

Ecological Assessment Report

**Gamagara Local Municipality Water
Reticulation Development,
Olifantshoek, Northern Cape Province
August 2019**

Compiled for:



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Executive Summary

The project applicant, Gamagara Local Municipality proposes to construct new water reticulation infrastructure within and around the existing informal settlement outside the town of Olifantshoek, Northern Cape Province. The proposed development will entail a new domestic water pipeline network consisting of five interlinked pipeline routes which will feed water from six existing boreholes and two existing reservoirs into the municipal water supply system. A single wastewater pipeline will also be developed for sewage management purposes.

Although the proposed development does not trigger any National Environmental Management Act (Act 107 of 1998); Listed Activities, Eco-Con Environmental was appointed by the applicant as the independent Environmental Practitioner (EAP) to conduct an informal Environmental Impact Assessment (EIA) process.

Due to the nature of the potential impacts of the proposed development on the local ecology, an Ecological study is required. This is required in order to determine the potential presence of ecologically significant species, habitats or wetland areas within the proposed project footprint which may be affected by the proposed development. Proposed mitigation and management measures in accordance with the NEMA (Act 107 of 1998) mitigation hierarchy must also be recommended in order to attempt to reduce/alleviate the identified potential impacts.

EcoFocus Consulting was therefore subsequently appointed by the EAP as the independent ecological specialist to conduct the required Ecological study for the proposed project. This report constitutes the Ecological Assessment. Site visits/assessments for the proposed development footprint area were conducted on 20 February 2019 and 17 April 2019. The first date forms part of the growing season and most plant species present could therefore be successfully identified while the second date forms part of the commencement of the winter season.

Methodology

The proposed development area was assessed on foot and visual observations/identifications were made of habitat conditions, ecologically sensitive areas and relevant species present. Species were listed and categorised as per the Red Data Species List; Protected Species List of the National Forests Act (Act 84 of 1998), Invasive Species List of the National Environmental Management: Biodiversity Act (Act 10 of 2004), Alien and Invasive Species Regulations, 2014 and the Provincially Protected species of the Northern Cape Nature Conservation Act (Act 9 of 2009). Georeferenced photographs

were taken of ecologically sensitive areas as well as the relevant nationally or provincially protected species if encountered in order to indicate their specific locations in a Geographic Information System (GIS) mapping format.

Potential impacts of the proposed project on the surrounding natural environment were identified, evaluated and rated. The Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of the proposed project area were also assessed and rated.

Study Area

The assessment area constitutes a new domestic water pipeline network consisting of five interlinked pipeline routes which will feed water from six existing boreholes and two existing reservoirs into the municipal water supply system. A single wastewater pipeline will also be developed for sewage management purposes. The assessment area therefore constitutes the linear routes of the proposed new pipeline network.

The assessment area is situated within and around the existing informal settlement outside the town of Olifantshoek which forms part of the Gamagara Local Municipality. This in turn, forms part of the ZF Mgcawu District Municipality, Northern Cape Province. Access to the assessment area is obtained via the N 14 national road and subsequent dirt roads from the north-west.

According to SANBI (2006-), the entire assessment area falls within the Olifantshoek Plains Thornveld vegetation type (SVk 13) which mainly consists of wide plains with an open tree and shrubland layer and usually a sparse grass layer. This vegetation type is classified as least threatened because of its broad distribution (SANBI, 2006-).

The linear routes of the proposed new pipeline network traverse areas categorised as Other Natural Areas (ONA), Ecological Support Areas (ESA) as well as some completely degraded land within the existing informal settlement in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province.

Results and Conclusion

The proposed new domestic water pipeline network will in all probability only impact on- and transform a narrow linear section along the pipeline routes.

The majority of the proposed new pipeline routes traverse areas within the existing informal settlement and run along existing dirt roads. The majority of natural surface vegetation has therefore been cleared within these existing informal settlement areas and the areas constitute highly degraded and transformed landscapes.

Only the south-western portion of the proposed new pipeline routes traverse undeveloped, relatively natural areas associated with the relevant Olifantshoek Plains Thornveld vegetation type (SVk 13). Assumed significant historic and continued long term overgrazing by livestock from the local community has however resulted in these areas being virtually completely devoid of a well-established grass layer as would otherwise have been expected in the natural climactic state of the relevant vegetation type. This relevant vegetation type, is classified as least threatened because of its broad distribution (SANBI, 2006-).

The linear routes of the proposed new pipeline network traverse areas categorised as Other Natural Areas (ONA), Ecological Support Areas (ESA) as well as some completely degraded land within the existing informal settlement in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province

Although no Red Data Listed species were found to be present within the assessment area, individuals of the nationally protected tree species *Boscia albitrunca* & *Vachellia erioloba* were found to be present throughout the undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes. Most individuals of the former species are very large (≥ 4 m in height) and presumably therefore also very old while most individuals of the latter species are not necessarily significant in size. Such large/old individuals of the former species are considered to be of high conservational significance.

It is therefore recommended that no individuals of these two nationally protected tree species may be removed during construction of the proposed new pipeline network. The pipeline route is to be adequately deviated around any such individuals by a minimum distance of 4 m.

The provincially protected species *Aloe hereroensis*, *Ammocharis coranica* & *Bulbine abyssinica* are well represented throughout the undeveloped, relatively natural portion, while only a few individuals of the provincially protected species *Euphorbia burmannii* & *Aloe grandidentata* were found to be present.

It is recommended that a minimum of 20 individuals of each of the three well-represented provincially protected species be removed, if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.

It is also recommended that any individuals of the provincially protected species *Aloe grandidentata* be removed if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.

These removal and relocation activities must be completed prior to the commencement of any vegetation clearance- or construction activities. A Provincial Flora Permit has to be obtained from the Northern Cape Department of Environment and Nature Conservation (DENC) for the relocation of the abovementioned individuals as well as for the removal/destruction of all other provincially protected species individuals found to be present within the proposed new pipeline routes prior to the commencement of any relocation or removal/destruction activities.

Due to the presence of the informal residential settlement situated directly adjacent north-east of the undeveloped, relatively natural portion along with continued grazing by livestock from the local community, the area is subjected to continued anthropogenic activity and disturbance. It is therefore not anticipated that any large or conservationally significant faunal species would utilise the undeveloped, relatively natural portion for breeding and/or persistence purposes.

Due to the slightly sloping topography of the assessment area, the entire area forms part of the upper region of a quaternary surface water catchment and drainage area which regionally drains towards the north.

Three small ephemeral water drainage lines are traversed by the proposed new pipeline routes. These drainage lines feed into a subsequent downstream third order watercourse which forms an important part of the quaternary surface water catchment and drainage. The drainage lines are therefore viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and the surface water catchment and drainage area. The construction footprints through the three drainage lines must therefore be adequately rehabilitated as soon as practicably possible after construction in order to ensure their continued flow and ecological integrity.

It is the opinion of the specialist that the potentially significant ecological impacts associated with the continued impeding and contamination of the flow regimes of the three small ephemeral water drainage lines as well as over extraction of domestic use water from the six existing boreholes, can be suitably reduced and mitigated to within acceptable residual levels. The project should therefore be considered by the applicant, Gamagara Local Municipality for approval and be allowed to continue.

The proposed development may however only continue if all recommended mitigations measures as per this ecological report are adequately implemented and managed for both the construction and operational phases of the proposed project. All necessary authorisations, licenses and permits must also be obtained prior to any commencement.

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Abbreviations

| | |
|--------|--|
| BA | Basic Assessment |
| CARA | Conservation of Agricultural Resources Act (Act 43 of 1983) |
| CBA | Critical Biodiversity Area |
| DAFF | Department of Agriculture Forestry and Fisheries |
| DENC | Northern Cape Department of Environment and Nature Conservation |
| EAP | Environmental Assessment Practitioner |
| EIA | Environmental Impact Assessment |
| EIS | Ecological Importance and Sensitivity |
| ESA | Ecological Support Area |
| MAP | Mean Annual Precipitation |
| NCPSBP | Northern Cape Provincial Spatial Biodiversity Plan 2016 |
| NEMBA | National Environmental Management: Biodiversity Act (Act 10 of 2004) |
| NEMA | National Environmental Management Act (Act 107 of 1998) |
| NFA | National Forests Act (Act 84 of 1998) |
| NWA | National Water Act (Act 36 of 1998) |
| ONA | Other Natural Area |
| PES | Present Ecological State |
| WULA | Water Use License Application |

Declaration of Independence

I, Adriaan Johannes Hendrikus Lamprecht, ID 870727 5043 083, declare that I:

- am the Director and Ecological Specialist of EcoFocus Consulting (Pty) Ltd
- act as an independent specialist consultant in the field of botany and ecology
- am assigned as the Ecological Specialist consultant by the Environmental Assessment Practitioner (EAP), Eco-Con Environmental, for the proposed project
- do not have or will not have any financial interest in the undertaking of the proposed project activity other than remuneration for work as stipulated in the Purchase Order terms of reference
- confirm that remuneration for my services relating to the proposed project is not linked to approval or rejection of the project by the competent authority
- have no interest in secondary or subsequent developments as a result of the authorisation of the proposed project
- have no and will not engage in any conflicting interests in the undertaking of the activity
- undertake to disclose to the applicant and the competent authority any information that has or may have the potential to influence the decision of the competent authority
- will provide the applicant and competent authority with access to all relevant project information in my possession whether favourable or not

AJH Lamprecht



Signature

1. Introduction

The project applicant, Gamagara Local Municipality proposes to construct new water reticulation infrastructure within and around the existing informal settlement outside the town of Olifantshoek, Northern Cape Province. The proposed development will entail a new domestic water pipeline network consisting of five interlinked pipeline routes which will feed water from six existing boreholes and two existing reservoirs into the municipal water supply system. A single wastewater pipeline will also be developed for sewage management purposes.

Although the proposed development does not trigger any National Environmental Management Act (Act 107 of 1998); Listed Activities, Eco-Con Environmental was appointed by the applicant as the independent Environmental Practitioner (EAP) to conduct an informal Environmental Impact Assessment (EIA) process.

Due to the nature of the potential impacts of the proposed development on the local ecology, an Ecological study is required. This is required in order to determine the potential presence of ecologically significant species, habitats or wetland areas within the proposed project footprint which may be affected by the proposed development. Proposed mitigation and management measures in accordance with the NEMA (Act 107 of 1998) mitigation hierarchy must also be recommended in order to attempt to reduce/alleviate the identified potential impacts.

EcoFocus Consulting was therefore subsequently appointed by the EAP as the independent ecological specialist to conduct the required Ecological study for the proposed project. This report constitutes the Ecological Assessment.

Preliminary preparations conducted prior to the ecological walkthrough/site assessment where as follows:

- Georeferenced spatial information was obtained of the proposed project area in order to determine the direct impact footprint area.
- A desktop study was conducted of the information available on the relevant vegetation types and national/provincial conservation significance status associated with the proposed footprint area.

2. Date and Season of Ecological Site Assessment

Site visits/assessments for the proposed development footprint area were conducted on 20 February 2019 and 17 April 2019. The first date forms part of the growing season and most plant species present could therefore be successfully identified while the second date forms part of the commencement of the winter season.

3. Assessment Rational

South Africa is a country rich in natural resources and splendour and is rated as having some of the highest biodiversity in the world. Other than the pure aesthetic value which our biodiversity and natural resources provides, it also plays a significant positive role in our national economy. While continuous economic development and progress is a key national focus area, which forms a cornerstone in the socio-economic improvement of society and the livelihoods of communities and individuals, the preservation and management of the integrity and sustainability of our natural resources is also essential in achieving this objective.

Socio-economic development and progress can therefore not be completely inhibited for the sake of ensuring environmental conservation, therefore solutions and compromises rather need to be explored in order to achieve the need for socio-economic development without unreasonably jeopardising the needs of environmental conservation. A sustainable and responsible balance needs to be maintained in order to accommodate the requirements of both.

Adequate, sustainable and responsible utilisation and management of our natural resources is crucial. Finding the required balance between socio-economic development and environmental conservation, should therefore always be a priority focus point during any proposed development process.

Various environmental legislation in South Africa makes provision for the protection of our natural resources and the functionality of ecological systems in order to ensure sustainability. Such acts include the National Environmental Management: Biodiversity Act (Act 10 of 2004), National Forests Act (Act 84 of 1998), Conservation of Agricultural Resources Act (Act 43 of 1983), National Water Act (Act 36 of 1998) and framework legislation such as the National Environmental Management Act (Act 10 of 2004).

An Ecological Impact Assessment of the proposed project area was therefore conducted in order to determine and quantify the impacts of the development on the natural environment in the area.

4. Objectives of the Assessment

Ecological and habitat survey:

- Describe the vegetation on the assessment area and identify and list conservationally significant faunal and floral species encountered on the assessment area.
 - List any nationally and/or provincially protected and/or Red Data Listed species.
- Determine and discuss the Present Ecological State (PES) and extent of degradation and/or transformation of the vegetation on the assessment area and surrounding areas. Also indicate the Ecological Importance and Sensitivity (EIS) of the assessment area in order to provide an indication of the conservational significance of the assessment area.
- Identify and delineate all watercourses/wetland areas potentially present on the assessment area.
- Identify, evaluate and rate the potential ecological impacts of the proposed development on the natural environment.
- Provide recommendations on mitigation and management measures in order to attempt to reduce/alleviate these identified potential ecological impacts.
- Provide recommendations on the suitability of the proposed development area.
- A digital report (this document) as well as the digital KML files of any identified ecologically sensitive/conservationally significant areas will be provided to the applicant.

5. Methodology

- The proposed development area was assessed on foot and visual observations/identifications were made of habitat conditions, ecologically sensitive areas and relevant species present.
- Species were listed and categorised as per the Red Data Species List; Protected Species List of the National Forests Act (Act 84 of 1998), Invasive Species List of the National Environmental Management: Biodiversity Act (Act 10 of 2004), Alien and Invasive Species Regulations, 2014 and the Provincially Protected species of the Northern Cape Nature Conservation Act (Act 9 of 2009).
- Georeferenced photographs were taken of ecologically sensitive areas as well as the relevant nationally or provincially protected species if encountered in order to indicate their specific locations in a Geographic Information System (GIS) mapping format.

The **Present Ecological State (PES)** of the proposed project area was assessed and rated as per the table below.

- The Present Ecological State (PES) refers to the current state or condition of an area in terms of all its characteristics and reflects the change to the area from its reference condition. The value gives an indication of the alterations that have occurred in the ecosystem.

Table 1: Criteria for PES calculations

| Ecological Category | Score | Description |
|----------------------------|--------------|---|
| A | > 90-100% | Unmodified , natural and pristine. |
| B | > 80-90% | Largely natural . A small change in natural habitats and biota may have taken place but the ecosystem functionality has remained essentially unchanged. |
| C | > 60-80% | Moderately modified . Moderate loss and transformation of natural habitat and biota have occurred, but the basic ecosystem functionality has still remained predominantly unchanged. |
| D | > 40-60% | Largely modified . A significant loss of natural habitat, biota and subsequent basic ecosystem functionality has occurred. |
| E | > 20-40% | Seriously modified . The loss of natural habitat, biota and basic ecosystem functionality is extensive. |
| F | 0-20% | Critically/Extremely modified . Transformation has reached a critical level and the ecosystem has been modified completely with a virtually complete loss of natural habitat and biota. The basic ecosystem functionality has virtually been destroyed and the transformation is irreversible. |

The **Ecological Importance and Sensitivity (EIS)** of the proposed project area was assessed and rated as per the table below.

- The Ecological Importance and Sensitivity (EIS) of an area is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales, and both abiotic and biotic components of the system are taken into consideration. Sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred.

Table 2: Criteria for EIS calculations

| EIS Categories | Score | Description |
|---------------------|----------|---|
| Low/Marginal | D | Not ecologically important and/or sensitive on any scale. Biodiversity is ubiquitous and not unique or sensitive to habitat modifications. |
| Moderate | C | Ecologically important and sensitive on local or possibly provincial scale. Biodiversity is still relatively ubiquitous and not usually sensitive to habitat modifications. |
| High | B | Ecologically important and sensitive on provincial or possibly national scale. Biodiversity is relatively unique and may be sensitive to habitat modifications. |
| Very High | A | Ecologically important and sensitive on national and possibly international scale. Biodiversity is very unique and sensitive to habitat modifications. |

Potential impacts of the proposed project on the surrounding natural environment were identified, evaluated and rated as per the methodology described below. The tables below indicate and explain the methodology and criteria used for the evaluation of the Environmental Risk Ratings as well as the calculation of the final Environmental Significance Ratings of the identified potential ecological impacts. Each potential environmental impact is scored for each of the Evaluation Components as per the table below.

Table 3: Scale utilised for the evaluation of the Environmental Risk Ratings

| Evaluation Component | Rating Scale and Description/Criteria |
|---|---|
| Magnitude of Negative or Positive Impact | <p>10 - Very high: Bio-physical features and/or ecological functionality/processes may be severely impacted upon.</p> <p>8 - High: Bio-physical features and/or ecological functionality/processes may be significantly impacted upon.</p> <p>6 - Medium: Bio-physical features and/or ecological functionality/processes may be moderately impacted upon.</p> <p>4 - Low: Bio-physical features and/or ecological functionality/processes may be slightly impacted upon.</p> <p>2 - Very Low: Bio-physical features and/or ecological functionality/processes may be slightly impacted upon.</p> <p>0 - Zero: Bio-physical features and/or ecological functionality/processes will not be impacted upon.</p> |
| Duration of Negative or Positive Impact | <p>5 – Permanent: Impact will continue on a permanent basis.</p> <p>4 - Long term: Impact should cease a period (> 40 years) after the operational phase/project life of the activity.</p> <p>3 - Medium term: Impact may occur for the period of the operational phase/project life of the activity.</p> <p>2 - Short term: Impact may only occur during the construction phase of the activity after which it will cease.</p> <p>1 - Immediate: Impact may only occur as a once off during the construction phase of the activity.</p> |

| | |
|--|---|
| Extent of Positive or Negative Impact | <p>5 - International: Impact will extend beyond National boundaries.</p> <p>4 - National: Impact will extend beyond Provincial boundaries but remain within National boundaries.</p> <p>3 - Regional: Impact will extend beyond 5 km of the development footprint but remain within Provincial boundaries.</p> <p>2 - Local: Impact will not extend beyond 5 km of the development footprint.</p> <p>1 - Site-specific: Impact will only occur on or within 200 m of the development footprint.</p> <p>0 – No impact.</p> |
| Irreplaceability of Natural Resources being impacted upon | <p>5 – Definite loss of irreplaceable natural resources.</p> <p>4 – High potential for loss of irreplaceable natural resources.</p> <p>3 – Moderate potential for loss of irreplaceable natural resources.</p> <p>2 – Low potential for loss of irreplaceable natural resources.</p> <p>1 – Very low potential for loss of irreplaceable natural resources.</p> <p>0 – No impact.</p> |
| Reversibility of Impact | <p>5 – Impact cannot be reversed.</p> <p>4 – Low potential that impact may be reversed.</p> <p>3 – Moderate potential that impact may be reversed.</p> <p>2 – High potential that impact may be reversed.</p> <p>1 – Impact will be reversible.</p> <p>0 – No impact.</p> |
| Probability of Impact Occurrence | <p>5 - Definite: Probability of impact occurring is > 95 %.</p> <p>4 - High: Probability of impact occurring is > 75 %.</p> <p>3 - Medium: Probability of impact occurring is between 25 % - 75 %.</p> <p>2 - Low: Probability of impact occurring is between 5 % - 25 %.</p> <p>1 - Improbable: Probability of impact occurring is < 5 %.</p> |
| Cumulative Impact | <p>High: Numerous similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts.</p> <p>Medium: Few similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts.</p> <p>Low: Virtually no similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts. The development is anticipated to be an isolated occurrence and should therefore have a negligible cumulative impact.</p> <p>None: No cumulative impact.</p> |

Once the Environmental Risk Ratings have been evaluated for each potential ecological impact, the Significance Score of each potential ecological impact is calculated by using the following formula:

- **SS (Significance Score) = (magnitude + duration + extent + irreplaceable + reversibility) x probability.**

The maximum Significance Score value is 150.

The Significance Score is then used to rate the Environmental Significance of each potential ecological impact as per Table 4 below. The Environmental Significance rating process is completed for all identified potential ecological impacts both before and after implementation of the recommended mitigation measures.

Table 4: Scale used for the evaluation of the Environmental Significance Ratings

| Environmental Significance Score | Environmental Significance Rating | Description/Criteria |
|----------------------------------|-----------------------------------|---|
| 125 – 150 | Very high | An impact of very high significance after mitigation will mean that the development may not take place. The impact cannot be suitably reduced and mitigated to within acceptable levels. |
| 100 – 124 | High | An impact of high significance after mitigation should influence a decision about whether or not to proceed with the development. Additional, impact-specific mitigation measures must be implemented if the continuation of the development is to be considered. |
| 75 – 99 | Medium-high | Additional, impact-specific mitigation measures must be implemented for an impact of medium-high significance if the continuation of the development is to be considered. |
| 50 – 74 | Medium | An impact of medium significance after mitigation must be adequately managed in accordance with the mitigation measures provided by the specialist. |
| < 50 | Low | If any mitigation measures are provided by the specialist for an impact of low significance after mitigation, the impact must be adequately managed in accordance with these measures. |
| + | Positive impact | A positive impact is likely to result in a beneficial consequence/effect and should therefore be viewed as a motivation for the development to proceed. |

Wetlands/watercourses were identified and delineated on the proposed project area as per the methodology described below:

For the purposes of this investigation a wetland was defined according to the definition in the National Water Act (Act 36 of 1998) as: “land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.”

In 2005 DWAF published a wetland delineation procedure in a guideline document titled “A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas”. Guidelines for the undertaking of biodiversity assessments exist. These guidelines contain a number of stipulations relating to the protection of wetlands and the undertaking of wetland assessments.

The wetland delineation procedure identifies the outer edge of the temporary zone of the wetland, which marks the boundary between the wetland and adjacent terrestrial areas. This constitutes the part of the wetland that might remain flooded or saturated close to the soil surface for only a few weeks in the year, but long enough to develop anaerobic conditions and determine the nature of the plants growing in the soil.

The guidelines also state that the locating of the outer edge of the temporary zone must make use of four specific indicators namely:

- terrain unit indicator,
- soil form indicator,
- soil wetness indicator and
- vegetation indicator.

In addition, the wetland/watercourse and a protective buffer zone beginning from the outer edge of the wetland temporary zone, was designated as sensitive in a sensitivity map. The guidelines stipulate buffers to be delineated around the boundary of a wetland. An adequate protective buffer zone, beginning from the outer edge of the wetland temporary zone, was implemented and designated as sensitive within which no development must be allowed to occur.

6. Study Area

The assessment area constitutes a new domestic water pipeline network consisting of five interlinked pipeline routes which will feed water from six existing boreholes and two existing reservoirs into the municipal water supply system. A single wastewater pipeline will also be developed for sewage management purposes. The assessment area therefore constitutes the linear routes of the proposed new pipeline network.

The assessment area is situated within and around the existing informal settlement outside the town of Olifantshoek which forms part of the Gamagara Local Municipality. This in turn, forms part of the ZF Mgcawu District Municipality, Northern Cape Province. Access to the assessment area is obtained via the N 14 national road and subsequent dirt roads from the north-west.

See locality map below.

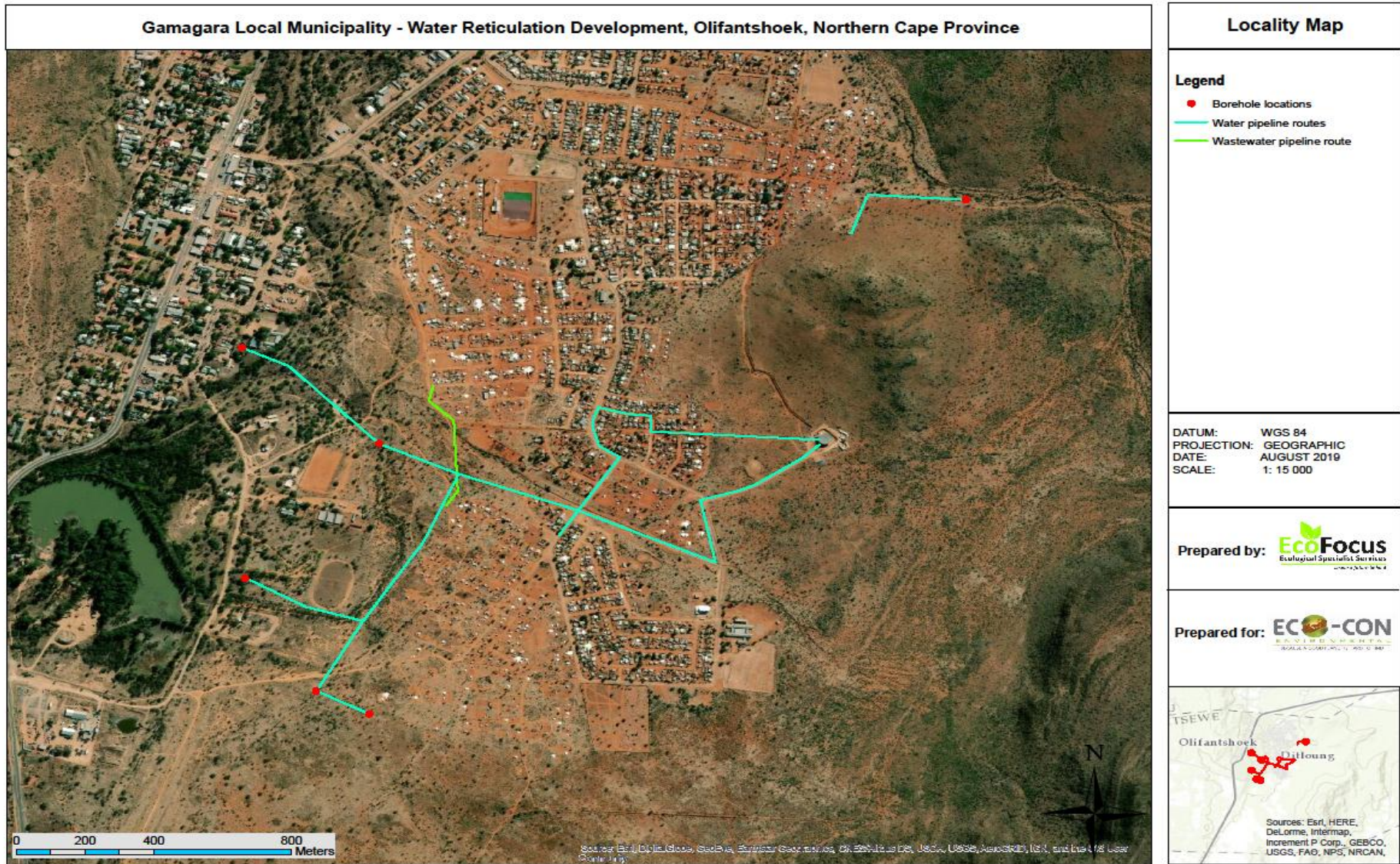


Figure 1: Locality map illustrating the assessment area (see A3 sized map in the Appendices)

6.1. Climate

The rainfall of the region peaks during the summer months and the Mean Annual Precipitation (MAP) of the area is approximately 342 mm (www.climate-data.org). The maximum average monthly temperature is approximately 24.9°C in the summer months while the minimum average monthly temperature is approximately 11.1°C during the winter. Maximum daily temperatures can reach up to 32.6°C in the summer months and dip to as low as 2.4°C during the winter.

6.2. Geology and Soils

According to Mucina & Rutherford (2006) the geology of the landscape and associated vegetation type can be described as the following:

Red aeolian sand of tertiary or recent age (Kalahari Group) with silcrete and calcrete and some andesitic and basaltic lava of the Griqualand West Supergroup. Deep Hutton soils are overwhelmingly dominant.

6.3. Vegetation and Conservation Status

According to SANBI (2006-), the entire assessment area falls within the Olifantshoek Plains Thornveld vegetation type (SVk 13) which mainly consists of wide plains with an open tree and shrubland layer and usually a sparse grass layer. This vegetation type is classified as least threatened because of its broad distribution (SANBI, 2006-).

The linear routes of the proposed new pipeline network traverse areas categorised as Other Natural Areas (ONA), Ecological Support Areas (ESA) as well as some completely degraded land within the existing informal settlement in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province.

The proposed new domestic water pipeline network will in all probability only impact on- and transform a narrow linear section along the pipeline routes.

See vegetation and conservation status maps below.

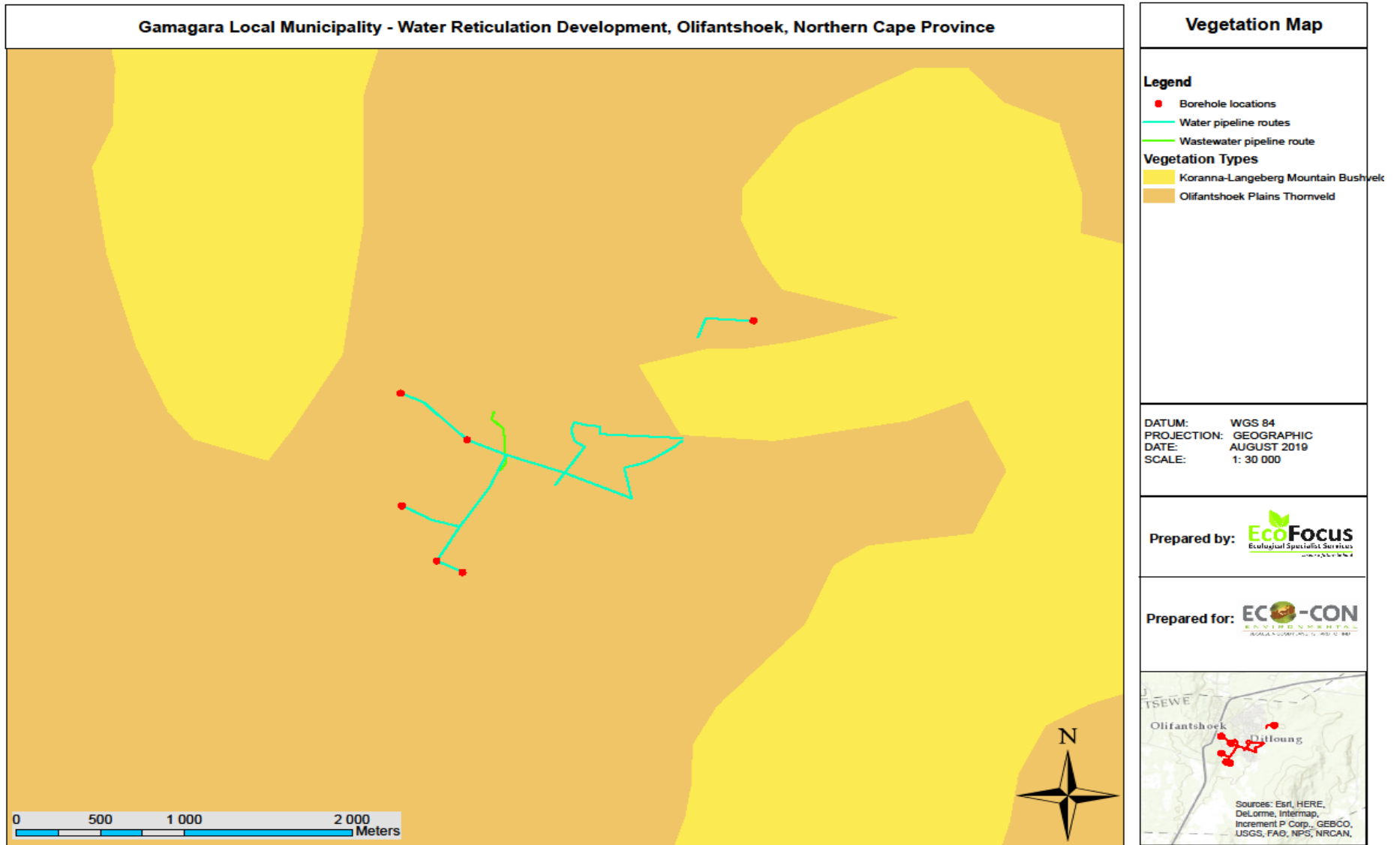


Figure 2: Vegetation map illustrating the vegetation type associated with the assessment area (see A3 sized map in the Appendices)

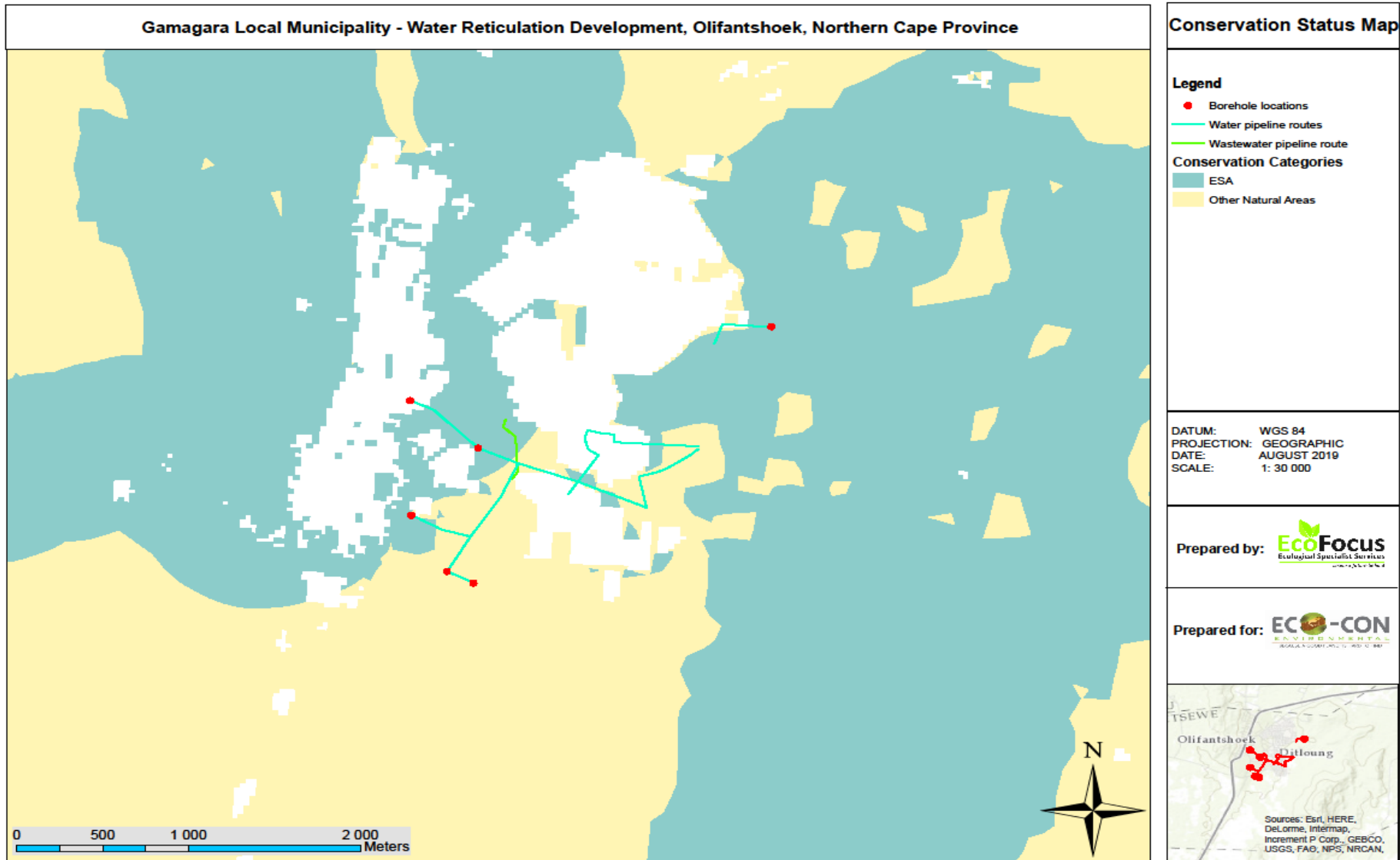


Figure 3: Conservation status map illustrating the conservation statuses associated with the assessment area (see A3 sized map in the Appendices)

7. Assumptions, Uncertainties and Gaps in Knowledge

Various assumptions need to be made during the assessment process at the hand of the relevant specialist. It is therefore assumed that:

- all relevant project information provided by the applicant and engineering design team to the ecological specialist was correct and valid at the time that it was provided.
- the proposed linear pipeline routes as provided by the engineering design team is correct and will not be significantly deviated from as these were the only areas assessed.
- strategic level investigations undertaken by the applicant prior to the commencement of the informal Environmental Impact Assessment process, determined that the proposed development footprint represents a potentially suitable and technically acceptable location.
- the public, local communities, relevant organs of state and landowners will receive a sufficient reoccurring opportunity to participate and comment on the proposed project during the informal Environmental Impact Assessment process, through the provision of adequately facilitated public participation interventions and timeframes as stipulated in the NEMA: EIA Regulations, 2014.
- the need and desirability of the proposed project is based on strategic national, provincial and local plans and policies which reflect the interests of both statutory and public viewpoints.
- the informal EIA process is a project-level framework and the specialists are limited to assessing the anticipated environmental impacts associated with the construction and operational phases of the proposed project.
- it is assumed that strategic level decision making by the relevant authorities will be conducted through cooperative governance principles, with the consideration of environmentally sustainable and responsible development principles underpinning all decision making.

Given that an informal EIA involves prediction, the uncertainty factor forms part of the assessment process. Two types of uncertainty are associated with the informal EIA process, namely process-related and prediction-related.

- Uncertainty of prediction is critical at the data collection phase as observations and conclusions are made, only based on professional specialist opinion. Final certainty will only be obtained upon actual implementation of the proposed development. Adequate research, specialist experience and expertise should however minimise this uncertainty.
- Uncertainty of relevant decision making relates to the interpretation of provided information by relevant authorities during the informal EIA process. Continual two way communication and coordination between EAP's and relevant authorities should however decrease the

uncertainty of subjective interpretation. The importance of widespread/comprehensive consultation towards minimising the risk/possibility of omitting significant information and impacts is further stressed. The use of quantitative impact significance rating formulas (as utilised in this document) can further standardise the objective interpretation of results and limit the occurrence and scale of uncertainty and subjectivity.

- The principle of human nature provides for uncertainties and unpredictability with regards to the socio-economic impacts of the proposed development and the subsequent public reaction/opinion which will be received during the Public Participation Process (PPP).

Gaps in knowledge can be attributed to:

- The ecological study process was undertaken prior to the availing of certain information which would only be derived from the final project design and layout. The design layout had not been finalised yet at the time of the ecological study.
- The potential of future similar developments in the same geographical area, which could lead to cumulative impacts cannot be meaningfully anticipated.

EcoFocus Consulting is an independent ecological specialist company. All information and recommendations as per this report are therefore provided in a fair and unbiased/objective manner based on professional specialist opinion.

8. Results and Discussion

The majority of the proposed new pipeline routes traverse areas within the existing informal settlement and run along existing dirt roads. The majority of natural surface vegetation has therefore been cleared within these existing informal settlement areas and the areas constitute highly degraded and transformed landscapes. Although this is the case, a significant number of naturally occurring mature tree individuals have not been removed but rather left in place, as they are used for shading purposes by residents on their properties.

Only the south-western portion of the proposed new pipeline routes traverse undeveloped, relatively natural areas associated with the relevant vegetation type. Assumed significant historic and continued long term overgrazing by livestock from the local community has however resulted in these areas being virtually completely devoid of a well-established grass layer as would otherwise have been expected in the natural climactic state of the relevant vegetation type.

The proposed new pipeline routes also traverse three small ephemeral water drainage lines.

8.1. Current Existing Vegetation and Site Description

The undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes constitute a homogenous flat to slightly sloping open savannah landscape associated with the relevant Olifantshoek Plains Thornveld vegetation type (SVk 13). The woody component is mainly dominated by tree individuals of the species *Boscia albitrunca* while tree and shrub individuals of the species *Vachellia erioloba* are also well represented (both of these species are listed as nationally protected).

The average density of *Boscia albitrunca* individuals within this undeveloped, relatively natural portion, amounts to approximately 10 trees/ha of which most individuals are very large (≥ 4 m in height) and presumably therefore also very old. Such large/old individuals of this species are considered to be of high conservational significance.

The average density of *Vachellia erioloba* individuals within this undeveloped, relatively natural portion, amounts to approximately 5 trees/ha. Most individuals of this species are however not necessarily significant in size (≤ 4 m in height) and are therefore considered to be of slightly less conservationally significant relative to the *Boscia albitrunca* individuals present.

It is however recommended that no individuals of these two nationally protected tree species may be removed during construction of the proposed new pipeline network. The pipeline route is to be adequately deviated around any such individuals by a minimum distance of 4 m.

Tree and shrub individuals of the species *Vachellia tortilis* are also well represented throughout the undeveloped, relatively natural portion. Other tree and shrub species also found to be sparsely present include *Senegalia mellifera*, *Ziziphus mucronata*, *Grewia flava*, *Ehretia alba* as well as the legally declared invasive species *Prosopis spp.* (Category 3) & *Opuntia sp.* (Category 1b).

Due to the assumed continued long term overgrazing, the low growing karroid shrub species *Rhigozum trichotomum* is dominant within the undeveloped, relatively natural portion, while the karroid shrub species *Monechma incanum*, *Hertia pallens* & *Crotalaria orientalis* are also well represented. The provincially protected species *Aloe hereroensis*, *Ammocharis coranica* & *Bulbine abyssinica* are well represented throughout the undeveloped, relatively natural portion while only a few individuals of the provincially protected species *Euphorbia burmannii* & *Aloe grandidentata* were found to be present.

It is recommended that a minimum of 20 individuals of each of the three well-represented provincially protected species be removed, if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.

It is also recommended that any individuals of the provincially protected species *Aloe grandidentata* be removed if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.

These removal and relocation activities must be completed prior to the commencement of any vegetation clearance- or construction activities. A Provincial Flora Permit has to be obtained prior to the commencement of any such removal and relocation activities.

Forb species found to be present within the assessment area include *Dipcadi crispum*, *Cassia italica*, *Albuca setosa*, *Ledebouria undulata*, *Tribulus cristatus* & *Ipomoea bathycolpos*.

As mentioned earlier, the undeveloped, relatively natural portion is virtually completely devoid of a well-established grass layer mainly due to assumed significant continued long term overgrazing by

livestock from the local community. The existing graminoid layer is completely dominated by small seedlings of what appears to be the nut-sedge species *Cyperus rotundus*. No other grass species were found to be well represented within the undeveloped, relatively natural portion as would otherwise have been expected in the natural climactic state of the relevant vegetation type.

No Red Data Listed species or any other species of conservational significance were found to be present within the undeveloped, relatively natural portion. The undeveloped, relatively natural portion and surrounding landscape also does not fall within any Important Bird Area (IBA) as per the latest IBA map obtained from the Birdlife SA website (www.birdlife.org.za/conservation/important_bird_areas/iba-map). No important bird species, unique or specialised bird habitats were observed or are expected to utilise the area for breeding and/or persistence purposes.

Due to the presence of the informal residential settlement situated directly adjacent north-east of the undeveloped, relatively natural portion along with continued grazing by livestock from the local community, the area is subjected to continued anthropogenic activity and disturbance. It is therefore not anticipated that any large or conservationally significant faunal species would utilise the undeveloped, relatively natural portion for breeding and/or persistence purposes.

See photographs below.



Figure 4: Two images illustrating the open savannah landscape of the undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes



Figure 5: Image illustrating an example of a more natural area in close proximity to the assessment area, which possesses a well-established grass layer more reminiscent of the natural climactic state of the relevant vegetation type

Due to the slightly sloping topography of the assessment area, the entire area forms part of the upper region of a quaternary surface water catchment and drainage area which regionally drains towards the north.

Three small ephemeral water drainage lines are traversed by the proposed new pipeline routes. The lack of constant water flow through the assessment area, has resulted in these drainage lines not possessing any distinct riparian zone or variation in vegetation species composition relative to the surrounding savannah. These drainage lines however feed into a subsequent downstream third order watercourse which forms an important part of the quaternary surface water catchment and drainage. The drainage lines are therefore viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and the surface water catchment and drainage area.



Figure 6: Image illustrating an example of the small ephemeral water drainage lines which are traversed by the proposed new pipeline routes

8.2. Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS)

The Present Ecological State (PES) of the majority of the proposed new pipeline routes which traverse areas within the existing informal settlement, is classified as Class F as these areas are critically/extremely modified. Transformation has reached a critical level and the ecosystem has been completely modified with a virtually complete loss of natural habitat and biota. The basic ecosystem functionality has virtually been destroyed and the transformation is deemed irreversible.

The Present Ecological State (PES) of the undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes is classified as Class C as it is moderately modified. Moderate loss and transformation of natural habitat and biota have occurred mainly due to assumed significant continued long term overgrazing by livestock from the local community, but the basic ecosystem functionality has still remained predominantly unchanged.

The Ecological Importance and Sensitivity (EIS) of the undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes is classified as Class C (moderate) as it is viewed as being ecologically important and sensitive on provincial scale mainly due to the significant presence of nationally and provincially protected species individuals. Biodiversity is however still relatively ubiquitous in the broader area. The undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes are therefore viewed as being of moderate conversational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and nationally and provincially protected species.

The three small ephemeral water drainage lines which are traversed by the proposed new pipeline routes, feed into a subsequent downstream third order watercourse which forms an important part of the quaternary surface water catchment and drainage. The Ecological Importance and Sensitivity (EIS) of the three small ephemeral water drainage lines which are traversed by the proposed new pipeline routes, is classified as Class C (moderate) as they are viewed as being ecologically important and sensitive on local and possibly provincial scale mainly due to them forming an important part of the quaternary surface water catchment and drainage. The drainage lines are therefore viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and the surface water catchment and drainage area.

8.3. Species List for the Assessment Area

Table 5: Species list for the undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes (Provincially protected species highlighted in yellow; nationally protected species highlighted in orange; legally declared invasive species highlighted in pink)

| Graminoids | Forbs | Shrubs & trees |
|-------------------------|----------------------------|------------------------------|
| <i>Cyperus rotundus</i> | <i>Albuca setosa</i> | <i>Boscia albitrunca</i> |
| - | <i>Aloe grandidentata</i> | <i>Crotalaria orientalis</i> |
| - | <i>Aloe hereroensis</i> | <i>Ehretia alba</i> |
| - | <i>Ammocharis coranica</i> | <i>Grewia flava</i> |
| - | <i>Bulbine abyssinica</i> | <i>Hertia pallens</i> |
| - | <i>Cassia italica</i> | <i>Monechma incanum</i> |
| - | <i>Dipcadi crispum</i> | <i>Opuntia sp.</i> |
| - | <i>Euphorbia burmannii</i> | <i>Prosopis spp.</i> |
| - | <i>Ipomoea bathycolpos</i> | <i>Rhigozum trichotomum</i> |
| - | <i>Ledebouria undulata</i> | <i>Senegalia mellifera</i> |
| - | <i>Tribulus cristatus</i> | <i>Vachellia erioloba</i> |
| - | - | <i>Vachellia tortilis</i> |
| - | - | <i>Ziziphus mucronata</i> |

8.4. Ecological Site Sensitivity Map

The site sensitivity map below illustrates the locations of the small ephemeral water drainage lines.

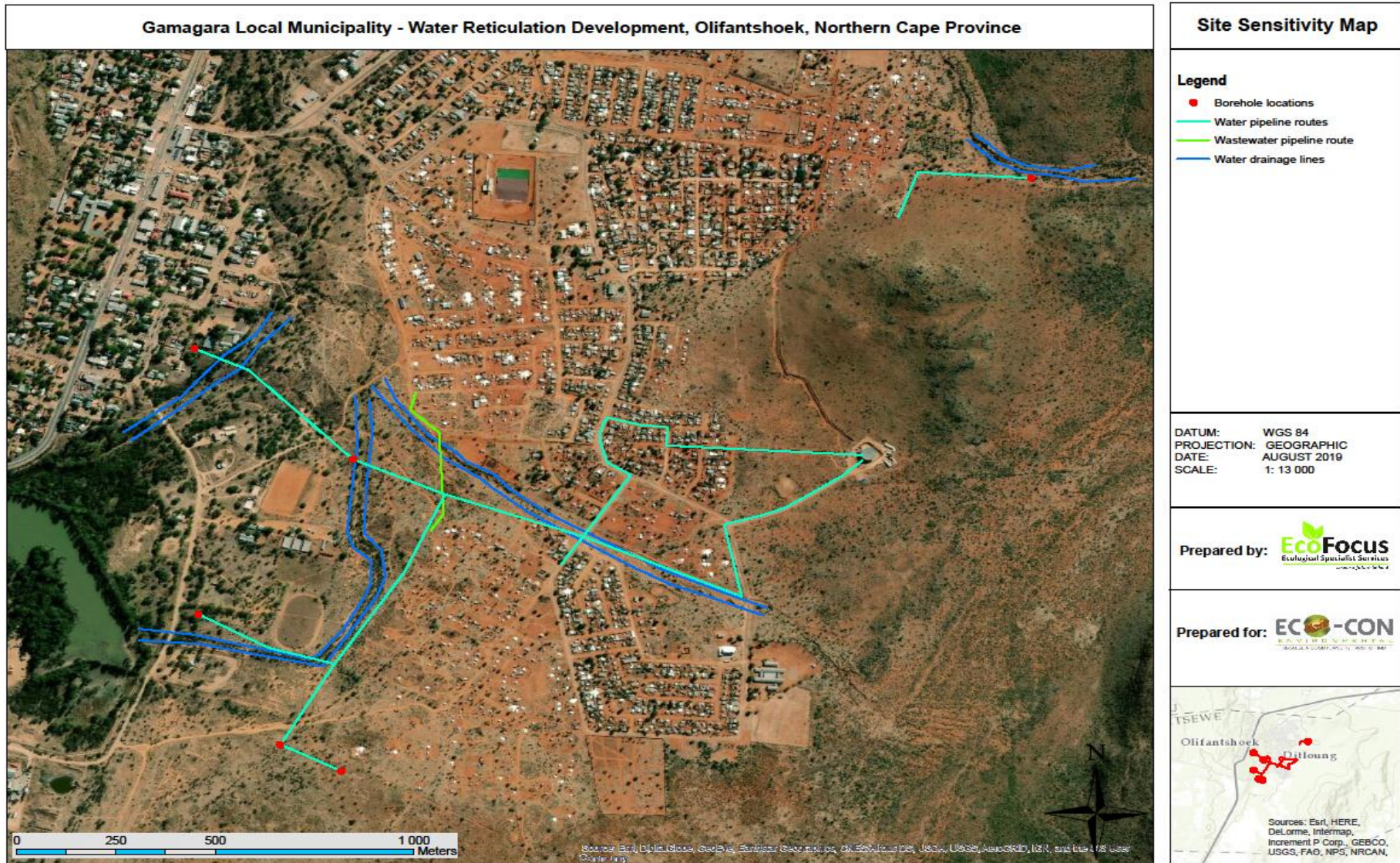


Figure 7: Site sensitivity map illustrating the locations of the small ephemeral water drainage lines (see A3 sized map in the Appendices)

9. Ecological Impact Assessment

The following section identifies the potential ecological impacts (both positive and negative) which the proposed project will have on the surrounding environment.

Once the potential ecological impacts are identified, they are assessed by rating their Environmental Risk after which the final Environmental Significance is calculated and rated for each identified ecological impact.

The same Environmental Risk rating process is then followed for each ecological impact to determine the Environmental Significance if the recommended mitigation measures were to be implemented.

The objective of this section is therefore firstly to identify all the potential ecological impacts of the proposed project and secondly to determine the significance of the impacts and how effective the recommended mitigation measures will be able to reduce their significance. The potential ecological impacts which are still rated as highly significant, even after implementation of mitigations, can then be identified in order to specifically focus on implement of effective management strategies for them.

9.1. Construction Phase

Transformation of terrestrial vegetation on the assessment area associated with the Olifantshoek Plains Thornveld vegetation type (SVk 13)

The proposed new domestic water pipeline network will in all probability only impact on- and transform a narrow linear section along the pipeline routes.

The Olifantshoek Plains Thornveld vegetation type (SVk 13) associated with the assessment area, is classified as least threatened because of its broad distribution (SANBI, 2006-). The majority of the proposed new pipeline routes traverse areas within the existing informal settlement and run along existing dirt roads. The majority of natural surface vegetation has therefore been cleared within these existing informal settlement areas and the areas constitute highly degraded and transformed landscapes.

Only the south-western portion of the proposed new pipeline routes traverse undeveloped, relatively natural areas associated with the relevant vegetation type. Assumed significant historic and continued long term overgrazing by livestock from the local community has however resulted in

these areas being virtually completely devoid of a well-established grass layer as would otherwise have been expected in the natural climactic state of the relevant vegetation type.

The significance of this potential impact will be low.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Destruction of-/damage to Red Data Listed, nationally or provincially protected species individuals/habitats associated with the assessment area

The proposed new domestic water pipeline network will in all probability only impact on- and transform a narrow linear section along the pipeline routes.

Although no Red Data Listed species were found to be present within the assessment area, individuals of the nationally protected tree species *Boscia albitrunca* & *Vachellia erioloba* were found to be present throughout the undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes. Most individuals of the former species are very large (≥ 4 m in height) and presumably therefore also very old while most individuals of the latter species are not necessarily significant in size. Such large/old individuals of the former species are considered to be of high conservational significance.

The provincially protected species *Aloe hereroensis*, *Ammocharis coranica* & *Bulbine abyssinica* are well represented throughout the undeveloped, relatively natural portion, while only a few individuals of the provincially protected species *Euphorbia burmannii* & *Aloe grandidentata* were found to be present.

The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Terrestrial and aquatic alien invasive species establishment

No significant alien invasive species establishments were found to be present within the assessment area. Tree and shrub individuals of the legally declared invasive species *Prosopis spp.* (Category 3) & *Opuntia sp.* (Category 1b), were however found to be sparsely present throughout the undeveloped,

relatively natural portion. These individuals will in fact be removed during the construction phase which will prove to be beneficial to the environment.

The proposed new pipeline routes and surrounding areas could potentially be prone to significant alien invasive species establishment due to surface disturbances and vegetation clearance caused by construction activities. The aquatic habitat of the small ephemeral water drainage lines which are traversed by the proposed new pipeline routes, could further also potentially act as significant transport/distribution vectors for numerous terrestrial and aquatic invasive species into the broader region.

The significance of this potential impact will be low.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Surface material erosion

The assessment area has a flat to slightly sloping topography. Due to the slightly sloping topography, the entire area forms part of the upper region of a quaternary surface water catchment and drainage area which regionally drains towards the north.

Assumed significant continued long term overgrazing by livestock from the local community has resulted in the undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes being virtually completely devoid of a well-established grass layer as would otherwise have been expected in the natural climactic state of the relevant vegetation type. The assessment area could therefore potentially be prone to surface soil erosion due to the loosening of materials and further clearance of vegetation caused by construction activities which usually binds surface material.

The significance of this potential impact will be low.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Dust generation and emissions

The construction activities associated with the proposed project development could potentially result in slight fugitive dust emissions due to vegetation clearance and movement of machinery and equipment. Generated dust could spread into- and contaminate the surrounding natural areas.

The significance of this potential impact will be low.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Impeding and contamination of the flow regimes of the three small ephemeral water drainage lines and subsequent downstream third order watercourse

Due to the slightly sloping topography, the entire area forms part of the upper region of a quaternary surface water catchment and drainage area which regionally drains towards the north.

The three small ephemeral water drainage lines which are traversed by the proposed new pipeline routes, feed into a subsequent downstream third order watercourse which forms an important part of the quaternary surface water catchment and drainage. The drainage lines are therefore viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and the surface water catchment and drainage area.

The activities associated with the construction phase could potentially result in contamination and impeding of natural surface water flow towards and within the three small ephemeral water drainage lines due to artificial obstruction of flow during rainfall events and hydrocarbon or other chemical spills by machinery and equipment.

The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4.

9.2. Operational Phase

Once the construction phase has been completed, there should be no significant additional potential ecological impacts associated with the operational phase over and above the already discussed long term impacts of the construction phase. The transformation of the relevant vegetation type and the destruction of nationally/provincially protected species individuals/habitats were discussed and addressed during the construction phase as potential long term impacts.

A number of identified potential ecological impacts could however change in nature and increase in significance from the construction phase into the operational phase and will continue throughout the entire lifespan and operational phase of the proposed project. The following additional potential ecological impacts could therefore take place during the operational phase:

Continued impeding and contamination of the flow regimes of the three small ephemeral water drainage lines and subsequent downstream third order watercourse

The established new pipelines could potentially continuously impede on the flow regimes of the three small ephemeral water drainage lines due to continued artificial obstruction of natural surface water flow during rainfall events.

The operations of the wastewater pipeline could further potentially result in continued contamination of natural surface water flow towards the three small ephemeral water drainage lines due to raw sewage spills through pipe leakages or failures.

The significance of this potential impact will be medium-high.

Mitigation measures to reduce impacts are recommended under heading 9.4.

Over extraction of domestic use water from the six existing boreholes

Significant quantities of water will be extracted from the six existing boreholes for domestic use purposes within the new residential areas to be developed. A geo-hydrological study was conducted of the six boreholes which concluded that these boreholes along with a number of additional boreholes would be able to adequately provide a sustainable yield and supply the required volumes of water necessary for domestic use within the new residential development.

Over extraction of ground water in excess of the allotted sustainable yield volumes could however potentially lead to and drying up of the underground aquifers if not adequately managed.

The significance of this potential impact will be medium.

Mitigation measures to reduce impacts are recommended under heading 9.4.

9.3. Cumulative Impacts

The proposed new domestic water pipeline network will in all probability only impact on- and transform a narrow linear section along the pipeline routes. The proposed development should therefore not pose any significant residual cumulative impacts.

Significant quantities of water will however be extracted from the six existing boreholes for domestic use purposes within the proposed new residential development. This, along with existing municipal water extraction could potentially lead to cumulative over extraction of ground water and drying up of the underground aquifers if not adequately managed.

Extraction of the allotted sustainable yield volumes as per the geo-hydrological study of the six boreholes, may not be exceeded at any time. Follow up geo-hydrological studies should be conducted on a minimum bi-annual basis (every two years) in order to ensure the sustainability and integrity of the underground aquifers are not being significantly compromised.

Other than that, it is not anticipated that the proposed development would pose any significant potential long term residual cumulative ecological impacts within the broader region if all the recommended mitigation measures are adequately implemented.

9.4. Risk Ratings of Potential Impacts

The following section provides the Environmental Risk as well as the Environmental Significance Ratings for the potential ecological impacts for the proposed project both before and after implementation of the recommended mitigation measures.

9.4.1. Construction Phase

Table 6: Environmental Risk and Significance Ratings

| | Proposed new pipeline routes | No go alternative |
|--|---|-------------------|
| Identified Environmental Impact | Transformation of terrestrial vegetation on the assessment area associated with the Olifantshoek Plains Thornveld vegetation type (SVk 13) | |
| Magnitude of Negative or Positive Impact | Low (4) | - |
| Duration of Negative or Positive Impact | Long term (4) | - |
| Extent of Positive or Negative Impact | Local (2) | - |
| Irreplaceability of Natural Resources being impacted upon | Low (2) | - |
| Reversibility of Impact | Low (4) | - |
| Probability of Impact Occurrence | Medium (3) | - |
| Cumulative Impact Rating prior to mitigation | Low | - |
| Environmental Significance Score and Rating prior to mitigation | Low (48) | - |

| | | |
|---|--|----------|
| <p style="text-align: center;">Mitigation Measures to be implemented</p> | <p>The linear project construction footprints of the proposed new pipeline routes must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place.</p> <p>No site construction camps to be established within the surrounding natural areas outside the project footprint area.</p> <p>Adequately cordon off the construction area and ensure that no construction activities, machinery or equipment operate or impact within the natural surrounding areas outside the cordoned off area.</p> <p>Adequate operational procedures for machinery and equipment must be developed in order to strictly govern movement of machinery only within project footprint area and ensure environmentally responsible construction practices and activities.</p> <p>Existing roads and farm tracks in close proximity to the proposed project area must be used during construction. No new roads or tracks to be constructed or implemented outside the footprint areas of the proposed development.</p> <p>Areas surrounding the construction footprint must be adequately rehabilitated as soon as practically possible after construction.</p> | |
| <p>Cumulative Impact Rating after mitigation implementation</p> | <p style="text-align: center;">Low</p> | <p>-</p> |

| | | |
|--|---|--------------------------|
| Environmental Significance Score and Rating after mitigation implementation | Low (13) | - |
| | | |
| | Proposed new pipeline routes | No go alternative |
| Identified Environmental Impact | Destruction of-/damage to Red Data Listed, nationally or provincially protected species individuals/habitats associated with the assessment area | |
| Magnitude of Negative or Positive Impact | Medium (6) | - |
| Duration of Negative or Positive Impact | Long term (4) | - |
| Extent of Positive or Negative Impact | Local (2) | - |
| Irreplaceability of Natural Resources being impacted upon | Moderate (3) | - |
| Reversibility of Impact | Low (4) | - |
| Probability of Impact Occurrence | Medium (3) | - |
| Cumulative Impact Rating prior to mitigation | Medium | - |

| | | |
|---|--|--------------------------------------|
| Environmental Significance Score and Rating prior to mitigation | <p style="text-align: center;">Medium (57)</p> | <p style="text-align: center;">-</p> |
| <p style="text-align: center;">Mitigation Measures to be implemented</p> | <p>The linear project construction footprints of the proposed new pipeline routes must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place.</p> <p>It is recommended that no individuals of these two nationally protected tree species <i>Boscia albitrunca</i> & <i>Vachellia erioloba</i> may be removed during construction of the proposed new pipeline network. The pipeline route is to be adequately deviated around any such individuals by a minimum distance of 4 m.</p> <p>It is recommended that a minimum of 20 individuals of each of the three well-represented provincially protected species (<i>Aloe hereroensis</i>, <i>Ammocharis coranica</i> & <i>Bulbine abyssinica</i>) be removed, if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.</p> <p>It is also recommended that any individuals of the provincially protected species <i>Aloe grandidentata</i> be removed if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.</p> <p>These removal and relocation activities must be completed prior to the commencement of any vegetation clearance- or construction activities.</p> <p>A Provincial Flora Permit has to be obtained from the Northern Cape Department of Environment and Nature Conservation (DENC) for the relocation of the abovementioned individuals as well as for the removal/destruction</p> | |

| | | |
|--|---|--------------------------|
| | <p>of all other provincially protected species individuals found to be present within the proposed new pipeline routes prior to the commencement of any relocation or removal/destruction activities.</p> <p>An adequate Plant Relocation Management Plan must be compiled by a suitably qualified and experienced ecologist.</p> | |
| Cumulative Impact Rating after mitigation implementation | Low | - |
| Environmental Significance Score and Rating after mitigation implementation | Low (28) | - |
| | | |
| | Proposed new pipeline routes | No go alternative |
| Identified Environmental Impact | Terrestrial and aquatic alien invasive species establishment | |
| Magnitude of Negative or Positive Impact | Low (4) | - |
| Duration of Negative or Positive Impact | Long term (4) | - |
| Extent of Positive or Negative Impact | Regional (3) | - |

| | | |
|--|---|---|
| Irreplaceability of Natural Resources being impacted upon | Low (2) | - |
| Reversibility of Impact | High (2) | - |
| Probability of Impact Occurrence | Medium (3) | - |
| Cumulative Impact Rating prior to mitigation | Low | - |
| Environmental Significance Score and Rating prior to mitigation | Low (45) | - |
| Mitigation Measures to be implemented | <p>Implement an adequate Alien Invasive Species Establishment Management and Prevention Plan during the construction and operational phases. Such a management plan must be compiled by a suitably qualified and experienced ecologist.</p> <p>Areas surrounding the construction footprint must be adequately rehabilitated as soon as practically possible after construction in order to prevent significant alien invasive species establishment.</p> | |
| Cumulative Impact Rating after mitigation implementation | Low | - |
| Environmental Significance Score and Rating after mitigation implementation | Low (11) | - |

| | Proposed new pipeline routes | No go alternative |
|--|--|-------------------|
| Identified Environmental Impact | Surface material erosion | |
| Magnitude of Negative or Positive Impact | Low (4) | - |
| Duration of Negative or Positive Impact | Short term (2) | - |
| Extent of Positive or Negative Impact | Local (2) | - |
| Irreplaceability of Natural Resources being impacted upon | Low (2) | - |
| Reversibility of Impact | High (2) | - |
| Probability of Impact Occurrence | Low (2) | - |
| Cumulative Impact Rating prior to mitigation | Low | - |
| Environmental Significance Score and Rating prior to mitigation | Low (24) | - |
| Mitigation Measures to be implemented | Adequate stormwater and erosion management measures must be implemented for the entire assessment area during the construction and operational phases. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation in order to prevent any significant erosion from occurring. | |

| | | |
|--|--|--------------------------|
| | Areas surrounding the construction footprint must be adequately rehabilitated as soon as practically possible after construction in order to prevent significant erosion from occurring. | |
| Cumulative Impact Rating after mitigation implementation | Low | - |
| Environmental Significance Score and Rating after mitigation implementation | Low (9) | - |
| | | |
| | Proposed new pipeline routes | No go alternative |
| Identified Environmental Impact | Dust generation and emissions | |
| Magnitude of Negative or Positive Impact | Very low (2) | - |
| Duration of Negative or Positive Impact | Short term (2) | - |
| Extent of Positive or Negative Impact | Local (2) | - |
| Irreplaceability of Natural Resources being impacted upon | Low (2) | - |
| Reversibility of Impact | High (2) | - |

| | | |
|--|---|---|
| Probability of Impact Occurrence | Medium (3) | - |
| Cumulative Impact Rating prior to mitigation | Low | - |
| Environmental Significance Score and Rating prior to mitigation | Low (30) | - |
| Mitigation Measures to be implemented | <p>Implement suitable dust management and prevention measures during the construction phase.</p> <p>Areas surrounding the construction footprint must be adequately rehabilitated as soon as practically possible after construction in order to prevent significant dust emissions from occurring.</p> | |
| Cumulative Impact Rating after mitigation implementation | Low | - |
| Environmental Significance Score and Rating after mitigation implementation | Low (9) | - |

| | Proposed new pipeline routes | No go alternative |
|--|--|-------------------|
| Identified Environmental Impact | Impeding and contamination of the flow regimes of the three small ephemeral water drainage lines and subsequent downstream third order watercourse | |
| Magnitude of Negative or Positive Impact | Medium (6) | - |
| Duration of Negative or Positive Impact | Short term (2) | - |
| Extent of Positive or Negative Impact | Regional (3) | - |
| Irreplaceability of Natural Resources being impacted upon | High (4) | - |
| Reversibility of Impact | Medium (3) | - |
| Probability of Impact Occurrence | High (4) | - |
| Cumulative Impact Rating prior to mitigation | Medium | - |
| Environmental Significance Score and Rating prior to mitigation | Medium (72) | - |
| Mitigation Measures to be implemented | Adequate stormwater and erosion management measures must be implemented for the entire assessment area during the construction and operational phases. This must be done to ensure and sufficiently manage storm | |

water runoff, clean/dirty water separation towards the three small ephemeral water drainage lines in order to maintain their ecological functionality and integrity.

The construction footprints through the three small ephemeral water drainage lines must also be adequately rehabilitated as soon as practicably possible after construction in order to ensure their continued flow and ecological integrity. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.

If hydrocarbons or other chemicals are to be stored on site during the construction phase, the storage areas must be situated as far away as practicably possible from the three small ephemeral water drainage lines.

Hydrocarbon and other chemical storage areas must be adequately banded in order to be able to contain a minimum of 150 % of the capacity of storage tanks/units.

Adequate hydrocarbon and other chemical storage, handling, usage and spillage clean-up procedures must be developed and all relevant construction personnel must be sufficient trained on- and apply these procedures during the entire construction phase.

Spill kits must be readily available on the construction site. All employees must be adequately trained on the correct procedure and use of the spill kits.

A Water Use License Application (WULA) must be submitted to the Department of Water and Sanitation in

| | | |
|--|--|---|
| | accordance with the National Water Act (Act 36 of 1998). | |
| Cumulative Impact Rating after mitigation implementation | Low | - |
| Environmental Significance Score and Rating after mitigation implementation | Low (13) | - |

9.4.2. Operational Phase

Table 7: Environmental Risk and Significance Ratings

| | Proposed new pipeline routes | No go alternative |
|--|---|-------------------|
| Identified Environmental Impact | Continued impeding and contamination of the flow regimes of the three small ephemeral water drainage lines and subsequent downstream third order watercourse | |
| Magnitude of Negative or Positive Impact | Medium (6) | - |
| Duration of Negative or Positive Impact | Medium term (3) | - |
| Extent of Positive or Negative Impact | Regional (3) | - |
| Irreplaceability of Natural Resources being impacted upon | High (4) | - |
| Reversibility of Impact | Medium (3) | - |
| Probability of Impact Occurrence | High (4) | - |
| Cumulative Impact Rating prior to mitigation | Medium | - |
| Environmental Significance Score and Rating prior to mitigation | Medium-High (76) | - |

| | | |
|---|---|---------------------------------|
| <p>Mitigation Measures to be implemented</p> | <p>If all the recommended mitigations measures for the construction phase are adequately implemented and managed, it should prove sufficient in preventing any continued impeding of- or significant impact on the three small ephemeral water drainage lines.</p> <p>The wastewater pipeline must be regularly inspected and adequately maintained over time in order to prevent any leakages or failures.</p> | |
| <p>Cumulative Impact Rating after mitigation implementation</p> | <p>Low</p> | <p>-</p> |
| <p>Environmental Significance Score and Rating after mitigation implementation</p> | <p>Low (14)</p> | <p>-</p> |
| | | |
| | <p>Proposed new pipeline routes</p> | <p>No go alternative</p> |
| <p>Identified Environmental Impact</p> | <p>Over extraction of domestic use water from the six existing boreholes</p> | |
| <p>Magnitude of Negative or Positive Impact</p> | <p>Medium (6)</p> | <p>-</p> |
| <p>Duration of Negative or Positive Impact</p> | <p>Medium term (3)</p> | <p>-</p> |
| <p>Extent of Positive or Negative Impact</p> | <p>Regional (3)</p> | <p>-</p> |

| | | |
|--|---|---|
| Irreplaceability of Natural Resources being impacted upon | High (4) | - |
| Reversibility of Impact | Moderate (3) | - |
| Probability of Impact Occurrence | Medium (3) | - |
| Cumulative Impact Rating prior to mitigation | Medium | - |
| Environmental Significance Score and Rating prior to mitigation | Medium (57) | - |
| Mitigation Measures to be implemented | <p>Extraction of the allotted sustainable yield volumes as per the geo-hydrological study of the six boreholes, may not be exceeded at any time.</p> <p>Follow up geo-hydrological studies should be conducted on a minimum bi-annual basis (every two years) in order to ensure the sustainability and integrity of the underground aquifers are not being significantly compromised.</p> <p>Domestic water use must be adequately managed in order to prevent potential over extraction of ground water.</p> <p>Water saving initiatives must be implemented by the local municipality in order to prevent potential over extraction of ground water.</p> <p>A Water Use License Application (WULA) must be submitted to the Department of Water and Sanitation for the</p> | |

| | | |
|--|---|---|
| | <p>six existing boreholes in accordance with the National Water Act (Act 36 of 1998).</p> <p>Only the allotted water quantities as per the approved Water Use License are to be extracted.</p> <p>Flow meters are to be installed in order to enable monitoring and management water consumption.</p> <p>Water consumption figures must be submitted to the Department of Water and Sanitation (DWS) on a regular basis in order to ensure compliance with the allotted water quantities as per the approved Water Use License.</p> | |
| Cumulative Impact Rating after mitigation implementation | Low | - |
| Environmental Significance Score and Rating after mitigation implementation | Low (32) | - |

10. Summary and Conclusion

The proposed new domestic water pipeline network will in all probability only impact on- and transform a narrow linear section along the pipeline routes.

The majority of the proposed new pipeline routes traverse areas within the existing informal settlement and run along existing dirt roads. The majority of natural surface vegetation has therefore been cleared within these existing informal settlement areas and the areas constitute highly degraded and transformed landscapes.

Only the south-western portion of the proposed new pipeline routes traverse undeveloped, relatively natural areas associated with the relevant Olifantshoek Plains Thornveld vegetation type (SVk 13). Assumed significant historic and continued long term overgrazing by livestock from the local community has however resulted in these areas being virtually completely devoid of a well-established grass layer as would otherwise have been expected in the natural climactic state of the relevant vegetation type. This relevant vegetation type, is classified as least threatened because of its broad distribution (SANBI, 2006-).

The linear routes of the proposed new pipeline network traverse areas categorised as Other Natural Areas (ONA), Ecological Support Areas (ESA) as well as some completely degraded land within the existing informal settlement in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province

Although no Red Data Listed species were found to be present within the assessment area, individuals of the nationally protected tree species *Boscia albitrunca* & *Vachellia erioloba* were found to be present throughout the undeveloped, relatively natural areas associated with the south-western portion of the proposed new pipeline routes. Most individuals of the former species are very large (≥ 4 m in height) and presumably therefore also very old while most individuals of the latter species are not necessarily significant in size. Such large/old individuals of the former species are considered to be of high conservational significance.

It is therefore recommended that no individuals of these two nationally protected tree species may be removed during construction of the proposed new pipeline network. The pipeline route is to be adequately deviated around any such individuals by a minimum distance of 4 m.

The provincially protected species *Aloe hereroensis*, *Ammocharis coranica* & *Bulbine abyssinica* are well represented throughout the undeveloped, relatively natural portion, while only a few individuals of the provincially protected species *Euphorbia burmannii* & *Aloe grandidentata* were found to be present.

It is recommended that a minimum of 20 individuals of each of the three well-represented provincially protected species be removed, if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.

It is also recommended that any individuals of the provincially protected species *Aloe grandidentata* be removed if found to be present within the linear pipeline routes and adequately relocated to a suitable and similar area as to where they were removed from.

These removal and relocation activities must be completed prior to the commencement of any vegetation clearance- or construction activities. A Provincial Flora Permit has to be obtained from the Northern Cape Department of Environment and Nature Conservation (DENC) for the relocation of the abovementioned individuals as well as for the removal/destruction of all other provincially protected species individuals found to be present within the proposed new pipeline routes prior to the commencement of any relocation or removal/destruction activities.

Due to the presence of the informal residential settlement situated directly adjacent north-east of the undeveloped, relatively natural portion along with continued grazing by livestock from the local community, the area is subjected to continued anthropogenic activity and disturbance. It is therefore not anticipated that any large or conservationally significant faunal species would utilise the undeveloped, relatively natural portion for breeding and/or persistence purposes.

Due to the slightly sloping topography of the assessment area, the entire area forms part of the upper region of a quaternary surface water catchment and drainage area which regionally drains towards the north.

Three small ephemeral water drainage lines are traversed by the proposed new pipeline routes. These drainage lines feed into a subsequent downstream third order watercourse which forms an important part of the quaternary surface water catchment and drainage. The drainage lines are therefore viewed as being of moderate conservational significance for habitat preservation and

ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and the surface water catchment and drainage area. The construction footprints through the three drainage lines must therefore be adequately rehabilitated as soon as practicably possible after construction in order to ensure their continued flow and ecological integrity.

It is the opinion of the specialist that the potentially significant ecological impacts associated with the continued impeding and contamination of the flow regimes of the three small ephemeral water drainage lines as well as over extraction of domestic use water from the six existing boreholes, can be suitably reduced and mitigated to within acceptable residual levels. The project should therefore be considered by the applicant, Gamagara Local Municipality for approval and be allowed to continue.

The proposed development may however only continue if all recommended mitigations measures as per this ecological report are adequately implemented and managed for both the construction and operational phases of the proposed project. All necessary authorisations, licenses and permits must also be obtained prior to any commencement.

11. References

Collins, N.B. 2017. Free State Province Biodiversity Plan: Technical Report v1.0. Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs. Internal Report.

Conservation of Agricultural Resources Act (Act 43 of 1983)

Mucina, L. & Rutherford, M.C. (eds.) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

National Environmental Management Act (Act 107 of 1998)

National Environmental Management: Biodiversity Act (Act 10 of 2004)

National Environmental Management: Biodiversity Act (Act 10 of 2004); Alien and Invasive Species Regulations, 2014

National Forests Act (Act 84 of 1998)

National Water Act (Act 36 of 1998)

Northern Cape Nature Conservation Act (Act 9 of 2009)

Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP)
<http://bgis.sanbi.org/Projects/Detail/203>

South African National Biodiversity Institute (2006-). The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Online, <http://bgis.sanbi.org/SpatialDataset/Detail/18>, Version 2012.*

www.climate-data.org

12. Details of the Specialist

Adriaan Johannes Hendrikus Lamprecht (Pr.Sci.Nat)

M.Env.Sci. Ecological remediation and sustainable utilisation (NWU: Potchefstroom)

South African Council for Natural Scientific Professions (SACNASP): Professional Ecological Scientist
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Email Address: ajhlamprecht@gmail.com

Abbreviated Curriculum Vitae

Qualifications

- M.Env.Sci Ecological Remediation and Sustainable Utilisation/Vegetation Ecology
 - 2010 - North West University Potchefstroom
- B.Sc Botany and Zoology (Cum Laude)
 - 2008 - North West University Potchefstroom

Accredited courses completed

- Implementing Environmental Management Systems ISO 14001
 - 2011 - North West University Potchefstroom
- Environmental Law for Environmental Managers
 - 2011 - North West University Potchefstroom
- SASS 5 Aquatic Biomonitoring Training Course
 - 2017 – GroundTruth Consulting

Professional registrations

- South African Council for Natural Scientific Professions (**SACNASP**)
 - Professional Ecological Scientist Registration number 115601

- International Association for Impact Assessment (**IAIA**)
 - Registration number 5232
- South African Green Industries Council (**SAGIC**) Invasive Species training
 - Registration number 2405/2459

Employment and Experience Background

Upon completion of his studies, Rikus started his career in 2011 as an **Environmental Professional in Training (PIT) at Anglo American Thermal Coal: Environmental Services**. He received environmental training and practical implementation experience in all environmental facets of the mining industry with the focus on: Environmental rehabilitation, land management (biodiversity and invasive species eradication), waste & water-, air quality-, game reserve-, environmental management and legislation, as well as corporate reporting. He was also appointed as the Biodiversity management custodian at Anglo American Thermal Coal collieries.

He was subsequently employed by **Fraser Alexander Tailings from October 2011 to the end of November 2015 as an Environmental Contracts Manager**, where he was responsible for the technical and operational management of all Fraser Alexander Tailings' mining environmental rehabilitation work. He was responsible for all facets of project management, as well as implementation of rehabilitation and environmental strategies, by planning activities, organising physical, financial and human resources, delegating task responsibilities, leading people, controlling risks and providing technical support.

He conducted a significant amount of quantitative and qualitative ecological vegetation monitoring during his employment period with the company. Such monitoring mainly included environmentally rehabilitated mining areas in the open-cast coal-, gold-, platinum- and chrome mining industries situated in the Free State, Gauteng, Mpumalanga, North-West and Limpopo Provinces. He was involved with analysis, processing and interpretation of environmental monitoring data and compilation of high quality technical/scientific environmental monitoring reports for clients. He was subsequently further involved with providing adequate ecological management and maintenance recommendations for rehabilitated areas. He also provided technical/scientific environmental rehabilitation support to mining clients, with regards to sufficient soil preparation and amelioration, grassing processes, as well as grass species mixtures and ratios.

He was then employed by **Enviroworks Consulting from January 2016 to the end of May 2017 as a Senior Ecological Specialist** where he was responsible for virtually all Ecological, Aquatic and Wetland specialist assessments and reporting related to Environmental Impact Assessment (EIA) and Basic Assessment (BA) projects. He also completed numerous EIA and BA projects as the main project Environmental Assessment Practitioner (EAP).

Rikus then subsequently established the company EcoFocus Consulting (Pty) Ltd, which provides high quality professional environmental and ecological specialist services and solutions to the industrial development-, construction-, mining-, agricultural and other sectors, at the end of May 2017.

He possesses significant qualifications, vast knowledge, skills and practical experience in the specialist field of ecological and environmental management. This, coupled with his disciplined, determined and goal-driven mind-set, as well as his high level of personal standards, ensure high quality, timely and outcomes based outputs and service delivery relating to any project.

Ecological Specialist Report Completion

2019

- Completion of a Water Use License Application (WULA) Risk Assessment for a proposed Kopanong Local Municipality Bridge Upgrading development project in Philippolis, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 4.9 ha Royal Vision Developments Gravel Quarry development project outside Kroonstad, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 53 ha Arborlane Estates (Pty) Ltd agricultural development project outside Augrabies, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 42.7 ha Arborlane Estates (Pty) Ltd NEMA Section 24G agricultural development project outside Augrabies, Northern Cape Province.
- Completion of a Water Use License Application (WULA) Risk Assessment for a proposed 53 ha Arborlane Estates (Pty) Ltd agricultural development project outside Augrabies, Northern Cape Province.

- Completion of a specialist ecological assessment and report for a proposed 20.2 km Water Pipeline Development from Lindley to Arlington, Free State Province.
- Completion of a specialist watercourse delineation and report for a proposed 5.36 ha Filling Station and Shopping Centre Development project in Thaba Nchu, Free State Province.
- Completion of a Water Use License Application (WULA) Risk Assessment for a proposed 20.2 km Water Pipeline Development from Lindley to Arlington, Free State Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for the Farm Driefontein no 274, outside Ficksburg, Free State Province.
- Completion of a Water Use License Application (WULA) Risk Assessment for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Completion of a Rehabilitation and Alien Invasive Species Management Plan for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Completion of a Protected Species Relocation Management Plan for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Completion of a GIS Master Layout Plan for a proposed 1262.7 ha Paul de Villiers NEMA Section 24G agricultural development project outside Douglas, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 535 ha Farms Bultfontein & Folmink agricultural development project outside Prieska, Northern Cape Province.
- Completion of a specialist ecological assessment and report for the proposed 6.42 ha Phokwane Local Municipality Residential development project in Jan Kempdorp, Northern Cape Province.
- Completion of a Stormwater Management Plan for a proposed 2 ha Chimoio Game Camp Lodging development project outside Kroonstad, Free State Province.
- Completion of a GIS Master Layout Plan for a proposed 2 ha Chimoio Game Camp Lodging development project outside Kroonstad, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 13.8 ha Phokwane Local Municipality Cemetery expansion project in Jan Kempdorp, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 19.9 ha Vergenoeg NEMA Section 24G residential development project in Wesselsbron, Free State Province.

- Completion of a specialist ecological assessment and report for a proposed 20.5 ha Khalinkomo NEMA Section 24G residential development project in Wesselsbron, Free State Province.
- Completion of a specialist Erosion and Rehabilitation Monitoring Report for the Farms Die Kranse no 1174 and De Rotsen no 52 outside Vrede, Free State Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for the Farm Zaaihoek no 1251, outside Vrede, Free State Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for Plot 19 of the Farm Ballyduff no 1594, in Bethlehem, Free State Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for the Farm Mooiuitzicht no 205, outside Bethlehem, Free State Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for the Farm Rietfontein no 1457, outside Bethlehem, Free State Province.

2018

- Completion of a specialist ecological assessment and report for the proposed 30 ha Portion 30 of the Farm Lilyvale no 2313 Residential development project in Bloemfontein, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 20 ha Luckhoff Waste Facility development project in Luckhoff, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 19 ha agricultural development project outside Griekwastad, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 135 ha agricultural development project outside Griekwastad, Northern Cape Province.
- Completion of five specialist ecological assessments and reports for the proposed Dawid Kruiper Local Municipality Residential Developments around Upington, Northern Cape Province.
- Completion of a specialist Grazing and Erosion Management Plan for the Retiefs Nek no 123, outside Bethlehem, Free State Province.
- Completion of a specialist Grazing and Erosion Management Plan for the Dekselfontein no 317, outside Bethlehem, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 12 ha agricultural development project in Petrusville, Northern Cape Province.

- Completion of a specialist ecological and wetland assessment and report for a proposed 270 ha industrial park development project in Secunda, Mpumalanga Province.
- Completion of a specialist ecological and wetland assessment and report for a proposed 233 ha industrial park development project in Sabie, Mpumalanga Province.
- Completion of a specialist ecological assessment and report for the proposed Dawid Kruiper Local Municipality Residential Development around Upington, Northern Cape Province.
- Completion of two specialist ecological assessments and reports for two proposed 15 ha agricultural development projects outside Hopetown, Northern Cape Province.
- Completion of two Alien Invasive Species Management Plans for two proposed 15 ha agricultural development projects outside Hopetown, Northern Cape Province.
- Completion of a Protected Species Relocation Management Plan for a proposed 15 ha agricultural development project outside Hopetown, Northern Cape Province.
- Completion of a specialist ecological and wetland assessment and report for a proposed 169 ha industrial park development project in Sabie, Mpumalanga Province.
- Completion of a specialist Grazing and Erosion Management Plan for the Farm Barnea no 231, outside Bethlehem, Free State Province.
- Compilation of a GIS locality, vegetation and sensitivity map for the proposed 7.13 ha Karoo Hoogland Local Municipality Residential Development project in Sutherland, Northern Cape Province.
- Completion of a specialist Erosion and Rehabilitation Monitoring Report for the Farms Die Kranse no 1174 and De Rotsen no 52 outside Vrede, Free State Province.
- Drafting of an official Environmental Policy for Teambo Facilitators (Pty) Ltd in Bloemfontein, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 11.6 ha COGHSTA NEMA Section 24G residential development project in Douglas, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 3.26 ha COGHSTA NEMA Section 24G residential development project in Strydenburg, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 25.6 ha COGHSTA NEMA Section 24G residential development project in Loxton, Northern Cape Province.
- Completion of a specialist biodiversity offset feasibility assessment and report for a proposed 805 ha agricultural development project outside Douglas, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.

- Completion of a specialist ecological exemption letter for the proposed Vanderkloof Tegnologie Chicken Abattoir development project in Petrusville, Northern Cape Province.
- Completion of a Protected Species Relocation Management Plan for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Completion of a Rehabilitation and Alien Invasive Species Management Plan for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Completion of a Stormwater and Erosion Management Plan for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Completion of a Water Use License Application (WULA) Risk Assessment for a proposed 2 ha Rouxville Waste Water Treatment Works expansion project in Rouxville, Free State Province.
- Completion of a revised specialist ecological assessment and report for the proposed 17.7 ha Luckhoff Waste Facility development project in Luckhoff, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 113.3 ha Dawn Valley Estate development project in Bloemfontein, Free State Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for the Farm Klipfontein no 71, outside Lindley, Free State Province.
- Completion of a specialist Grazing and Invasive Species Management Plan for the Farm Meyerskop no 1801, outside Bethlehem, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 2.24 ha Mullerstuine Cemetery development project in Vanderbijlpark, Gauteng Province.
- Completion of a specialist Species of Special Concern & Alien Invasive Species assessment and report for all the Transnet Engineering Group 5 Free State Province Sites.
- Completion of a specialist Species of Special Concern & Alien Invasive Species assessment and report for all the Transnet Engineering Group 6 Northern Cape Province Sites.
- Completion of a specialist ecological assessment and report for a proposed 80 ha agricultural development project outside Ritchie, Northern Cape Province.
- Completion of a specialist ecological and wetland assessment and report for a proposed 545 ha residential development project in Leandra, Mpumalanga Province.
- Completion of a specialist ecological assessment and report for a proposed 2 ha Chimoio Game Camp Lodging development project outside Kroonstad, Free State Province.
- Completion of a Water Use License Application (WULA) Risk Assessment for a proposed 2 ha Chimoio Game Camp Lodging development project outside Kroonstad, Free State Province.

- Completion of a Protected Species Relocation Management Plan for a proposed 80 ha agricultural development project outside Ritchie, Northern Cape Province.
- Completion of a Rehabilitation and Alien Invasive Species Management Plan for a proposed 80 ha agricultural development project outside Ritchie, Northern Cape Province.
- Completion of a Water Use License Application (WULA) Risk Assessment for a proposed 80 ha agricultural development project outside Ritchie, Northern Cape Province.
- Completion of a specialist Grazing Management Plan for the Farm Fairdale no 1048, outside Vrede, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 14.4 ha Frankfort Landfill Site expansion project in Frankfort, Free State Province.

2017

- Completion of a specialist ecological assessment and report for the proposed Phethogo Consulting filling station development project in Bloemfontein, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 132 kV CENTLEC Harvard transmission line development project in Bloemfontein, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed Zevenfontein filling station development project in Johannesburg, Gauteng Province.
- Completion of a specialist ecological assessment and report for the proposed Olifantsvlei Curro School development project in Johannesburg, Gauteng Province.
- Completion of a specialist ecological assessment and report for the proposed 23 ha Babereki Agricultural development project in Hartswater, Northern Cape Province.
- Completion of a specialist ecological assessment and report for the proposed Eikenhof Curro School development project in Johannesburg, Gauteng Province.
- Completion of a specialist ecological assessment and report for the proposed 40 ha CoGHSTA residential development project in Norvalspont, Northern Cape Province.
- Completion of a specialist ecological assessment and report for the proposed 9 ha CoGHSTA residential development project in Williston, Northern Cape Province.
- Completion of a specialist ecological and wetland assessment and report for the proposed 100 ha Musgrave residential and commercial development in Bloemfontein, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 15 ha BVI Engineering Waste Water Treatment Works and associated pipeline development project in Britstown, Northern Cape Province.

- Completion of a specialist ecological walkthrough assessment and report and relocation of provincially protected species *Eucomis autumnalis* individuals for the Bloemwater 33.6 km Brandkop Bypass water supply pipeline in Bloemfontein, Free State Province.
- Completion and execution of a Species Relocation and Re-establishment Plan for 13 individuals of the provincially protected species, *Eucomis autumnalis*, for the Bloemwater 33.6 km Brandkop Bypass water supply pipeline in Bloemfontein, Free State Province.
- Completion of a specialist ecological exemption letter for the proposed Siloam Crematorium development in Welkom, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 0.5 ha Vuna Afrika Agricultural feedmill pelletizing plant development project outside Wepener, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 0.4 ha Olympic Flame filling station development project in Welkom, Free State Province.
- Completion of a specialist ecological assessment and report for a proposed 3000 ha agricultural development project outside Douglas, Northern Cape Province.
- Completion of a specialist ecological assessment and report for the proposed 46.04 ha University, Industrial and Residential development project in Orania, Northern Cape Province.
- Completion of a specialist ecological assessment and report for a proposed 482 ha Piet Louw NEMA Section 24G agricultural development project outside Hopetown, Northern Cape Province.
- Completion of a specialist ecological assessment for a proposed 500 ha Wolfkop Valley Estate development project outside Bloemfontein, Free State Cape Province.
- Completion of a specialist Erosion and Rehabilitation Management Plan for the Farms Die Kranse no 1174 and De Rotsen no 52 outside Vrede, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 4.1 ha Plot 31 Spitskop Residential development project in Bloemfontein, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 26.8 ha Oxidation Dam development project in Orania, Northern Cape Province.

2016

- Completion of a specialist ecological assessment and report for the proposed 3 km Olifantshoek Bulk Water Supply and reservoir development project in Olifantshoek, Northern Cape Province.

- Completion of two specialist ecological and wetland assessments and reports for the proposed respective 16 ha and 6 ha N8 highway gravel quarries development project near Ladybrand, Free State Province.
- Completion of a specialist ecological assessment and report for the proposed 100 ha De Eelt vineyard development project near Prieska, Northern Cape Province.
- Completion of two specialist ecological and wetland assessments and reports for the Lafarge cement production facility and quarry, respectively near Lichtenburg, North-West Province.
- Completion of a specialist ecological assessment and report for the proposed 12 ha Nooitgedacht Retirement Estate development project near Nelspruit, Mpumalanga Province.
- Completion of a specialist ecological assessment and report for the proposed 42 km Ventersburg Bulk Water Supply and reservoir development project between Ventersburg and Riebeeckstad, Free State Province.