLUSTER 2 BOUNDARY
HOMESTEADS
NATURAL VEGETATION
RIVERS
CULTIVATION
RESIDENTIAL
COMMERCIAL
INDUSTRIAL
LINEAR INFRASTRUCTURE (ROADS / RAIL)
MINING
1.0 km
3.0 km
5.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 5: LANDCOVER
TETRA 4 CLUSTER 2
FREE STATE PROVINCE
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Date: 15/10/2021

PLATE 11, NATURAL AREAS WHICH ARE GENERALLY LOCATED WITHIN THE VALLEY SYSTEMS

PLATE 12, MAJOR MINING OPERATIONS ARE HIGHLY CONSPICUOUS THROUGHOUT THE DEVELOPMENT AREA

PLATE 13, ISOLATED AND SMALL GROUPS OF HOMESTEADS ARE THE MAIN SETTLEMENT TYPE

PLATE 14, THE R30 IS ONE OF TWO REGIONAL ROADS RUNNING THROUGH THE DEVELOPMENT AREA

PLATE 15, LOCAL UNSURFACED ROADS LARGELY SERVICING LOCAL PEOPLE

3.2.3 VEGETATION PATTERNS

The following vegetation types are evident within the study area;

a) Natural vegetation that is generally associated with the shallow valley lines;
b) Agricultural vegetation that is comprised of cultivated fields and vegetation which is largely comprised of alien trees and shrubs around homesteads and on field boundaries.

a) Natural Vegetation

Mucina and Rutherford[1] indicate that the predominant vegetation type of the study area is comprised of Vaal-Vet Sandy Grassland, Central Free State Grassland and Highveld Alluvial Vegetation.

Highveld Alluvial Vegetation is described as Flat topography supporting riparian thickets mostly dominated by *Acacia karroo*, accompanied by seasonally flooded grasslands and disturbed herblands often dominated by alien plants. From a superficial overview it appears that this vegetation type is generally located on lower valley slopes and is largely comprised of alien vegetation.

Vaal-Vet Sandy Grassland, Central Free State Grassland generally occupy the upper valley slopes.

The Highveld Alluvial Grassland provides a degree of screening. The open grassland vegetation however provides no screening.

b) Agricultural Vegetation

[1] The Vegetation of South Africa, Lesotho and Swaziland

Agriculture in the study area is largely focused on cultivation including maize and sunflowers.

Within the agricultural pattern there are small patches of alien species including gum trees on field edges, along roads and around homesteads. There are also patches of woody vegetation along main drainage lines.

In visual terms, general crop areas have produced a relatively open landscape.

3.2.4 LANDSCAPE CHARACTER AREAS, VISUAL ABSORPTION CAPACITY (VAC) AND SIGNIFICANCE

Landscape Character Areas (LCAs) are defined as "single unique areas which are the discrete geographical areas of a particular landscape type".

The overriding character differentiating factors within the subject landscape appear to be landform /drainage and vegetation cover.

The landform appears to divide the landscape into Four discrete areas including;

a) **Cultivated Rural Landscape Character Area**. This area has gently undulating topography and a predominance of cultivated fields that are generally separated by areas of natural grassland. This is a relatively open landscape with little VAC which is only provided by minor ridgelines and alien vegetation;
b) **Natural Landscape Character Area**. This area is comprised of the shallow valleys surrounding watercourses and is generally covered in Natural Vegetation including grassland and woody alien species that occur in alluvial areas. VAC within these areas is generally moderate due to the fact that much of the woody vegetation extends above eye level;
c) **Mining Landscape Character Area.** This area includes all mining operations and the extensive stockpiles and infrastructure that associated with them; and
d) The Urban / Residential LCA. This area is comprised entirely of the urban areas of Virginia and Welkom. VAC is generally high within these areas due to the extent of structures and urban vegetation. Also due to distance (minimum 2.7km) surrounding rural vegetation and mining activities are likely to provide an effective screen.

Refer to Map 6, LCAs and Receptors.

3.3 VISUAL RECEPTORS

3.3.1 DEFINITION

Visual Receptors are defined as "individuals and / or defined groups of people who have the potential to be affected by the proposal".

The significance of a change in a view for a visual receptor is likely to relate to use.

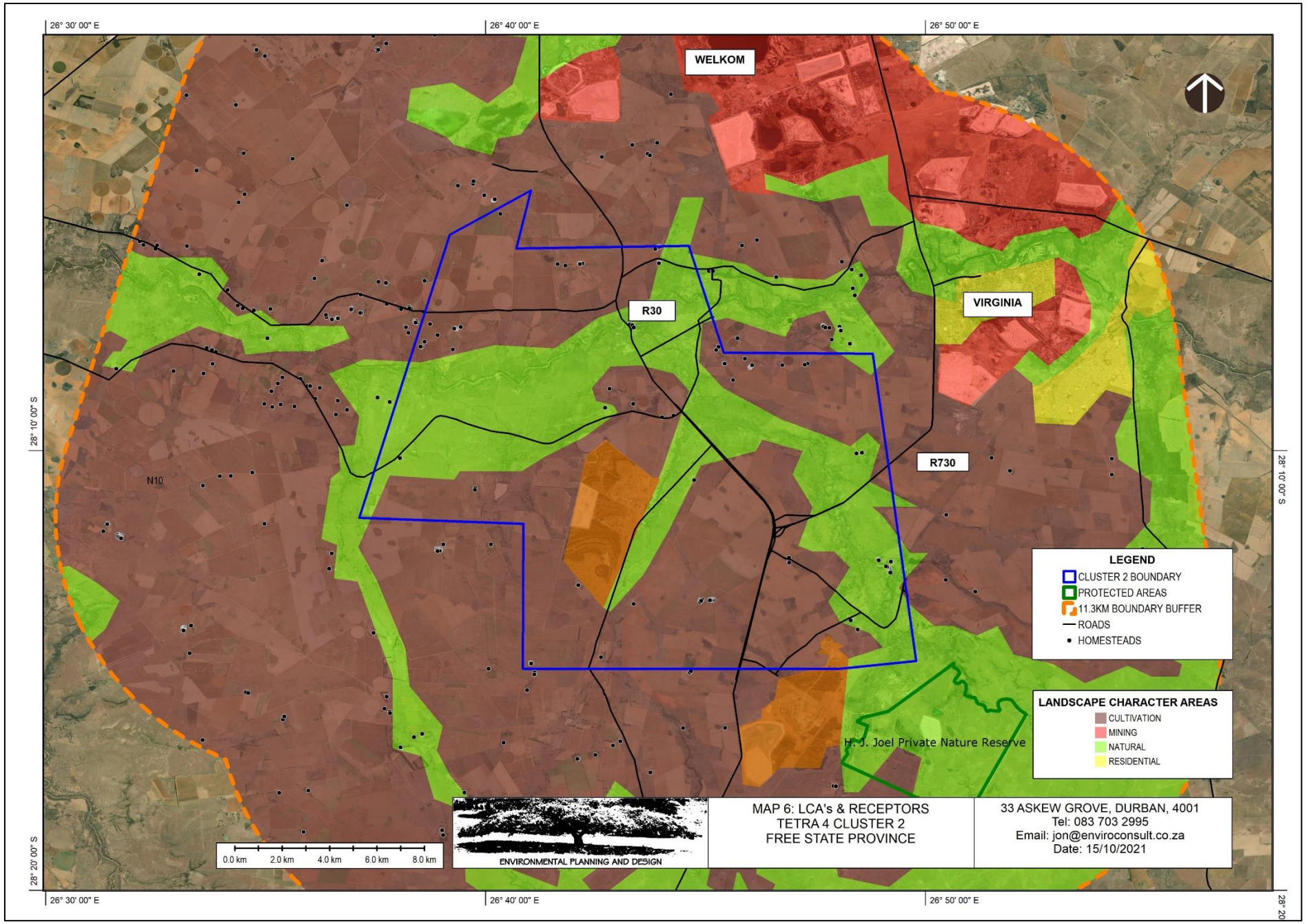
Uses such as guest houses, recreation and tourism related areas are likely to rely on the maintenance of an outlook for successfully attracting guests and users. Residential areas could depend on outlook for the enjoyment of the area by residents and for maintaining property values. A route that is particularly important for tourism may also be dependent on outlook for the maintenance of a suitable experience for users.

3.3.2 IDENTIFIED VISUAL RECEPTORS

Receptors within the affected landscape that due to use could be sensitive to landscape change are indicated below.

- Area Receptors may include;
    - **Urban areas within the towns of Virginia and Welkom** which are located approximately 2.7km to the east and 7.3km north of the proposed Cluster 2 Boundary Extension respectively; and
    - **The H Joel Private Nature Reserve** which, at its closest, is located approximately 1.0km to the south of the proposed Phase 2 Extension area.
- Point Receptors that include;
    - There are a number of **Local Farmsteads and Homesteads** located both within the surrounding landscape. From the site visit it appears that the farmsteads within the proposed site have a primarily agricultural use.
- Linear Receptors or routes through the area that include;
    - **The R30, the R730 and the unsurfaced local roads that that run through the proposed Phase 2 Extension area.** All of these are used mainly by local people with little or no tourism / recreational importance.

Refer to Map 6, LCAs and Receptors.


26° 30' 00" E
26° 40' 00" E
26° 50' 00" E
28° 10' 00" S
28° 20' 00" S
WELKOM
VIRGINIA
R30
R730
N10
H. J. Joel Private Nature Reserve
LEGEND
CLUSTER 2 BOUNDARY
PROTECTED AREAS
11.3KM BOUNDARY BUFFER
ROADS
HOMESTEADS
LANDSCAPE CHARACTER AREAS
CULTIVATION
MINING
NATURAL
RESIDENTIAL
0.0 km 2.0 km 4.0 km 6.0 km 8.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 6: LCA's & RECEPTORS
TETRA 4 CLUSTER 2
FREE STATE PROVINCE
33 ASKEW GROVE, DURBAN, 4001
Tel: 083 703 2995
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Date: 15/10/2021

4 THE NATURE OF POTENTIAL VISUAL IMPACTS

4.1 GENERAL

Impacts could include general degradation of the Landscape Character Areas due to the development that may detract from the existing character as well as change of view for affected people and / or activities;

a. General landscape change or degradation. This is particularly important for protected areas where the landscape character might be deemed to be exceptional or rare. However it can also be important in non-protected areas particularly where landscape character is critical to a specific broad scale use such as tourism areas or for general enjoyment of an area. This is generally assessed by the breaking down of a landscape into components that make up the overall character and understanding how proposed elements may change the balance of the various elements. The height, mass, form and colour of new elements all help to make new elements more or less obvious as does the structure of an existing landscape which can provide screening ability or texture that helps to assimilate new elements. This effect is known as visual absorption capacity.
b. Change in specific views within the affected area from which the character of a view may be important for a specific use or enjoyment of the area.
    - Visual intrusion is a change in a view of a landscape that reduces the quality of the view. This can be a highly subjective judgement. Subjectivity has however been removed as far as is possible by classifying the landscape character of each area and providing a description of the change in the landscape that will occur due to the proposed development. The subjective part of the assessment is to define whether the impact is negative or positive. Again to make the assessment as objective as possible, the judgement is based on the level of dependency of the use in question on existing landscape characteristics.
    - Visual obstruction is the blocking of views or foreshortening of views. This can generally be measured in terms of extent.

    Due to the nature of the proposed development, visual impacts are expected to relate largely to intrusion.

4.2 THE NATURE OF LIKELY VIEWS OF THE DEVELOPMENT

4.2.1 EXPLORATION AND WELL CONSTRUCTION

During the exploration phase, the drilling rigs that will be used to sink boreholes are likely to be significantly taller (approximately 10m) than permanent works (approximately 2.5m – 3.0m). It is likely therefore that the proposed project will be visible over a wider area during exploration and construction phases than the operational and decommissioning phases.

However, it is likely that a limited number of drilling rigs will be used with each rig being moved to a new drill location on completion of each exploration borehole (approximately 3-5 days subject to the nature of material being drilled).

It is also likely that plant and storage of materials around drilling sites will be more extensive during exploration and construction of wells than during the operational phase. The working area around the drilling operation will be in the order of 100m x 100m. The

nature of a typical drilling area can be seen in **Plate 14**. Once drilling and well construction is complete, well infrastructure will be below ground and all that will be visible is an access manhole. It is unlikely that the manhole will be visible for more than 300m.

it is expected that traffic will be slightly increased as trucks will be required to transport materials and equipment to the site during exploration. However, apart from the occasional delivery of equipment for maintenance.

Following the construction of wells, pipeline and compressor plant construction will be undertaken.

PLATE 16, DRILLING OPERATIONS UNDERWAY DURING PHASE 1 EXPLORATION

PLATE 17, PHASE 2 BELOW GROUND WELL

All that will be visible when complete is a concrete cover to the bunker and a manhole cover for access.

4.2.2 PIPELINES

Proposed pipelines will be buried approximately 1.5m below plough level. Inspection chambers will be installed. Inspection chambers will allow access for pipeline pigging which enables cleaning and inspection to be undertaken.

Pipelines will be constructed using appropriate excavation equipment, part backfilling with pipe bedding material to ensure that it is laid on an even grade, placing the pipe and backfilling with material that was originally excavated from the trench.

Following backfilling of the trenches, a bare section of soil will remain above the pipeline until grass and other surrounding vegetation re-colonises the area. When this has happened however all that will be visible will be pipeline markers and inspection chambers. These are relatively small elements that are necessary for pipeline maintenance. They are only likely to be visible from their immediate vicinity.

PLATE 18, PHASE 1 OPERATIONAL GAS PIPELINE
Note: the pipeline is only obvious due to the pipeline marker in the foreground and the inspection chamber in the middle distance.

4.2.3 COMPRESSOR STATIONS

Visually compressor stations are similar to wells in that they will be comprised of compressor plant enclosed by a mesh security fence in the order of 2.5m high. They will differ from well sites in that the enclosed area is smaller and the plant within the enclosure is smaller. However, like the well sites they will largely be visible from the immediate vicinity and should be easily screened.

Compressor stations are likely to be more obvious during construction than during the operational phase due to the nature of construction activities. Once construction is complete however, and subject to where they are located, compressor stations are likely

to be easily missed by the casual observer particularly if they are some distance from receptors or if they are screened by vegetation.

Compressor stations will require a medium voltage substation connection from existing Municipal/Eskom lines (6.6kV/3.3kV switchboard to a 400V switchboard). Eskom MV mini-substations are comprised of closed structures in the order of 3.0m long, 1.2m wide and 1.2m high[2]. These are therefore likely to be relatively small elements that will be located close to the compressor stations.

PLATE 19, PHASE 1 OPERATIONAL PIGGING STATION

4.2.4 PROPOSED 132KV OVERHEAD POWERLINE

Plates 20 and 21 indicates a views along the line of 132kV overhead power lines. The views are taken during a period of good visibility along the line of towers which have a spacing of +/- 250m. In total 9 towers are visible along the line indicated in Figure 18 before it connects to another line at approximately right angles. The last tower in the line which is a solid pole structure is just visible at +/-2.5km.

From this review it is obvious that whilst the theoretical distance that a 31.15m high 132kV power line may be visible from is 19.9km in reality and in the majority of conditions it is unlikely to be obvious at distances greater than 2-3km.

It is possible that either lattice or mono pole towers could be used for the development. Due to the fact that from close views lattice towers tend to read as a more solid structure and the cross section of pole used for a monopole is significantly smaller than the cross section of a lattice tower, monopoles tend to be less imposing from close up. From a distance, however, lattice towers are more visually permeable and the more solid monopole structure is generally more obvious. Despite the observations above, the potential visibility of monopole and lattice towers is likely to be similar.

[2] ESKOM SPECIFICATION FOR MEDIUM VOLTAGE MINIATURE SUBSTATIONS

The following visual limits have been drawn from these observations:

a) Due to the matt grey colour of the galvanised steel from which it is constructed, visibility of overhead power line structures reduces significantly with distance.

b) The visual mass of the overhead power line is unlikely to be visually obvious from distances greater than 3km.

PLATE 20 - A VIEW ALONG THE LINE OF A 132KV OVERHEAD POWER LINE WITH MONOPOLE TOWERS

PLATE 21 - A VIEW ALONG THE LINE OF AN EXISTING SIMILAR OVERHEAD POWER LINE WITH STEEL LATTICE TOWERS

4.2.5 SECURITY LIGHTING

The proposed production plant is the only section of the proposed project that will be lit throughout the night. This is likely to make the plant obvious during hours of darkness.

Other elements including compressor stations may be lit during night time maintenance operations. They are therefore only likely to infrequently be obvious during the hours of darkness.

4.2.6 SITE ACCESS ROADS

Existing surfaced and unsurfaced roads will be used to access the various sites.

Where a new road is required this will take the form of an unsurfaced road that will be sufficiently wide to allow access for delivery of equipment and access for maintenance. When not in use, new roads are unlikely to be visually obvious outside their general vicinity. When in use however, they are likely to be obvious due to the traffic using them. Due to their likely lite use they are unlikely to be highly obvious.

4.2.7 COMBINED HELIUM AND LIQUID NATURAL GAS PLANT AND 40MVA SUBSTATION

This is a relatively large industrial operation. It will be viewed from the R30 which passes to the east of the proposed plant.

The plant is proposed within a shallow valley and so from this road motorists will have an acute overview of the plant as well as an elevational view as the motorist travels through the valley.

The majority of elements within the plant are relatively low. However, elements such as gas storage tanks may be in the order of 10m high.

The proposed 40MVA substation will either be located within the proposed within the proposed Combined Helium and Liquid Natural Gas or immediately outside it. The substation will be located within a fenced enclosure.

Table 1 - Sub-station components and their functions

Equipment	Function
Circuit breakers	Automatic switching during normal or abnormal conditions
Feeder bay	Steelwork housing for circuits
Reactors	Equipment for the efficient operation of long transmission power lines as they compensate the voltage on power lines to avoid uncontrolled voltage rise, especially on lightly loaded lines
Isolators	Equipment for de-energising a circuit for maintenance and repair
Bus bars	Incoming and outgoing circuits of the same voltage tie into a common node called a busbar, which consists of a number of tubular conductors made of aluminium
Loop-in lines	Incoming power lines (connected to busbars)
Loop-out lines	Outgoing power lines (connected to busbars)
Telecommunication mast	Equipment used for remote communication with the sub-station
Buildings	Administrative office, control room, ablution blocks, equipment and storage areas

Lighting	For safety and security as well as for night-time emergency operations and maintenance

There will be a 16m high stack for flaring excess gas. There will be no permanent flame or pilot flame. There is an ignition source in the event that the flare is needed and the flare does not burn unless there is an uncontrolled release which is likely to be a very rare occurrence, or emergency maintenance has to be undertaken which requires some venting/flaring which again is likely to be a very rare occurrence.

The highest elements within a substation are generally the bus bars that facilitate the transfer of electrical current from the transformers to the downstream power line. These are likely to be in the order of 10m high.

4.2.8 SUMMARY

It is anticipated that the exploration and the construction period will overlap because as the flow of gas is proven in each borehole, well infrastructure is likely to be installed.

Landscape and visual impacts during exploration and construction are likely to be significantly larger both in terms of extent and nature of impacts, than during the operational phase. However, these larger impacts are likely to be local and will be short term and temporary.

When construction is complete and because a large proportion of elements will be located some distance from receptors and / or may be screened by vegetation or landform, it is likely that a large proportion of the various elements may not be obvious to the casual observer.

For many receptors therefore the links between various elements is unlikely to be clear and it will not be obvious that they are part of a larger project.

The exception to this is likely to be in situations where the receptor has a clear view along a line of wells in which case the link between the elements is likely to be clear and the project will read as a more significant development.

5 LANDSCAPE, RECEPTORS AND SITE SENSITIVITY

5.1 GENERAL

Due to the general flatness of the surrounding topography and the low nature and small scale and isolated nature of the majority of the proposed elements within the project, it is unlikely that it will affect areas extending significantly further than their immediate vicinity.

Exceptions to this are likely to include:

- Well drilling operations when the +/- 10m high drill rigs may be visible for up to 11.3km; and
- The Production plant, which could also have tanks and plant up to 10m high which could also be visible for up to 11.3km.

The key considerations include:

- The drill rigs will be in place on a temporary short term basis. The drilling rigs are also likely to be comprised of relatively slender structures and because of this are unlikely to be visible to the full extent of their theoretical limit of visibility.
- It is also likely that many of the boreholes will be inclined which means that the drill rigs will also be inclined thus reducing their overall height;
- The production plant will be in place on a long term basis. It is also likely that the visual mass of the plant is likely to be such that it could be visible to its theoretical limit of visibility.
- The limited height and visual mass of the proposed wells and compressor stations is likely to be such that these elements should be easily screened by natural vegetation. Their visibility is also likely to be mitigated with distance.
- Pipelines are only likely to have any significant impact during construction and then it is likely to be the construction plant and pipeline storage that will be most obvious. Once construction is complete, the only items that will be visible are likely to be pipeline markers and inspection chambers;
- The LV overhead power line is unlikely to have any significant impact at distances greater than 2.5km.

5.2 SENSITIVITY

Site (Landscape) sensitivity **(Map 6)** is largely related to the way that the site fits into the surrounding landscape i.e. is it an important component.

The sensitivity of potential receptors generally relates to whether views are important to support current or potential usage. However, they also relate to nuisance and whether for instance a proposed use could impose on and make an existing use uncomfortable or even untenable.

The landscape within which the proposed projects is located is not highly sensitive. It has largely been transformed by large scale mining operations and commercial agriculture.

The topography and vegetation patterns are also such that there is little VAC, receptors are therefore to a large degree affected by views of mining operations.

However, the development proposal is likely to result in a finer grain industrial character which could mean that even though the majority of individual elements are relatively small they will be considerably closer to the majority of potential receptors.

5.2.1 NO GO AREAS

Due to the fact that the affected landscape is highly transformed by both agriculture and mining and because protected areas are highly unlikely to be affected, there are no potentially affected areas where development should not happen due to potential landscape or visual impacts.

5.2.2 AREAS WITH HIGH SENSITIVITY

There are potentially affected areas that could be sensitive to potential development, these include:

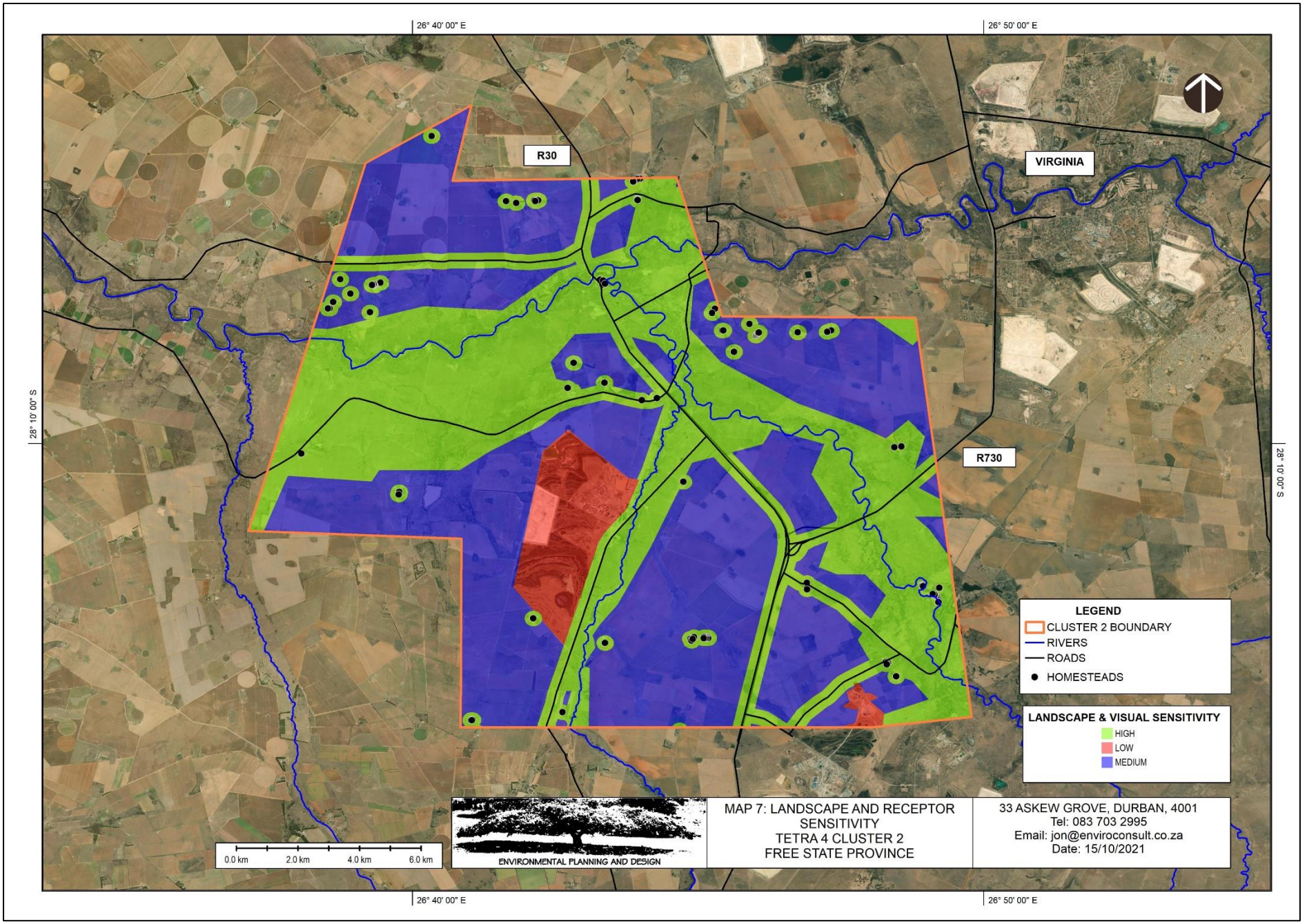
- **All Natural areas** that are largely located within the shallow river valleys. These areas have largely survived in a natural state due to their unsuitability for large scale mining and agriculture, they are therefore relatively intact. In addition to the provision of key environmental services such as attenuation of storm run-off, they provide visual buffers between intensive agriculture and mining operations. There are therefore sound reasons to maintain the integrity of these areas. From a landscape and visual perspective however, it is likely that the location of wells, compressor stations and pipelines might occur within these areas with minimal impact. However, this is subject to minimal disturbance and appropriate mitigation to ensure that the natural landscape character remains intact;
- **All areas within close proximity to homesteads**. Currently there are views from many homesteads of large scale mining operations. However, there are very few homesteads that have close range views over industrial operations. It is possible that the development of the various elements associated with the proposed project could be located in close proximity to homesteads and, subject to distance, these could dominate views of residents. Due to the small scale of the majority of proposed elements, he screening ability of natural areas in which many of the proposed elements are located, a 250m buffer has been indicated around homesteads. It is not proposed that development in these areas is prevented, however, development must be undertaken in a way that views from affected homesteads are not dominated by views of the elements, appropriate mitigation is undertaken and appropriate consultation is undertaken with residents.
- **All areas within close proximity to roads**. Views from the main "R" roads that pass through the affected area are currently largely comprised of large scale arable agriculture in the foreground and middle distance backed by large scale mining operations. These views are punctuated by natural landscape areas as the motorist crosses the shallow river valleys. Subject to distance, the majority of proposed elements are such that their location within the current large scale open agricultural landscape is unlikely to be highly obvious. Due to their scale, a well, compressor station or LV overhead power line located 250m away from a road is unlikely to the highly visible from the road. A pipeline at any distance from the road, as long as appropriate rehabilitation is undertaken, is unlikely to be highly visible.

5.2.3 AREAS WITH MEDIUM SENSITIVITY

Areas with medium sensitivity to development include all arable agricultural areas outside 250m from homesteads and roads.

5.2.4 NON-SENSITIVE AREAS

All non-sensitive areas including mining areas outside 250m from homesteads and roads.


26° 40' 00" E
26° 50' 00" E
28° 10' 00" S
R30
VIRGINIA
R730
LEGEND
CLUSTER 2 BOUNDARY
RIVERS
ROADS
HOMESTEADS
LANDSCAPE & VISUAL SENSITIVITY
HIGH
LOW
MEDIUM
0.0 km
2.0 km
4.0 km
6.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 7: LANDSCAPE AND RECEPTOR SENSITIVITY
TETRA 4 CLUSTER 2
FREE STATE PROVINCE
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Date: 15/10/2021

6 VISIBILITY

6.1 ZONES OF THEORETICAL VISIBILITY

Zones of Theoretical Visibility (ZTV) are defined as "a map usually digitally produced showing areas of land within which a development is theoretically visible"[3].

ZVTs of the proposed development have been assessed using Global Mapper GIS.

The ZTV has been calculated from terrain data only, existing vegetation and / or other development could have a modifying effect on the areas indicated.

The main elements that will have visual implications include:

- A series of compressor stations with structures up to 3.0m high.
- The proposed Combined Helium and Liquid Natural Gas Plant (CHLNGP); and
- The proposed 132kV overhead power line.

It should be noted that production well structures will be below ground and so will not be visible in the landscape.

ZTV analysis have been undertaken in order to provide an indication of visibility of these elements.

The temporary landscape and visual impact of construction operations and in particular drilling rigs has been discussed in Section 4.

The approximate limit of visibility of the main elements that are likely to contribute to landscape and visual impacts has been derived using a universally accepted navigational formula has been used to calculate the likely distance that the proposed structures might be visible over (**Appendix III**). This indicates that in a flat landscape the proposed structures may be visible for the following distances;

Table 2 - Approximate limit of Visibility (ALV)

ELEMENT	APPROXIMATE LIMIT OF VISIBILITY
Compressor Stations including MV substations, up to 3.0m high.	6.2 kilometres
The CHLNGP including 40MV substation, up to 10m high.	11.3 kilometres
132kV Overhead Power Line up to 31.25m high	19.9 kilometres

6.2 LIKELY VISIBILITY OF WELLS AND COMPRESSOR STATIONS

The ZTV analysis indicates these elements could be visible throughout the proposed Cluster 2 Extension area including all identified Landscape Character Areas. The ZTV also indicates that compressor plant are likely to be more visible in a north to south running band through the study area.

There are approximately 11 homesteads in close proximity to compressor stations that could be negatively impacted.

[3] UK Guidelines

There are also seven areas where compressor plant appear to be located in close proximity to roads.

Whilst these elements may be visible over a distance of up to 6.2km, they are relatively low with much of the higher sections including fencing likely to be relatively transparent. This means that visibility should be relatively successfully mitigated with distance and will also be relatively easily screened in areas with taller vegetation as long as disturbance is minimised.

Therefore, where these elements are located within the Natural LCA, as long as disturbance is minimised and rehabilitation undertaken, they are unlikely to be visually obvious.

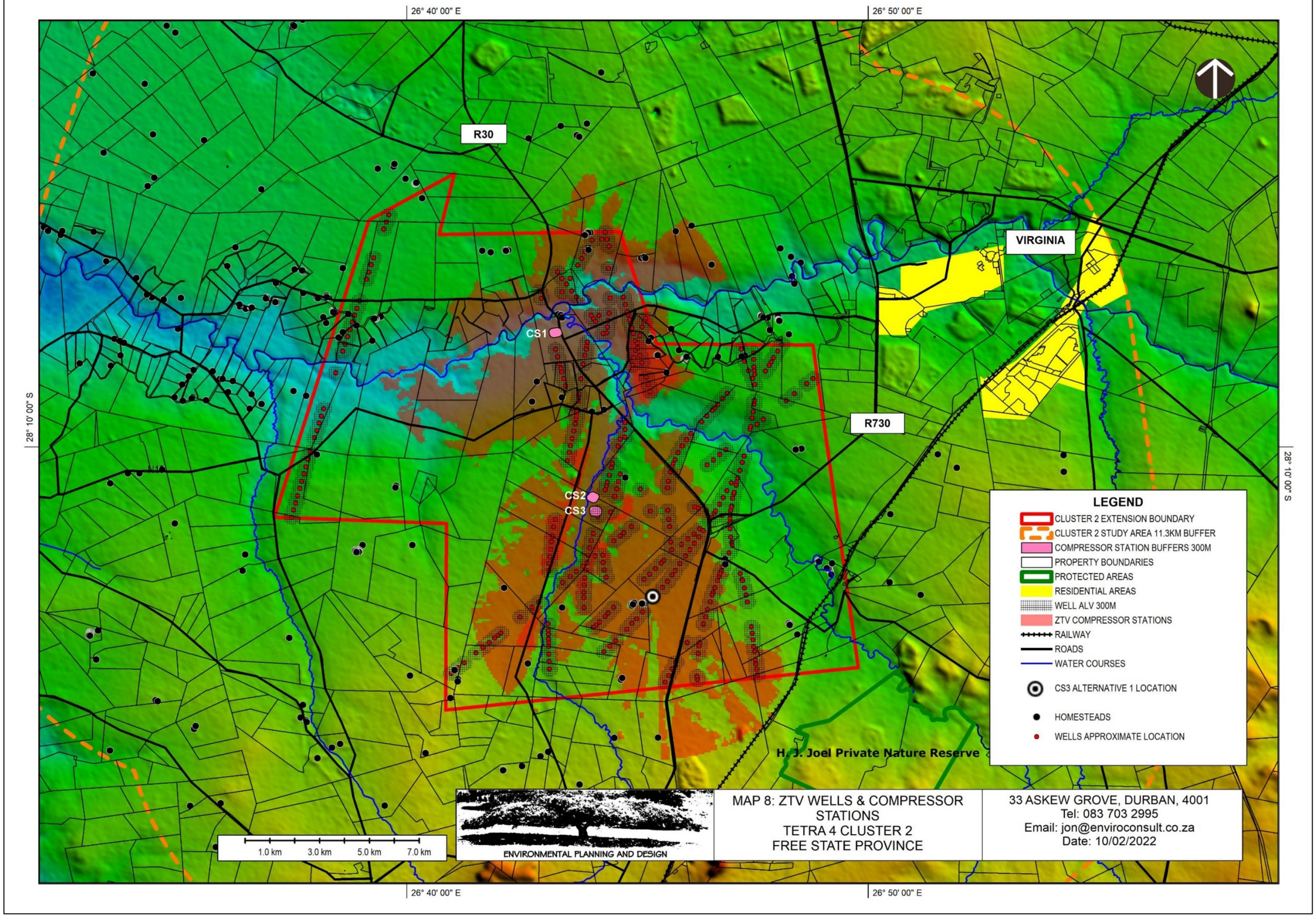
Within open landscape areas and particularly the wide open and relatively flat Agricultural LCA, having these elements organised in relatively straight lines along geological faults, could make them relatively obvious. It is likely that closely located grouping of these elements could also make them more obvious.

When assessing likely landscape and visual impacts, it has to be considered that the Agricultural LCA is a working landscape and whilst the proposed development could have a slight negative impact on agricultural production, it will not dominate or create an overall landscape change. They will therefore be viewed within a large scale agricultural landscape which will still dominate landscape character.

It is noted that there are two alternative locations for Compressor Station 3 under consideration. The preferred location is close to Compressor Station 2 and also within 1km of a local road whereas the alternative location is within 400m of a group of eight homesteads and 1.3km of the R30. Whilst impacts associated with both alternatives are likely to be relatively low, the developer's preferred alternative is preferred from a landscape and visual perspective due to the lower potential to impact on residential homesteads.

Because the proposed wells will be located underground and will only be visible as a manhole at the surface, they will not be visible outside their immediate vicinity. An arbitrary 300m ALV buffer is indicated on the map but in reality, they are unlikely to be visually obvious for more than 200m.

PLATE 22, OPEN AND FLAT AGRICULTURAL LANDSCAPE WITHIN WHICH COMPRESSOR PLANTS ARE LIKELY TO BE VISUALLY OBVIOUS


26° 40' 00" E
26° 50' 00" E
28° 10' 00" S
R30
R730
VIRGINIA
CS1
CS2
CS3
H. J. Joel Private Nature Reserve
LEGEND
CLUSTER 2 EXTENSION BOUNDARY
CLUSTER 2 STUDY AREA 11.3KM BUFFER
COMPRESSOR STATION BUFFERS 300M
PROPERTY BOUNDARIES
PROTECTED AREAS
RESIDENTIAL AREAS
WELL ALV 300M
ZTV COMPRESSOR STATIONS
RAILWAY
ROADS
WATER COURSES
CS3 ALTERNATIVE 1 LOCATION
HOMESTEADS
WELLS APPROXIMATE LOCATION
1.0 km
3.0 km
5.0 km
7.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 8: ZTV WELLS & COMPRESSOR STATIONS
TETRA 4 CLUSTER 2
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Date: 10/02/2022

6.3 LIKELY VISIBILITY OF THE COMBINED HELIUM AND LIQUID NATURAL GAS PLANT INCLUDING A 40MV SUBSTATION AND GAS FLARE

The ZTV analysis indicates that the proposed CHLNGP will largely be visible from within the shallow Sand River Valley. The CHLNGP is therefore likely to be largely screened by landform from agricultural landscape areas to the north and south.

As it will be located immediately adjacent to the existing plant, it is likely that both facilities will be visible over the same general area.

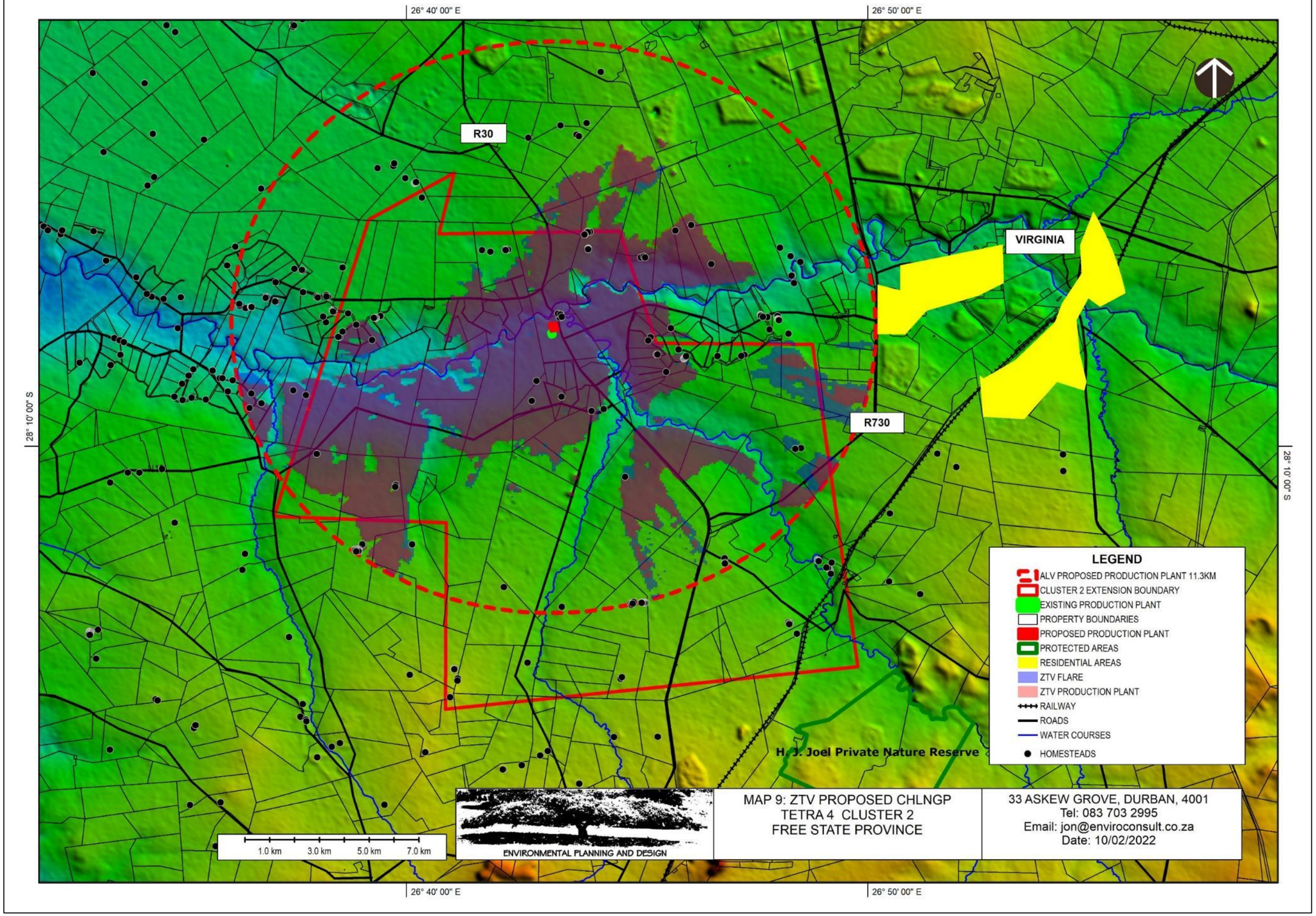
The facility could be highly obvious from the R30 as it crossed the valley. Whilst Cluster 1 plant is closest to the road, Cluster 2 plant is likely to add to the impact. It is noted however, that little rehabilitation has been undertaken to screen the existing plant.

The proposed CHLNGP is located approximately 220m from the closest private buildings and could be visible from a group of buildings some of which are used for residential use. These buildings are part of the Moerkands Pan which is a local bar. The buildings are lower than the road and trees between them and the proposed CHLNGP are likely to largely screen the plant.

Map 9 indicates that the likely extent of visibility of the plant including the 16m high stack which is likely to be visible from a similar area as the structures associated with the proposed plant.

PLATE 23, VIEW OF THE EXISTING CHLNGP IN THE SAND RIVER VALLEY.
THE CLUSTER 2 CHLNGP WILL BE LOCATED IMMIDIATELY ADJACENT TO THE EXISTING PLANT.

PLATE 24, MOERKANDSPAN WHICH IS A LOCAL BAR LOCATED ON THE OPPOSITE SIDE OF THE R30 TO THE PROPOSED CHLNGP


26° 40' 00" E
26° 50' 00" E
28° 10' 00" S
R30
R730
VIRGINIA
H. J. Joel Private Nature Reserve
LEGEND
ALV PROPOSED PRODUCTION PLANT 11.3KM
CLUSTER 2 EXTENSION BOUNDARY
EXISTING PRODUCTION PLANT
PROPERTY BOUNDARIES
PROPOSED PRODUCTION PLANT
PROTECTED AREAS
RESIDENTIAL AREAS
ZTV FLARE
ZTV PRODUCTION PLANT
RAILWAY
ROADS
WATER COURSES
HOMESTEADS
1.0 km
3.0 km
5.0 km
7.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 9: ZTV PROPOSED CHLNGP
TETRA 4 CLUSTER 2
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Date: 10/02/2022

6.4 LIKELY VISIBILITY OF THE PROPOSED 132KV OVERHEAD POWER LINE

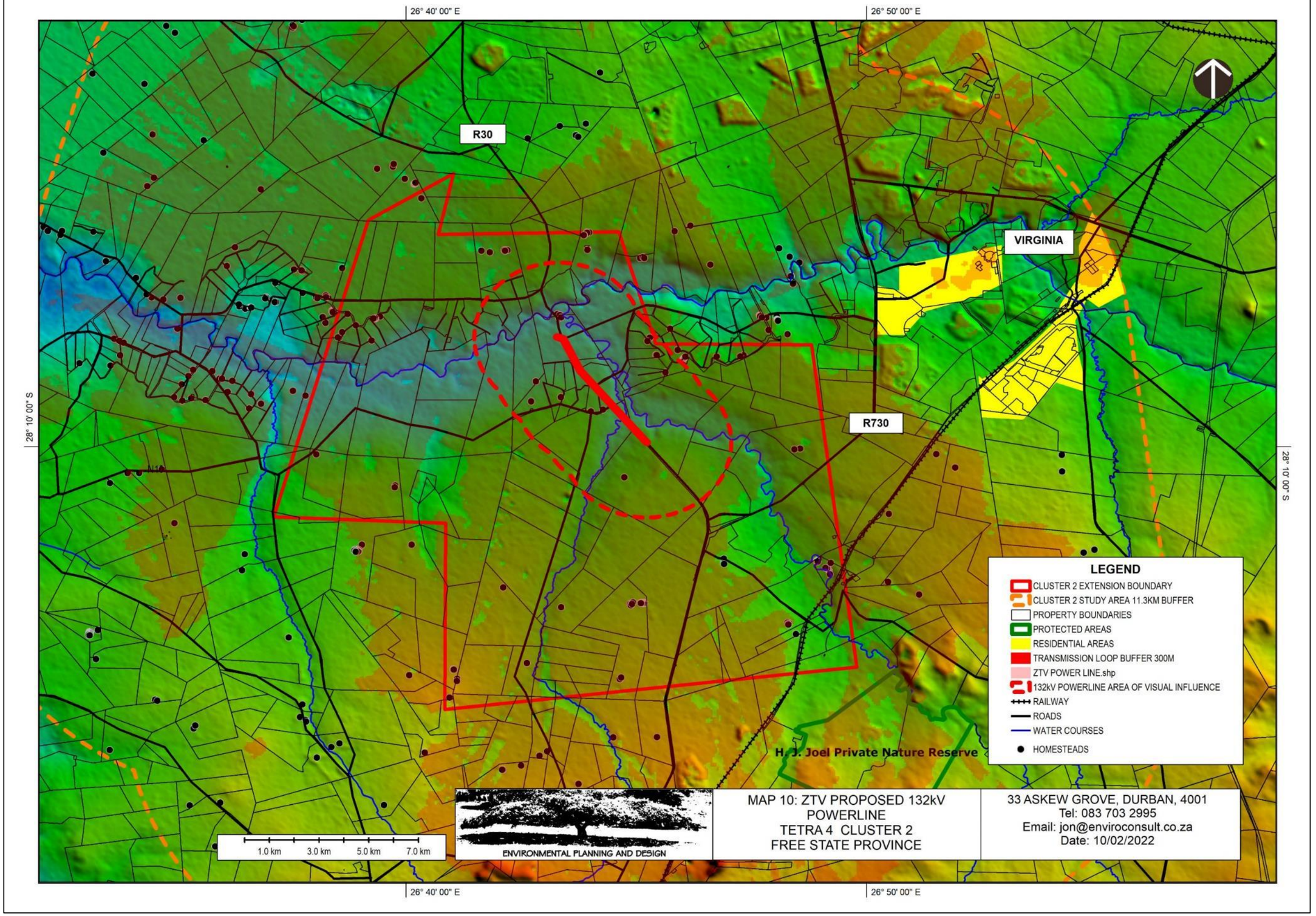
Due to the height of the proposed power line, it is potentially visible over an extensive area. However, due to the colouring and relative transparency of the power line, visibility is rapidly mitigated with distance to the extent that at a distance of approximately 2.5-3.0km, the power line is unlikely to be visually obvious.

The proposed power line will run parallel to the section of the R30 pictured in Plate 23.

The proposed power line will add an industrial element that will be highly obvious from the road. However, impacts are likely to be limited to approximately 10.8km of the R30.

The view of overhead power lines is a common site within the vicinity of the affected section of the R30.

PLATE 25, VIEW OF THE EXISTING EVEREST PERSEUS 275KV OVERHEAD POWER LINE FROM THE R30


26° 40' 00" E
26° 50' 00" E
28° 10' 00" S
R30
R730
VIRGINIA
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CLUSTER 2 EXTENSION BOUNDARY
CLUSTER 2 STUDY AREA 11.3KM BUFFER
PROPERTY BOUNDARIES
PROTECTED AREAS
RESIDENTIAL AREAS
TRANSMISSION LOOP BUFFER 300M
ZTV POWER LINE.shp
132kV POWERLINE AREA OF VISUAL INFLUENCE
RAILWAY
ROADS
WATER COURSES
HOMESTEADS
1.0 km
3.0 km
5.0 km
7.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 10: ZTV PROPOSED 132kV POWERLINE
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Date: 10/02/2022

7 ASSESSMENT

7.1 GENERAL

The previous section of the report identified specific areas where visual impacts may occur as well as their likely nature. This section will quantify these potential visual impacts in their respective geographical locations and in terms of the identified issues.

7.2 LANDSCAPE AND VISUAL ISSUES

7.2.1 URBAN RESIDENTIAL AREAS

From the site visit, due to distance and topography, it was obvious that the proposed project would not be visible from either the urban area of Virginia or Welkom. This has been confirmed by the ZTV analysis with none of the assessments indicating that elements are likely to be visible from urban areas.

7.2.2 H J JOEL PRIVATE NATURE RESERVE

This reserve is located within and around the Joel Mine that is located to the south east of the proposed Cluster 2 Extension Area (**Figure 2**). From within the reserve the Joel mine and stockpiles are obvious.

The closest elements associated with the project are potential well locations that are located approximately 2.8km to the north-west. Between the possible well locations and the reserve there are facilities associated with the Joel Mine as well as the Beatrix Mine. It is therefore highly unlikely that the proposed wells will be visible from within the reserve whereas it is highly likely that existing mining operations will be visible.

7.2.3 LANDSCAPE AND VISUAL ISSUES TO BE ASSESSED

The following list of possible landscape and visual impacts were confirmed as being likely during the site visit;

a) The proposed development could change the character and sense of place of the landscape setting;
b) The proposed development could change the character of the landscape as seen from the local roads;
c) The proposed development could change the character of the landscape as seen from local homesteads;
d) Lighting impacts.

As indicated, landscape change and change in the views of receptors are likely to be greatest during exploration and construction. When storage and working areas are cleared, rehabilitation is undertaken and natural vegetation regenerates, areas and the nature of impacts are likely to reduce significantly to the extent that some elements are unlikely to be obvious to the casual observer.

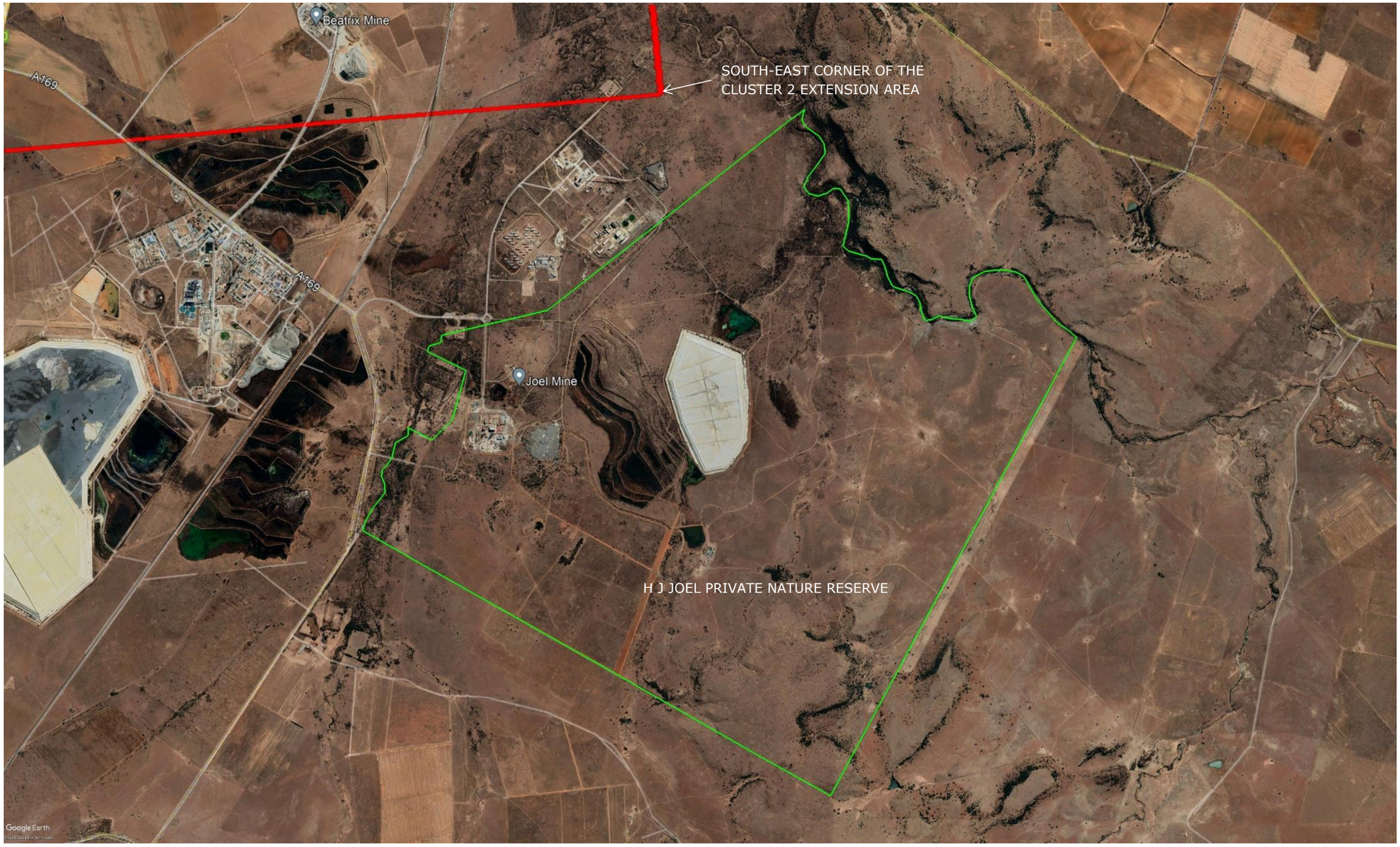

FIGURE 2, GOOGLE EARTH OVERVIEW OF THE H J JOEL PRIVATE NATURE RESERVE

From the overview it is clear that the Nature Reserve is within and around the Joel Mine and that mine facilities are located between the reserve and the proposed Cluster 2 Extension Area

7.3 DETAILED METHODOLOGY

The impact assessment methodology is guided by the requirements of the NEMA EIA Regulations (2010). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/likelihood (P) of the impact occurring. This determines the environmental risk. In addition other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). Please note that the impact assessment must apply to the identified Sub Station alternatives as well as the identified Transmission line routes.

7.3.1 DETERMINATION OF ENVIRONMENTAL RISK

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER).

The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$C = \frac{(E+D+M+R)}{4} \times N$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table .

Table 3: Criteria for Determining Impact Consequence

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),

Aspect	Score	Definition
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/scored as per Table .

Table 4: Probability Scoring

Probability	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur),

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

ER= C x P

Table 5: Determination of Environmental Risk

Consequence	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
		Probability				

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in Table .

Table 6: Significance Classes

Environmental Risk Score	
Value	**Description**
< 9	Low (i.e. where this impact is unlikely to be a significant environmental risk),
≥9; <17	Medium (i.e. where the impact could have a significant environmental risk),
≥ 17	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/mitigated.

7.3.3 IMPACT PRIORITISATION

In accordance with the requirements of Regulation 31 (2)(l) of the EIA Regulations (GNR 543), and further to the assessment criteria presented in the Section above it is necessary to assess each potentially significant impact in terms of:

- Cumulative impacts; and
- The degree to which the impact may cause irreplaceable loss of resources.

In addition it is important that the public opinion and sentiment regarding a prospective development and consequent potential impacts is considered in the decision making process.

In an effort to ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority/significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/mitigation impacts are implemented.

Table 7: Criteria for Determining Prioritisation

Public response (PR)	Low (1)	Issue not raised in public response.
	Medium (2)	Issue has received a meaningful and justifiable public response.
	High (3)	Issue has received an intense meaningful and justifiable public response.
Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the

		impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable loss of resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 11. The impact priority is therefore determined as follows:

Priority = PR + CI + LR

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (Refer to Table).

Table 8: Determination of Prioritisation Factor

Priority	Ranking	Prioritisation Factor
3	Low	1
4	Medium	1.17
5	Medium	1.33
6	Medium	1.5
7	Medium	1.67
8	Medium	1.83
9	High	2

In order to determine the final impact significance the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is to be able to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential, significant public response, and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

Table 9: Final Environmental Significance Rating

Environmental Significance Rating	
Value	**Description**
< 10	Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),

Environmental Significance Rating	
≥10 <20	Medium (i.e. where the impact could influence the decision to develop in the area),
≥ 20	High (i.e. where the impact must have an influence on the decision process to develop in the area).

7.4 LANDSCAPE AND VISUAL IMPACT ASSESSMENT

Due to the scale elements, mitigation measures are generally likely to be significant in reducing levels of visual impact.

For the sake of the assessment the construction phase has been taken as including the initial exploration works;

7.4.1 THE PROPOSED FACILITY COULD IMPACT ON THE RURAL AGRICULTURAL LANDSCAPE CHARACTER AREA

a) Nature of Impact

In general terms the proposed project could industrialise this Landscape Character Area. Large scale mining operations are currently visible from within this landscape. The proposed project will see drilling operations occurring throughout the area during exploration and construction. However when this is complete, there will be up to 300 production well, compressor plants and a 4km long 132kV overhead power line within the landscape. These are relatively small infrastructure elements. The large scale agricultural nature of the landscape will remain very evident. A degree of industrialisation will therefore occur however, the existing landscape character will still dominate.

b) Impact Assessment

In terms of determining prioritisation, public response, cumulative effects and the possible irreplaceable loss of resources have to be considered.

As consultation has not been undertaken it is impossible to confirm public response, however, given the extent of mining in the vicinity and the fact that landscape is not protected and not of high quality, it seems unlikely that the issue will be raised as a significant concern.

In terms of cumulative effects, the proposed project will not significantly change the character of views. It will however combine with large scale mining operations including stockpiles and plant during the construction and operational phases to intensify current impacts on landscape character.

After decommissioning, visual impacts will reduce due to the removal of operational plant.

Due to the fact that the affected landscape is relatively flat and open, no mitigation is feasible.

7.4.2 IMPACT ASSESSMENT TABLES

Table 10 - Impact on Existing Agricultural Landscape Character, Assessment Table

Impact Name	Change of Agricultural Landscape Character
Phase	10A - Construction
Environmental Risk	

Attribute	Pre-mitigation	Post-mitigation	Attribute	Pre-mitigation	Post-mitigation
Nature of Impact	-1	-1	Magnitude of Impact	3	3
Extent of Impact	2	2	Reversibility of Impact	2	2
Duration of Impact	1	1	Probability	4	4
Environmental Risk (Pre-mitigation)					-8.00
Mitigation Measures					
No effective mitigation possible.					
Environmental Risk (Post-mitigation)					-8,00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-9.36

Impact Name	**Change of Agricultural Landscape Character**				
Phase	**10B - Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	1	1
Extent of Impact	1	1	Reversibility of Impact	2	2
Duration of Impact	4	4	Probability	2	2
Environmental Risk (Pre-mitigation)					-3.50
Mitigation Measures					
• Rehabilitate disturbed area and reinstate agricultural usage					
Environmental Risk (Post-mitigation)					-3,50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-4,095

Impact Name	**Change of Agricultural Landscape Character**				
Phase	**10C - Decommissioning**				
Nature of Impact	-1	-1	Magnitude of Impact	2	1

Extent of Impact	2	1	Reversibility of Impact	2	1
Duration of Impact	4	1	Probability	4	1
Environmental Risk (Pre-mitigation)					-10,00
Mitigation Measures					
• Remove all above ground infrastructure; and • Return land to agricultural use.					
Environmental Risk (Post-mitigation)					-1,00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-1.17

Table 11 - Impact on Existing Natural Landscape Character, Assessment Table

Impact Name	**Change of Natural Landscape Character**				
Phase	**11A - Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	1	Reversibility of Impact	2	2
Duration of Impact	1	1	Probability	4	2
Environmental Risk (Pre-mitigation)					-8.00
Mitigation Measures					
• Minimise disturbance of the natural landscape; and • Undertake rehabilitation and screen planting					
Environmental Risk (Post-mitigation)					-3,00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-3.51

Impact Name	**Change of Natural Landscape Character**
Phase	**11- B Operation**
Environmental Risk	

Impact Name	Change of Natural Landscape Character				
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	2	1	Reversibility of Impact	2	1
Duration of Impact	4	4	Probability	3	2
Environmental Risk (Pre-mitigation)					-7.50
Mitigation Measures					
• Minimise disturbance of the natural landscape; and • Undertake rehabilitation and screen planting.					
Environmental Risk (Post-mitigation)					-3,50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-4,095

Impact Name	Change of Natural Landscape Character				
Phase	**11 C - Decommissioning**				
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	2	1	Reversibility of Impact	2	1
Duration of Impact	1	1	Probability	3	2
Environmental Risk (Pre-mitigation)					-5.25
Mitigation Measures					
• Remove all above ground infrastructure; • Rehabilitate disturbed areas.					
Environmental Risk (Post-mitigation)					-2,00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact will result in spatial and temporal cummulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-2,34

Table 12, The visual impact on views from local roads

Impact Name	Change of Natural of Views from Local Roads
Phase	**12A - Construction**

Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	3	2
Extent of Impact	2	2	Reversibility of Impact	2	2
Duration of Impact	1	1	Probability	4	3
Environmental Risk (Pre-mitigation)					-8.00
Mitigation Measures					
• Locate wells and compressor stations a minimum 250m from the edge of local roads; • Undertake rehabilitation; • Return disturbed agricultural land to agricultural use; and • Undertake screen planting between the R30 and the proposed production plant.					
Environmental Risk (Post-mitigation)					-5,25
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-6.14

Impact Name	**Change of Natural of Views from Local Roads**				
Phase	**12B - Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	1	1	Reversibility of Impact	2	2
Duration of Impact	4	4	Probability	3	2
Environmental Risk (Pre-mitigation)					-6.75
Mitigation Measures					
• Locate compressor stations a minimum 250m from the edge of local roads; • Undertake rehabilitation; • Return disturbed agricultural land to agricultural use; and • Undertake screen planting between the R30 and the proposed production plant.					
Environmental Risk (Post-mitigation)					-4,00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					

Impact Name	Change of Natural of Views from Local Roads				
Prioritisation Factor					1.17
Final Significance					-4,68

Impact Name	Change of Natural of Views from Local Roads				
Phase	**12C - Decommissioning**				
Nature of Impact	-1	-1	Magnitude of Impact	3	1
Extent of Impact	2	1	Reversibility of Impact	2	1
Duration of Impact	3	1	Probability	4	1
Environmental Risk (Pre-mitigation)					-10,00
Mitigation Measures					
• Remove all above ground infrastructure; • Rehabilitate disturbed natural areas and • Return disturbed agricultural land to agricultural use.					
Environmental Risk (Post-mitigation)					-1,00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1
Final Significance					-1.00

Table 13, The visual impact on views from local homesteads

Impact Name	Change of Natural of Views from Homesteads				
Phase	**13 A - Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	4	1
Extent of Impact	2	2	Reversibility of Impact	2	2
Duration of Impact	4	1	Probability	4	3
Environmental Risk (Pre-mitigation)					-12.00
Mitigation Measures					
• Locate wells and compressor stations a minimum 250m from homesteads; • Rehabilitate disturbed natural areas; and • Return disturbed agricultural land to agricultural use; and • Undertake screen planting between the R30 and the proposed production plant.					
Environmental Risk (Post-mitigation)					-4,50
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2

Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	1
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.17
Final Significance	-5.26

Impact Name	**Change of Natural of Views from Homesteads**				
Phase	**13B - Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	2	1
Extent of Impact	1	1	Reversibility of Impact	2	2
Duration of Impact	4	4	Probability	3	2
Environmental Risk (Pre-mitigation)					-6.75
Mitigation Measures					
• Locate wells and compressor stations a minimum 250m from homesteads; • Undertake rehabilitation; • Re-establish agricultural uses; and • Undertake screen planting between the R30 and the proposed production plant.					
Environmental Risk (Post-mitigation)					-4,00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					2
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.17
Final Significance					-4,68

Impact Name	**Change of Natural of Views from Homesteads**				
Phase	**13C - Decommissioning**				
Nature of Impact	-1	-1	Magnitude of Impact	3	1
Extent of Impact	2	1	Reversibility of Impact	2	1
Duration of Impact	3	1	Probability	4	1
Environmental Risk (Pre-mitigation)					-10,00
Mitigation Measures					
• Remove all above ground infrastructure; • Rehabilitate disturbed natural areas and • Return disturbed agricultural land to agricultural use.					
Environmental Risk (Post-mitigation)					-1,00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1

Low: Issue not raised in public responses	
Cumulative Impacts	1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	1
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1
Final Significance	-1.00

Table 14, The visual impact of Lighting

Impact Name	**Lighting Impacts**				
Phase	**14A - Construction**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	4	1
Extent of Impact	2	1	Reversibility of Impact	1	1
Duration of Impact	1	1	Probability	4	1
Environmental Risk (Pre-mitigation)					-8.00
Mitigation Measures					
• Ensure that temporary lighting is of sufficient power to ensure safety but not so powerful that it creates glare that could cause danger for drivers or nuisance for neighbours; • Ensure that temporary lighting minimises light spill outside the area that it is intended to light.					
Environmental Risk (Post-mitigation)					-1,00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.00
Final Significance					-4.00

Impact Name	**Lighting Impacts**				
Phase	**14B - Operation**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	4	1
Extent of Impact	2	1	Reversibility of Impact	1	1
Duration of Impact	4	4	Probability	4	1
Environmental Risk (Pre-mitigation)					-11.00
Mitigation Measures					
• Ensure that temporary lighting is of sufficient power to ensure safety but not so powerful that it creates glare that could cause danger for drivers or nuisance for neighbours;					

Environmental Risk (Post-mitigation)	-1.75
Degree of confidence in impact prediction:	Medium
Impact Prioritisation	
Public Response	1
Low: Issue not raised in public responses	
Cumulative Impacts	1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact will result in spatial and temporal cumulative change.	
Degree of potential irreplaceable loss of resources	1
The impact is unlikely to result in irreplaceable loss of resources.	
Prioritisation Factor	1.00
Final Significance	-1.75

Impact Name	**Lighting Impacts**				
Phase	**14C - Decommissioning**				
Environmental Risk					
Attribute	**Pre-mitigation**	**Post-mitigation**	**Attribute**	**Pre-mitigation**	**Post-mitigation**
Nature of Impact	-1	-1	Magnitude of Impact	4	1
Extent of Impact	2	1	Reversibility of Impact	1	1
Duration of Impact	1	1	Probability	4	1
Environmental Risk (Pre-mitigation)					-8.00
Mitigation Measures					
• Ensure that temporary lighting is of sufficient power to ensure safety but not so powerful that it creates glare that could cause danger for drivers or nuisance for neighbours; • Ensure that temporary lighting minimises light spill outside the area that it is intended to light.					
Environmental Risk (Post-mitigation)					-1,00
Degree of confidence in impact prediction:					Medium
Impact Prioritisation					
Public Response					1
Low: Issue not raised in public responses					
Cumulative Impacts					1
Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is possible that the impact will result in spatial and temporal cumulative change.					
Degree of potential irreplaceable loss of resources					1
The impact is unlikely to result in irreplaceable loss of resources.					
Prioritisation Factor					1.00
Final Significance					-4.00

8 CONCLUSION

8.1 AREAS AND NATURE OF LIKELY VISUAL IMPACTS

The assessment indicates that the development of the proposed facility is highly unlikely to impact on sensitive or protected landscape areas.

The proposed project is likely to be visible over the widest area and have the largest impact during exploration and construction than during the operational and decommissioning phases. This is due to:

- The necessary use of drilling rigs, which, because of their height (10.0m), will be visible over a significantly larger distance than elements associated with the final development the majority of which will be significantly lower (3.0m); and
- Because exploration and construction sites require significantly larger working and storage areas than the final development footprints.

By way of mitigation, drill rigs are likely to be in each location for a relatively short period

During the operational phase:

- Within the Natural LCA, due to limited height and the extent of taller vegetation, production wells compressor plant, pigging stations and other pipeline infrastructure is unlikely to be visually obvious as long as disturbance is minimised;
- Within the Agricultural LCA, due to the openness of the landscape, compressor plants, pigging stations and other pipeline infrastructure is likely to be relatively visible. However, their low height and small footprint is likely to make them less obvious with distance. The underground wells are only likely to impact during construction.
- Visibility of the proposed Combined Helium and Liquid Natural Gas Plant will be limited due to its location within the shallow Sand River Valley. This landform will mean that the plant is unlikely to be visible from outside the Valley. Visibility may also be limited by woody vegetation within the valley. It is important however, that disturbance of vegetation is minimised during construction.

8.2 IMPACT ON LANDSCAPE CHARACTER

Key Landscape Character Areas that could be affected include:

- **The Agricultural LCA** which is largely comprised of higher and relatively flat areas of the affected area that are used for commercial arable agriculture. Views within this LCA however are also backed by large scale mining operations. It is likely that a proportion of the production wells compressor plant, pigging stations and other pipeline infrastructure will be obvious, however, visibility of these elements will diminish with distance. Their presence will introduce new industrial elements however, they will not change the overall agricultural landscape character.

  Even with the low level of Visual Absorption Capacity due to the openness of the landscape, due to the fact that lines of wells marching across the landscape are all underground, they likely to make even distant structures more obvious during construction but during operation the impact will be limited. This impact on landscape character was assessed as likely to have a medium significance even with mitigation during construction. During operation and decommissioning the impact significance reduces to low.

- **The Natural LCA** which is largely comprised of the landscape within the shallow valleys that bisect the affected area. It is also generally covered by relatively low woody vegetation and grassland. Where woody vegetation exists, the majority lower development elements are unlikely to be visually obvious and so will not affect the perceived landscape character. However, due to its size, there is potential for the Combined Helium and Liquid Natural Gas Plant to introduce an obvious industrial element into this LCA. To a degree, this is inevitable as it will be seen from higher valley slopes from where it will be obvious as well as from within lower sections of the valley from where it could be largely screened by vegetation.

  Because of the relatively large level of Visual Absorption Capacity within this LCA, with mitigation, the significance of impact was assessed as likely to be low throughout the project cycle.

Whilst these Landscapes will be affected and they are no doubt important as they provide relatively green buffers between industry and urban areas, they are not unique or protected. The predominant character will also remain in place.

8.3 IMPACT ON RECEPTORS

Receptors that were identified as potentially being sensitive include:

- Local road users; and
- People living in local homesteads.

Potential views for both of these groups of receptors were assessed as likely to have a medium significance during construction. However, the significance is likely to reduce to a low level throughout the rest of the project cycle.

Mitigation should include:

- Ensuring that a minimum distance of 250m is included between proposed development and receptors;
- Minimising disturbance of the landscape; and
- Undertaking landscape rehabilitation.

8.4 ALTERNATIVES

An alternative location in addition to the proposed location of Compressor Station 3 has been considered.

The preferred location is close to Compressor Station 2 and also within 1km of a local road whereas the alternative location is within 400m of a group of eight homesteads and 1.3km of the R30. Whilst impacts associated with both alternatives are likely to be relatively low, the developer's preferred alternative is preferred from a landscape and visual perspective due to the lower potential to impact on residential homesteads. However, as long as recommended mitigation measures are undertaken, there is no reason from a Landscape and Visual Impact perspective why either alternative should not be used.

8.5 RECOMMENDATION

Because the affected landscape areas are neither unique or protected and due to the fact that mitigation measures should generally be effective in minimising landscape impacts and visual impact experienced by potential receptors, there is no reason from a landscape

and visual impact perspective that the project should not proceed as long as listed mitigation measures are implemented.

REFERENCES

Guidelines for involving visual and aesthetic specialists in EIA processes, Author; Bernard Oberhozer. Published by the Provincial Government of the Western Cape: Department of Environmental Affairs and Development Planning, 2005

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The vegetation of South Africa, Lesotho and Swaziland(Strelitzia series; no. 19), Mucina, L. & Rutherford, M.C. (eds.), 2006, South African National Biodiversity Institute, Pretoria.

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APPENDIX II

ASSESSOR'S CURRICULUM VITAE

Name	JONATHAN MARSHALL
Nationality	British
Year of Birth	1956
Specialisation	Landscape Architecture / Landscape & Visual Impact Assessment / Environmental Planning / Environmental Impact Assessment.
Qualifications	
Education	Diploma in Landscape Architecture, Gloucestershire College of Art and Design, UK (1979) Environmental Law, University of KZN (1997)
Professional	Registered Professional Landscape Architect (SACLAP) Chartered Member of the Landscape Institute (UK) Member of the International Association of Impact Assessment, South Africa
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General

Jon qualified as a Landscape Architect (Dip LA) at Cheltenham (UK) in 1979. He has been a chartered member of the Landscape Institute UK since 1986. He is also a Registered Landscape Architect and has had extensive experience as an Environmental Assessment Practitioner within South Africa.

During the early part of his career (1981 - 1990) He worked with Clouston (now RPS) in Hong Kong and Australia. During this period he was called on to undertake visual impact assessment (VIA) input to numerous environmental assessment processes for major infrastructure projects. This work was generally based on photography with line drawing superimposed to illustrate the extent of development visible.

He has worked in the United Kingdom (1990 - 1995) for major supermarket chains including Sainsbury's and prepared CAD based visual impact assessments for public enquiries for new store development. He also prepared the VIA input to the environmental statement for the Cardiff Bay Barrage for consideration by the UK Parliament in the passing of the Barrage Act (1993).

His more recent VIA work (1995 to present) includes a combination of CAD and GIS based work for a new international airport to the north of Durban, new heavy industrial operations, overhead electrical transmission lines, mining operations in West Africa and numerous commercial and residential developments.

VIA work undertaken during the last twelve months includes wind energy projects, numerous solar plant projects (CSP and PV) and electrical infrastructure.

Select List of Visual Impact Assessment Projects

- **Geelkop Solar PV projects –** Landscape and Visual Impact Assessment for seven proposed solar PV projects near Upington in the Northern Cape Province for Atlantic Renewable Energy Partners.
- **Makapanstad Agri- Hub –** Landscape and Visual Impact Assessment for proposed Agri-Hub development at Makapanstad in the North West Province for the Department of Rural Development and Land Reform.
- **Madikwe Sky Bubble -** Landscape and Visual Impact Assessment for proposed development of up-market accommodation at the Molori concession within the Madikwe Game Reserve.
- **Hartebeest Wind Energy Facility** – Landscape and Visual Impact Assessment Addendum Report for the proposed upgrading of turbine specifications for an authorised WEF near Mo0rreesburg in the Western Cape Province for a private client.
- **Selati Railway Bridge** - Landscape and Visual Impact Assessment for proposed development of up-market accommodation on a railway bridge at Skukuza in the Kruger Park.
- **Kangala Mine Extension -** Landscape and Visual Impact Assessment for a proposed extension to the Kangala Mine in Mpumalanga for Universal Coal.
- **Khunab Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Upington in the Northern Cape Province for a private client.
- **Sirius Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Upington in the Northern Cape Province for Sola Future Energy.
- **Aggeneys Solar Developments** – Landscape and Visual Impact Assessment for two proposed solar PV projects near Aggeneys in the Northern Cape Province for a private client.
- **Hyperion Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Kathu in the Northern Cape Province for Building Energy South Africa.
- **Eskom Combined Cycle Power Plant** - Landscape and Visual Impact Assessment for proposed gas power plant in Richards Bay, KwaZulu Natal Province.
- **N2 Wild Coast Toll Road, Mineral Sources and Auxiliary Roads –** VIA for the Pondoland Section of this project for the South African National Roads Agency.
- **Mpushini Park Ashburton –** VIA for a proposed amendment to an authorised development plan which included residential, office park and light industrial uses to logistics and warehousing.
- **Moedeng PV Solar Project -** VIA for a solar project near Vrybury in the North West Province for a private client.
- **Establishment of Upmarket Tourism Accommodation on the Selati Bridge, Kruger National Park** – Assessment of visual implications of providing tourism accommodation in 12 railway carriages on an existing railway bridge at the Skukuza Rest Camp in the Kruger Park.
- **Jozini TX Transmission Tower** – Assessment of visual implications of a proposed MTN transmission tower on the Lebombo ridgeline overlooking the Pongolapoort Nature reserve and dam.
- **Bhangazi Lake Development** – Visual Impact Assessment for a proposed tourism development within the iSimangaliso Wetlend Park World Heritage Site.
- **Palesa Power Station** - VIA for a new 600MW power station near Kwamhlanga in Mpumalanga for a private client.
- **Heuningklip PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Kruispad PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Doornfontein PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Olifantshoek Power Line and Substation** – VIA for a new 10MVA 132/11kV substation and 31km powerline, Northern Cape Province, for Eskom.
- **Noupoort Concentrating Solar Plants -** Scoping and Visual Impact Assessments for two proposed parabolic trough projects.

- **Drakensberg Cable Car –** Preliminary Visual Impact Assessment and draft terms of reference as part of the feasibility study.
- **Paulputs Concentrating Solar Plant (tower technology)** – Visual Impact Assessment for a new CSP project near Pofadder in the Northern Cape.
- **Ilanga Concentrating Solar Plants 1, 2, 3, 4 & 5** – Scoping and Visual Impact Assessments for the proposed extension of five authorised CSP projects including parabolic trough and tower technology within the Karoshoek Solar Valley near Upington in the Northern Cape.
- **Ilanga Concentrating Solar Plants 1, 2, 3, 4 & 5 Shared Infrastructure** –Visual Impact Assessment for the necessary shared infrastructure including power lines, substation, water pipeline and roads for these projects.
- **Ilanga Concentrating Solar Plants 7, 8 & 9** - Scoping and Visual Impact Assessments for three new CSP projects including parabolic trough and tower technology within the Karoshoek Solar Valley near Upington in the Northern Cape.
- **Sol Invictus Solar Plants** - Scoping and Visual Impact Assessments for three new Solar PV projects near Pofadder in the Northern Cape.
- **Gunstfontein Wind Energy Facility** – Scoping and Visual Impact Assessment for a proposed WEF near Sutherland in the Northern Cape.
- **Moorreeesburg Wind Energy Facility** – Visual Impact Assessment for a proposed WEF near Moorreeesburg in the Western Cape.
- **Semonkong Wind Energy Facility** - Visual Impact Assessment for a proposed WEF near Semonkong in Southern Lesotho.
- **Great Karoo Wind Energy Facility** – Addendum report to the Visual Impact Assessment Report for amendment to this authorised WEF that is located near Sutherland in the Northern Cape. Proposed amendments included layout as well as rotor diameter.
- **Perdekraal East Power Line** – Visual Impact Assessment for a proposed power line to evacuate power from a wind energy facility near Sutherland in the Northern Cape.
- **Tshivhaso Power Station** – Scoping and Visual Impact Assessment for a proposed new power station near Lephalale in Limpopo Province.
- **Saldanha Eskom Strengthening** – Scoping and Visual Impact Assessment for the upgrading of strategic Eskom infrastructure near Saldanha in the Western Cape.
- **Eskom Lethabo PV Installation** - Scoping and Visual Impact Assessment for the development of a solar PV plant within Eskom's Lethabo Power Station in the Free State.
- **Eskom Tuthuka PV Installation** - Scoping and Visual Impact Assessment for the development of a solar PV plant within Eskom's Thutuka Power Station in Mpumalanga.
- **Eskom Majuba PV Installation** - Scoping and Visual Impact Assessment for the development of a solar PV plant within Eskom's Majuba Power Station in Mpumalanga.
- **Golden Valley Power Line** - Visual Impact Assessment for a proposed power line to evacuate power from a wind energy facility near Cookhouse in the Eastern Cape.
- **Mpophomeni Shopping Centre** – Visual impact assessment for a proposed new shopping centre close to the southern shore of Midmar Dam in KwaZulu Natal.
- **Rheeboksfontein Power Line** - Addendum report to the Visual Impact Assessment Report for amendment to this authorised power line alignment located near Darling in the Western Cape.
- **Woodhouse Solar Plants** – Scoping and Visual Impact Assessment for two proposed solar PV projects near Vryburg in the North West Province.
- **AngloGold Ashanti, Dokyiwa (Ghana)** – Visual Impact Assessment for proposed new Tailings Storage Facility at a mine site working with SGS as part of their EIA team.
- **Gateway Shopping Centre Extension (Durban)** – Visual Impact Assessment for a proposed shopping centre extension in Umhlanga, Durban.
- **Kouroussa Gold Mine (Guinea)** – Visual impact assessment for a proposed new mine in Guinea working with SGS as part of their EIA team.

- **Mampon Gold Mine (Ghana)** - Visual impact assessment for a proposed new mine in Ghana working with SGS as part of their EIA team.
- **Telkom Towers** – Visual impact assessments for numerous Telkom masts in KwaZulu Natal.
- **Eskom Isundu Substation** – Visual Impact Assessment for a proposed major new Eskom substation near Pietermaritzburg in KwaZulu Natal.
- **Eskom St Faiths Power Line and Substation** – Visual Impact Assessment for a major new substation and associated power lines near Port Shepstone in KwaZulu Natal.
- **Eskom Ficksburg Power Line** – Visual Impact Assessment for a proposed new power line between Ficksburg and Cocolan in the Free State.
- **Eskom Matubatuba to St Lucia Power Line** – Visual Impact Assessment for a proposed new power line between Mtubatuba and St Lucia in KwaZulu Natal.
- **Dube Trade Port, Durban International Airport** – Visual Impact Assessment
- **Sibaya Precinct Plan** – Visual Impact Assessment as part of Environmental Impact Assessment for a major new development area to the north of Durban.
- **Umdloti Housing** – Visual Impact Assessment as part of Environmental Impact Assessment for a residential development beside the Umdloti Lagoon to the north of Durban.
- **Tata Steel Ferrochrome Smelter** - Visual impact assessment of proposed new Ferrochrome Smelter in Richards Bay as part of EIA undertaken by the CSIR.
- **Durban Solid Waste Large Landfill Sites –** Visual Impact Assessment of proposed development sites to the North and South of the Durban Metropolitan Area. The project utilised 3d computer visualisation techniques.
- **Hillside Aluminium Smelter, Richards Bay -** Visual Impact Assessment of proposed extension of the existing smelter. The project utilised 3d computer visualisation techniques.
- **Estuaries of KwaZulu Natal Phase 1 –** Visual character assessment and GIS mapping as part of a review of the condition and development capacity of eight estuary landscapes for the Town and Regional Planning Commission. The project was extended to include all estuaries in KwaZulu Natal.
- **Signage Assessments** – Numerous impact assessments for proposed signage developments for Blast Media.
- **Signage Strategy** – Preparation of an environmental strategy report for a national advertising campaign on National Roads for Visual Image Placements.
- **Zeekoegatt, Durban** - Computer aided visual impact assessment. EDP acted as advisor to the Province of KwaZulu Natal in an appeal brought about by a developer to extend a light industrial development within a 60 metre building line from the National N3 Highway.
- **La Lucia Mall Extension** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed extension to shopping mall for public consultation exercise.
- **Redhill Industrial Development** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed new industrial area for public consultation exercise.
- **Avondale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
- **Hammersdale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
- **Southgate Industrial Park, Durban** - Computer Aided Visual Impact Assessment and Landscape Design for AECI.
- **Sainsbury's Bryn Rhos** - Computer Aided Visual Impact Assessment/ Planning Application for the development of a new store within the Green Wedge North of Swansea.
- **Ynyston Farm Access** - Computer Aided Impact Assessment of visual intrusion of access road to proposed development of Cardiff for the Land Authority for Wales.

- **Cardiff Bay Barrage** – Preparation of the Visual Impact Statement for inclusion in the Impact Statement for debate by parliament (UK) prior to the passing of the Cardiff Bay Barrage Bill.
- **A470, Cefn Coed to Pentrebach** - Preparation of landscape frameworks for the assessment of the impact of the proposed alignment on the landscape for The Welsh Office.
- **Sparkford to Illchester Bye Pass** - The preparation of the landscape framework and the draft landscape plan for the Department of Transport.
- **Green Island Reclamation Study** - Visual Impact Assessment of building massing, Urban Design Guidelines and Masterplanning for a New Town extension to Hong Kong Island.
- **Route 3** - Visual Impact Assessment for alternative road alignments between Hong Kong Island and the Chinese Border.
- **China Border Link** - Visual Impact Assessment and initial Landscape Design for a new border crossing at Lok Ma Chau.
- **Route 81, Aberdeen Tunnel to Stanley** - Visual Impact Assessment for alternative highway alignments on the South side of Hong Kong Island.

APPENDIX II

GUIDELINES FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

(Preface, Summary and Contents for full document go to the Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning web site, http://eadp.westerncape.gov.za/your-resource-library/policies-guidelines)

GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

PROVINCIAL GOVERNMENT OF THE WESTERN CAPE:
DEPARTMENT OF ENVIRONMENTAL AFFAIRS
AND DEVELOPMENT PLANNING

bola

CSIR

Edition 1
June 2005

GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

Edition 1

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Stakeholders engaged in the guideline development process:

These guidelines were developed through a consultative process and have benefited from the inputs and comments provided by a wide range of individuals and organizations actively working to improve EIA practice. Thanks are due to all who took the time to engage in the guideline development process.

In particular, thanks are due to Jan Glazewski (University of Cape Town), Keith Wiseman (City of Cape Town), Paul Britton (SANPARKS), Graham Young (University of Pretoria), Lisa Parkes (Ninham Shand) and Paul Claassen (Environomics) for providing useful information and in-depth comments.

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PREFACE

The purpose of an Environmental Impact Assessment (EIA) is to provide decision-makers (be they government authorities, the project proponent or financial institutions) with adequate and appropriate information about the potential positive and negative impacts of a proposed development and associated management actions in order to make an informed decision whether or not to approve, proceed with or finance the development.

For EIA processes to retain their role and usefulness in supporting decision-making, the involvement of specialists in EIA needs to be improved in order to:

- Add greater value to project planning and design;
- Adequately evaluate reasonable alternatives;
- Accurately predict and assess potential project benefits and negative impacts;
- Provide practical recommendations for avoiding or adequately managing negative impacts and enhancing benefits;
- Supply enough relevant information at the most appropriate stage of the EIA process to address adequately the key issues and concerns, and effectively inform decision-making in support of sustainable development.

It is important to note that not all EIA processes require specialist input; broadly speaking, specialist involvement is needed when the environment could be significantly affected by the proposed activity, where that environment is valued by or important to society, and/or where there is insufficient information to determine whether or not unavoidable impacts would be significant.

The purpose of this series of guidelines is to improve the efficiency, effectiveness and quality of specialist involvement in EIA processes. The guidelines aim to improve the capacity of roleplayers to anticipate, request, plan, review and discuss specialist involvement in EIA processes. Specifically, they aim to improve the capacity of EIA practitioners to draft appropriate terms of reference for specialist input and assist all roleplayers in evaluating whether or not specialist input to the EIA process is appropriate for the type of development and environmental context. Furthermore, they aim to ensure that specialist inputs support the development of effective, practical Environmental Management Plans where projects are authorised to proceed (refer to *Guideline for Environmental Management Plans*).

The guidelines draw on best practice in EIA in general, and within specialist fields of expertise in particular, to address the following issues related to the timing, scope and quality of specialist input. The terms "specialist involvement" and "input" have been used in preference to "specialist assessment" and "studies" to indicate that the scope of specialists' contribution (if required) depends on the nature of the project, the environmental context and the amount of available information and does not always entail detailed studies or assessment of impacts.

The guidelines draw on best practice in EIA in general, and within specialist fields of expertise in particular, to address the following issues related to the timing, scope and quality of specialist input. The terms "specialist involvement" and "input" have been used in preference to "specialist

assessment" and "studies" to indicate that the scope of specialists' contribution depends on the nature of the project, the environmental context and the amount of available information.

	ISSUES
TIMING	▪ When should specialists be involved in the EIA process; i.e. at what stage in the EIA process should specialists be involved (if at all) and what triggers the need for their input?
SCOPE	▪ Which aspects must be addressed through specialist involvement; i.e. what is the purpose and scope of specialist involvement? ▪ What are appropriate approaches that specialists can employ? ▪ What qualifications, skills and experience are required?
QUALITY	▪ What triggers the review of specialist studies by different roleplayers? ▪ What are the review criteria against which specialist inputs can be evaluated to ensure that they meet minimum requirements, are reasonable, objective and professionally sound?

The following guidelines form part of this first series of guidelines for involving specialists in EIA processes:

- Guideline for determining the scope of specialist involvement in EIA processes
- Guideline for the review of specialist input in EIA processes
- Guideline for involving biodiversity specialists in EIA processes
- Guideline for involving hydrogeologists in EIA processes
- Guideline for involving visual and aesthetic specialists in EIA processes
- Guideline for involving heritage specialists in EIA processes
- Guideline for involving economists in EIA processes

The *Guideline for determining the scope of specialist involvement in EIA processes* and the *Guideline for the review of specialist input in EIA processes* provide generic guidance applicable to any specialist input to the EIA process and clarify the roles and responsibilities of the different roleplayers involved in the scoping and review of specialist input. It is recommended that these two guidelines are read first to introduce the generic concepts underpinning the guidelines which are focused on specific specialist disciplines.

Who is the target audience for these guidelines?

The guidelines are directed at authorities, EIA practitioners, specialists, proponents, financial institutions and other interested and affected parties involved in EIA processes. Although the guidelines have been developed with specific reference to the Western Cape province of South Africa, their core elements are more widely applicable.

What type of environmental assessment processes and developments are these guidelines applicable to?

The guidelines have been developed to support project-level EIA processes regardless of whether they are used during the early project planning phase to inform planning and design decisions (i.e. during pre-application planning) or as part of a legally defined EIA process to obtain statutory approval for a proposed project (i.e. during screening, scoping and/or impact assessment). Where specialist input may be required the guidelines promote early, focused and appropriate involvement of specialists in EIA processes in order to encourage proactive consideration of potentially significant impacts, so that negative impacts may be avoided or

effectively managed and benefits enhanced through due consideration of alternatives and changes to the project.

The guidelines aim to be applicable to a range of types and scales of development, as well as different biophysical, social, economic and governance contexts.

What will these guidelines not do?

In order to retain their relevance in the context of changing legislation, the guidelines promote the principles of EIA best practice without being tied to specific legislated national or provincial EIA terms and requirements. They therefore do not clarify the specific administrative, procedural or reporting requirements and timeframes for applications to obtain statutory approval. They should, therefore, be read in conjunction with the applicable legislation, regulations and procedural guidelines to ensure that mandatory requirements are met.

It is widely recognized that no amount of theoretical information on how best to plan and coordinate specialist inputs, or to provide or review specialist input, can replace the value of practical experience of coordinating, being responsible for and/or reviewing specialist inputs. Only such experience can develop sound judgment on such issues as the level of detail needed or expected from specialists to inform decision-makers adequately. For this reason, the guidelines should not be viewed as prescriptive and inflexible documents. Their intention is to provide best practice guidance to improve the quality of specialist input.

Furthermore, the guidelines do not intend to create experts out of non-specialists. Although the guidelines outline broad approaches that are available to the specialist discipline (e.g. field survey, desktop review, consultation, modeling), specific methods (e.g. the type of model or sampling technique to be used) cannot be prescribed. The guidelines should therefore not be used indiscriminately without due consideration of the particular context and circumstances within which an EIA is undertaken, as this influences both the approach and the methods available and used by specialists.

How are these guidelines structured?

The specialist guidelines have been structured to make them user-friendly. They are divided into six parts, as follows:

- **Part A**: Background;
- **Part B**: Triggers and key issues potentially requiring specialist input;
- **Part C**: Planning and coordination of specialist inputs (drawing up terms of reference);
- **Part D**: Providing specialist input;
- **Part E**: Review of specialist input; and
- **Part F**: References.

Part A provides grounding in the specialist subject matter for all users. It is expected that authorities and peer reviewers will make most use of Parts B and E; EIA practitioners and project proponents Parts B, C and E; specialists Part C and D; and other stakeholders Parts B, D and E. Part F gives useful sources of information for those who wish to explore the specialist topic.

SUMMARY

This guideline document, which deals with specialist visual input into the EIA process, is organised into a sequence of interleading sections. These follow a logical order covering the following:

- the background and context for specialist visual input;
- the triggers and issues that determine the need for visual input;
- the type of skills and scope of visual inputs required in the EIA process;
- the methodology, along with information and steps required for visual input;
- finally, the review or evaluation of the visual assessment process.

Part A is concerned with defining the visual and aesthetic component of the environment, and with principles and concepts relating to the visual assessment process. The importance of the process being logical, holistic, transparent and consistent is stressed in order for the input to be useful and credible.

The legal and planning context within which visual assessments take place indicate that there are already a number of laws and bylaws that protect visual and scenic resources. These resources within the Western Cape context have importance for the economy of the region, along with the proclaimed World Heritage Sites in the Province.

The role and timing of specialist visual inputs into the EIA process are outlined, with the emphasis being on timely, and on appropriate level of input, from the early planning stage of a project, through to detailed mitigation measures and management controls at the implementation stage.

Part B deals with typical factors that trigger the need for specialist visual input to a particular project. These factors typically relate to:

(a) the nature of the receiving environment, in particular its visual sensitivity or protection status;
(b) the nature of the project, in particular the scale or intensity of the project, which would result in change to the landscape or townscape.

The correlation between these two aspects are shown in a table, in order to determine the varying levels of visual impact that can be expected, i.e. from little or no impact, to very high visual impact potential.

Part C deals with the choice of an appropriate visual specialist, and the preparation of the terms of reference (TOR) for the visual input. Three types of visual assessment are put forward, each requiring different expertise, namely:

Type A: assessments involving large areas of natural or rural landscape;
Type B: assessments involving local areas of mainly built environment;
Type C: assessments involving smaller scale sites with buildings, or groups of buildings.

The scope of the visual input would in summary relate to the following:

- the issues raised during the scoping process;
- the time and space boundaries, i.e. the extent or zone of visual influence;

- the types of development alternatives that are to be considered;
- the variables and scenarios that could affect the visual assessment;
- the inclusion of direct, indirect and cumulative effects.

Approaches to the visual input relate to the level of potential impact and range from minimal specialist input, to a full visual impact assessment (VIA). A list of the typical components of a visual assessment is given, and the integration with other studies forming part of the EIA process is discussed.

Part D provides guidance for specialist visual input, and on the information required by specialists. Notes on predicting potential visual impacts are given, along with suggested criteria for describing and rating visual impacts. The assessment of the overall significance of impacts, as well as thresholds of significance are discussed.

Further aspects that need to be considered by visual specialists in EIA processes include:

- affected parties who stand to benefit or lose,
- risks and uncertainties related to the project,
- assumptions that have been made, and their justification,
- levels of confidence in providing the visual input or assessment,
- management actions that can be employed to avoid or mitigate adverse effects and enhance benefits, and
- the best practicable environental option from the perspective of the visual issues and impacts.

Finally, pointers for the effective communication of the findings are given.

Part E lists specific evaluation criteria for reviewing visual input by a specialist, where this becomes necessary. Further guidance on this is given in the document on *Guideline for the review of specialist input in EIA processes*.

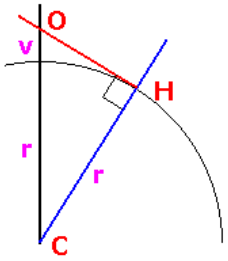
CONTENTS

APPENDIX III

FORMULA FOR DERIVING THE APPROXIMATE VISUAL HORIZON

The Mathematics behind this Calculation

This calculation should be taken as a guide only as it assumes the earth is a perfect ball 6378137 metres radius. It also assumes the horizon you are looking at is at sea level. A triangle is formed with the centre of the earth (C) as one point, the horizon point (H) is a right angle and the observer (O) the third corner. Using Pythagoras's theorem we can calculate the distance from the observer to the horizon (OH) knowing CH is the earth's radius (r) and CO is the earth's radius (r) plus observer's height (v) above sea level.



Sitting in a hotel room 10m above sea level a boat on the horizon will be 11.3km away. The reverse is also true, whilst rowing across the Atlantic, the very top of a mountain range 400m high could be seen on your horizon at a distance of 71.4 km assuming the air was clear enough.