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Ecologists & Environmental Services

Report on the ecological assessment of a proposed poultry facility on the Farm Fransina 2060/0 near the Rustfontein Dam, Free State Province.

October 2018

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DECLARATION OF INDEPENDENCE

DPR Ecologists and Environmental Services is an independent company and has no financial, personal or other interest in the proposed project, apart from fair remuneration for work performed in the delivery of ecological services. There are no circumstances that compromise the objectivity of the study.

Report Version	Final 1.0		
Title	Report on the ecological assessment of a proposed poultry facility on the Farm Fransina 2060/0 near the Rustfontein Dam, Free State Province.		
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Executive Summary

The site proposed for the poultry facility has been rated as being acceptable for this development though this is dependant on the identified sensitive areas being avoided and recommended mitigation implemented.

The proposed poultry facility will be located on the Farm Fransina 2060/0 which is situated approximately 2 km to the west of the Rustfontein Dam (Map 2). The site consists of natural vegetation without any significant alterations to its condition. The vegetation structure on the site is dominated by a grass layer with a significant component of dwarf karroid shrubs and small shrubs present where dolerite outcrops occur.

The topography of the site consists of a moderate to gentle slope from west to east. To the east of the outcrops the area slopes toward the west and a small drainage line and stream is located here (Map 1). As long as the poultry facility is located further than 100 meters from these watercourses it is unlikely that the development will affect them. Furthermore, due to the direction of runoff on the site, eastwards, runoff should not be able to enter these watercourses. If the facility should occur closer than 100 meters to these watercourses the need to apply for a Water Use License (WUL) should be determined. In addition, adequate storm water management systems should be implemented and is especially relevant where runoff from the poultry facility with high nutrient values may affect these watercourses.

From the survey of the site and the recorded species composition and vegetation structure the following conclusions can be made about the vegetation on the site. The vegetation type present on the site is not considered to be a Threatened Ecosystem (Map 2). It does however still consist of natural vegetation which must be considered to have a significant conservation value but owing to the small extent of the proposed development this will not have a high impact in terms of the transformation of natural vegetation. The site does not form part of a Critical Biodiversity Area (CBA) in terms of the Free State Province Biodiversity Management Plan (2015) but is located in an Ecological Support Area 1 (ESA 1) which still functions in the support of such areas (Map 3). The proposed development is however not envisaged to alter the ecological support functioning to a large degree. The habitat and species diversity on the site is considered moderate in terms of this region and does not contain any rare or endangered species. However, a bulb species of significant conservation value, *Gladiolus permeabilis*, forms a small colony along the eastern border (Map 1). This colony should be excluded from the development footprint as far as possible and where this is not possible the necessary permits must be obtained to transplant it to an adjacent area where it will remain unaffected (Appendix C). A small drainage line and stream is located to the west of the site (Map 1). They should remain unaffected by the development as long as its footprint is located further than 100 meters from these watercourses. If the facility should occur closer than 100 meters to these watercourses the need to apply for a Water Use License (WUL) should be determined. Should the above recommendations be adhered to the proposed development will not have a high impact on the ecology of the area.

The impact significance has been determined and will mostly be moderate with the loss of protected species being moderate-high. With adequate mitigation as described these can mostly be decreased low-moderate.

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Ecological assessment

1. INTRODUCTION

1.1 Background

Natural vegetation is an important component of ecosystems. Some of the vegetation units in a region can be more sensitive than others, usually as a result of a variety of environmental factors and species composition. These units are often associated with water bodies, water transferring bodies or moisture sinks. These systems are always connected to each other through a complex pattern. Degradation of a link in this larger system, e.g. tributary, pan, wetland, usually leads to the degradation of the larger system. Therefore, degradation of such a water related system should be prevented.

Though vegetation may seem to be uniform and low in diversity it may still contain species that are rare and endangered. The occurrence of such a species may render the development unviable. Should such a species be encountered the development should be moved to another location or cease altogether.

South Africa has a large amount of endemic species and in terms of plant diversity ranks third in the world. This has the result that many of the species are rare, highly localised and consequently endangered. It is our duty to protect our diverse natural resources.

South Africa's water resources have become a major concern in recent times. As a water scarce country, we need to manage our water resources sustainably in order to maintain a viable resource for the community as well as to preserve the biodiversity of the system. Thus, it should be clear that we need to protect our water resources so that we may be able to utilise this renewable resource sustainably. Areas that are regarded as crucial to maintain healthy water resources include wetlands, streams as well as the overall catchment of a river system.

Development of livestock and poultry facilities are necessary to feed an ever-growing population. This promotes food security and contributes to the economy. Areas used for intensive agricultural activities are often degraded due to the clearing of the natural vegetation required for these activities. Though this may often be the case portions of remaining natural vegetation may still consist of sensitive habitats such as watercourses, wetlands or rare vegetation types that need to be conserved. These areas may also contain endangered fauna and flora.

The proposed poultry facility will be located on the Farm Fransina 2060/0 which is situated approximately 2 km to the west of the Rustfontein Dam (Map 2). The site consists of natural vegetation without any significant alterations to its condition. It is however situated adjacent to an existing poultry facility and an overhead powerline also crosses the site.

A site visit was conducted on 3 September 2018. The entire footprint of the site was surveyed over the period of several hours. The site survey was conducted at the beginning of spring and consequently several plant species may not have been identifiable. However, on-site results indicate that a good representative vegetation assemblage was present

For the above reasons it is necessary to conduct an ecological assessment of an area proposed for development.

The report together with its recommendations and mitigation measures should be used to minimise the impact of the proposed development.

1.2 The value of biodiversity

The diversity of life forms and their interaction with each other and the environment has made Earth a uniquely habitable place for humans. Biodiversity sustains human livelihoods and life itself. Although our dependence on biodiversity has become less tangible and apparent, it remains critically important.

The balancing of atmospheric gases through photosynthesis and carbon sequestration is reliant on biodiversity, while an estimated 40% of the global economy is based on biological products and processes.

Biodiversity is the basis of innumerable environmental services that keep us and the natural environment alive. These services range from the provision of clean water and watershed services to the recycling of nutrients and pollution. These ecosystem services include:

- Soil formation and maintenance of soil fertility.
- Primary production through photosynthesis as the supportive foundation for all life.
- Provision of food, fuel and fibre.
- Provision of shelter and building materials.
- Regulation of water flows and the maintenance of water quality.
- Regulation and purification of atmospheric gases.
- Moderation of climate and weather.
- Detoxification and decomposition of wastes.
- Pollination of plants, including many crops.
- Control of pests and diseases.
- Maintenance of genetic resources.

2. SCOPE AND LIMITATIONS

- To evaluate the present state of the vegetation and ecological functioning of the area proposed for the poultry facility.
- To identify possible negative impacts that could be caused by the proposed construction of a poultry facility.

2.1 Vegetation

Aspects of the vegetation that will be assessed include:

- The vegetation types of the region with their relevance to the proposed site.
- The overall status of the vegetation on site.
- Species composition with the emphasis on dominant-, rare- and endangered species.

The amount of disturbance present on the site assessed according to:

- The amount of grazing impacts.
- Disturbance caused by human impacts.
- Other disturbances.

2.2 Fauna

Aspects of the fauna that will be assessed include:

- A basic survey of the fauna occurring in the region using visual observations of species as well as evidence of their occurrence in the region (burrows, excavations, animal tracks, etc.).
- The overall condition of the habitat.
- A list of species that may occur in the region (desktop study).

2.3 Limitations

The survey was undertaken at the start of the rainy season and it may be possible that several annual or geophytic species may not yet be present or identifiable and may therefore have been overlooked.

Some geophytic or succulent species may have been overlooked due to a specific flowering time or cryptic nature.

Although a comprehensive survey of the site was done it is still likely that several species were overlooked.

Some animal species may not have been observed as a result of their nocturnal and/or shy habits.

3. METHODOLOGY

3.1 Several literature works were used for additional information.

Vegetation:

Red Data List (Raymondo *et al.* 2009)

Vegetation types (Mucina & Rutherford 2006)

Field guides used for species identification (Bromilow 1995, 2010, Coates-Palgrave 2002, Court 2010, Fish *et al* 2015, Gibbs-Russell *et al* 1990, Manning 2009, Moffett 1997, Pooley 1998, Retief & Meyer 2017, Van Oudtshoorn 2004, Van Wyk & Malan 1998, Van Wyk & Van Wyk 1997, Venter & Joubert 1985).

Terrestrial fauna:

Field guides for species identification (Smithers 1986a, Child *et al* 2016).

3.2 Survey

The site was assessed by means of transects and sample plots.

Noted species include rare and dominant species.

The broad vegetation types present on the site were determined.

The state of the environment was assessed in terms of condition, grazing impacts, disturbance by humans, erosion and presence of invader and exotic species.

Animal species were also noted as well as the probability of other species occurring on or near the site according to their distribution areas and habitat requirements.

The state of the habitat was also assessed.

3.3 Criteria used to assess sites

Several criteria were used to assess the site and determine the overall status of the environment.

Vegetation characteristics

Characteristics of the vegetation in its current state. The diversity of species, sensitivity of habitats and importance of the ecology as a whole.

Habitat diversity and species richness: normally a function of locality, habitat diversity and climatic conditions.

Scoring: Wide variety of species occupying a variety of niches – 1, Variety of species occupying a single nich – 2, Single species dominance over a large area containing a low diversity of species – 3.

Presence of rare and endangered species: The actual occurrence or potential occurrence of rare or endangered species on a proposed site plays a large role on the feasibility of a development. Depending on the status and provincial conservation policy, presence of a Red Data species can potentially be a fatal flaw.

Scoring: Occurrence actual or highly likely – 1, Occurrence possible – 2, Occurrence highly unlikely – 3.

Ecological function: All plant communities play a role in the ecosystem. The ecological importance of all areas though, can vary significantly e.g. wetlands, drainage lines, ecotones, etc.

Scoring: Ecological function critical for greater system – 1, Ecological function of medium importance – 2, No special ecological function (system will not fail if absent) – 3.

Degree of rarity/conservation value:

Scoring: Very rare and/or in pristine condition – 1, Fair to good condition and/or relatively rare – 2, Not rare, degraded and/or poorly conserved – 3.

Vegetation condition

The sites are compared to a benchmark site in a good to excellent condition. Vegetation management practises (e.g. grazing regime, fire, management, etc.) can have a marked impact on the condition of the vegetation.

Percentage ground cover: Ground cover is under normal and natural conditions a function of climate and biophysical characteristics. Under poor grazing management, ground cover is one of the first signs of vegetation degradation.

Scoring: Good to excellent – 1, Fair – 2, Poor – 3.

Vegetation structure: This is the ratio between tree, shrub, sub-shrubs and grass layers. The ratio could be affected by grazing and browsing by animals.

Scoring: All layers still intact and showing specimens of all age classes – 1, Sub-shrubs and/or grass layers highly grazed while tree layer still fairly intact (bush partly opened up) – 2, Mono-layered structure often dominated by a few unpalatable species (presence of barren patches notable) – 3.

Infestation with exotic weeds and invader plants or encroachers:

Scoring: No or very slight infestation levels by weeds and invaders – 1, Medium infestation by one or more species – 2, Several weed and invader species present and high occurrence of one or more species – 3.

Degree of grazing/browsing impact:

Scoring: No or very slight notable signs of browsing and/or grazing – 1, Some browse lines evident, shrubs shows signs of browsing, grass layer grazed though still intact – 2, Clear browse line on trees, shrubs heavily pruned and grass layer almost absent – 3.

Signs of erosion: The formation of erosion scars can often give an indication of the severity and/or duration of vegetation degradation.

Scoring: No or very little signs of soil erosion – 1, Small erosion gullies present and/or evidence of slight sheet erosion – 2, Gully erosion well developed (medium to large dongas) and/or sheet erosion removed the topsoil over large areas – 3.

Faunal characteristics

Presence of rare and endangered species: The actual occurrence or potential occurrence of rare or endangered species on a proposed site plays a large role on the feasibility of a development. Depending on the status and provincial conservation policy, presence of a Red Data species or very unique and sensitive habitats can potentially be a fatal flaw.

Scoring: Occurrence actual or highly likely – 1, Occurrence possible – 2, Occurrence highly unlikely.

3.4 Biodiversity sensitivity rating (BSR)

The total scores for the criteria above were used to determine the biodiversity sensitivity ranking for the sites. On a scale of 0 – 30, six different classes are described to assess the suitability of the sites to be developed. The different classes are described in the table below:

Table 1: Biodiversity sensitivity ranking

BSR	BSR general floral description	Floral score equating to BSR class
Ideal (5)	Vegetation is totally transformed or in a highly degraded state, generally has a low level of species diversity, no species of concern and/or has a high level of invasive plants. The area has lost its inherent ecological function. The area has no conservation value and potential for successful rehabilitation is very low. The site is ideal for the proposed development.	29 – 30
Preferred (4)	Vegetation is in an advanced state of degradation, has a low level of species diversity, no species of concern and/or has a high level of invasive plants. The area's ecological function is seriously hampered, has a very low conservation value and the potential for successful rehabilitation is low. The area is preferred for the proposed development.	26 – 28
Acceptable (3)	Vegetation is notably degraded, has a medium level of species diversity although no species of concern are present. Invasive plants are present but are still controllable. The area's ecological function is still intact but may be hampered by the current levels of degradation. Successful rehabilitation of the area is possible. The conservation value is regarded as low. The area is acceptable for the proposed development.	21 – 25
Not preferred (2)	The area is in a good condition although signs of disturbance are present. Species diversity is high and species of concern may be present. The ecological function is intact and very little rehabilitation is needed. The area is of medium conservation importance. The area is not preferred for the proposed development.	11 – 20
Sensitive (1)	The vegetation is in a pristine or near pristine condition. Very little signs of disturbance other than those needed for successful management are present. The species diversity is very high with several species of concern known to be present. Ecological functioning is intact and the conservation importance is high. The area is regarded as sensitive and not suitable for the proposed development.	0 - 10

4. ECOLOGICAL OVERVIEW OF THE SITE

4.1 Overview of ecology and vegetation types (Mucina & Rutherford 2006)

Refer to the list of species encountered on the site in Appendix B.

According to Mucina & Rutherford (2006) the area consists of Central Free State Grassland (Gh 6). This vegetation type is currently listed as being of Least Concern (LC) under the National List of Threatened Ecosystems (Notice 1477 of 2009) (National Environmental Management Biodiversity Act, 2004) (Map 2). It is therefore not considered to be currently subjected to high levels of transformation though dryland crop cultivation is still significant in this vegetation type. The site is also listed as an Ecological Support Area 1(ESA 1) under the Free State Province Biodiversity Management Plan (2015) (Map 3). Although this is not a Critical Biodiversity Area (CBA) which has a high conservation value it still functions in the support of such areas and would therefore still have some conservation value.

The National Protected Areas Expansion Strategy (NPAES) has been developed to identify certain Focus Areas which may be incorporated into protected areas in the future. Large-scale transformation of these areas should therefore be prevented if possible in order to conserve their integrity for possible inclusion in future protected areas. The proposed poultry facility is located at the border of such an area (Map 2). However, the extent of the development is small and being located at the border of a Focus Area it should not cause any significant decrease in the ecological integrity of this area.

The site consists almost exclusively of indigenous vegetation with a few areas where disturbance is evident. The site is bordered to the north and east by a small gravel road, railway line and associated servitudes (Map 1). These areas are degraded and has an effect on the site along its borders. An overhead powerline crosses the site from east to west and has also caused local disturbance underneath it and especially at the pylon locations. A trench crosses the site and an underground pipeline is in the process of being installed. This also causes local disturbance along the pipeline. An existing poultry facility is also located to the north of the site but does not seem to affect the site itself. The site is currently being used as grazing for domestic stock.

The proposed poultry facility will be located on the Farm Fransina 2060/0 which is situated approximately 2 km to the west of the Rustfontein Dam (Map 2). The site consists of natural vegetation without any significant alterations to its condition. The vegetation structure on the site is dominated by a grass layer with a significant component of dwarf karroid shrubs and small shrubs present where dolerite outcrops occur.

The topography of the site consists of a moderate to gentle slope from west to east. The site therefore has an eastern aspect. A few low dolerite outcrops occur along the western border of the site and also explains the slope of the site. To the east of the outcrops the area slopes toward the west and a small drainage line and stream is located here (Map 1). As long as the poultry facility is located further than 100 meters from these watercourses it is unlikely that the development will affect them. Furthermore, due to the direction of runoff on the site, eastwards, runoff should not be able to enter these watercourses. If the facility should occur closer than 100 meters to these watercourses the need to apply for a Water Use License (WUL) should be determined. The elevation of the site varies from 1414 m along the western border and decreases to 1405 m along the eastern border and this clearly indicates the slope of the site.

The underlying geology consists of mudrock and subordinate sandstone of the Adelaide Subgroup in the Beaufort Group of the Karoo Supergroup (Council for Geoscience 2016).

The mean annual rainfall for the area is given as 533 mm. Temperatures range from an average maximum of 30°C in January to an average minimum of 1°C in June. Monthly pan-evaporation rates are highest in summer with 323 mm in December and lowest in winter with 85 mm in July.

As mentioned previously the vegetation structure on the site is dominated by a grass layer. The dominant grass species includes *Eragrostis lehmanniana*, *Cymbopogon pospischillii*, *Themeda triandra*, *Aristida adscensionis*, *A. diffusa*, *A. congesta*, *Tragus koelerioides*, *Heteropogon contortus*, *Digitaria eriantha* and *Triraphis andropogonoides*. This is a mixture of climax and pioneer species and indicates that some level of disturbance is present though the vegetation is considered largely natural. Several of these species are also associated with dolerite outcrops and shallow soils. Other grass species present on the site but scattered and of lower abundance includes *Eragrostis obtusa*, *E. superba*, *E. nindensis* and *Cynodon dactylon*. Within this grass layer a significant dwarf karroid shrub layer is also present. This is also indicative of some level of disturbance of the grass layer. These include *Nenax microphylla*, *Felicia muricata*, *Nolletia ciliaris*, *Amphiglossa triflora*, *Chrysocoma ciliata* and *Melolobium candicans*. It should be said that though from the above description some species indicate a level of disturbance in the grassland it is not considered extensive and the grassland is still largely natural. Several herbaceous species are also interspersed in the grass layer but not prominent. The most common of these include *Berkheya macrocephala*, *Senecio consanguineus*, *Arctotis arctotheca*, *A. venusta*, *Salvia verbenaca* and *Gazania krebsiana*. Where dolerite outcrops, a few low shrubs establish and include *Searsia ciliata* and *Diospyros austro-africana*. This also provides a suitable habitat for succulent species and include *Rabiea* sp., *Chasmatophyllum musculinum*, *Crassula capitella* and *Ruschia unidens*. A protected bulb, *Gladiolus permeabilis*, was identified as forming a small colony along the eastern border of the site (Map 1). This species is relatively widespread but rather rare and consequently is of significant conservation value. This colony should be excluded from the development as far as possible and where this is not possible permits should be obtained and the plants re-located to an adjacent area where they will remain unaffected (Appendix C). A single exotic weed, *Tagetes minuta*, was identified on the site in low numbers.

From the survey of the site and the recorded species composition and vegetation structure the following conclusions can be made about the vegetation on the site. The vegetation type present on the site is not considered to be a Threatened Ecosystem (Map 2). It does however still consist of natural vegetation which must be considered to have a significant conservation value but owing to the small extent of the proposed development this will not have a high impact in terms of the transformation of natural vegetation. The site does not form part of a Critical Biodiversity Area (CBA) in terms of the Free State Province Biodiversity Management Plan (2015) but is located in an Ecological Support Area 1 (ESA 1) which still functions in the support of such areas (Map 3). The proposed development is however not envisaged to alter the ecological support functioning to a large degree. The habitat and species diversity on the site is considered moderate in terms of this region and does not contain any rare or endangered species. However, a bulb species of significant conservation value, *Gladiolus permeabilis*, forms a small colony along the eastern border (Map 1). This colony should be excluded from the development footprint as far as possible and where this is not possible the necessary permits must be obtained to transplant it to an adjacent area where it will remain

unaffected (Appendix C). A small drainage line and stream is located to the west of the site (Map 1). They should remain unaffected by the development as long as its footprint is located further than 100 meters from these watercourses. If the facility should occur closer than 100 meters to these watercourses the need to apply for a Water Use License (WUL) should be determined. Should the above recommendations be adhered to the proposed development will not have a high impact on the ecology of the area.

4.2 Overview of terrestrial fauna (actual & possible)

Tracks and signs of mammals occur on the site and include soil mounds of the Common Molerat (*Cryptomys hottentotus*), burrows of a small unidentified mammal and shallow foraging excavations possibly from the same mammal. The mammal population is anticipated to be largely natural, however, due to the proximity to human activities such as the powerline, railway, gravel road and nearby poultry facility this will decrease the population to some extent and will likely dissuade sensitive species from occurring near human activities.

The proposed development will transform the majority of the vegetation on the site and thus also the available habitat to fauna. However, the extent of the proposed development is small and therefore this impact cannot be considered as high.

It is also considered likely that several mammal species were overlooked during the survey.

It is recommended that any hunting, trapping or capturing be strictly prohibited. As construction activities commence they will vacate the area by their own accord.

List of some Red Data terrestrial mammals that could occur in the region:

South African Hedgehog	<i>Atelerix frontalis</i>
Aardwolf	<i>Proteles cristatus</i>
African Wild Cat	<i>Felis lybica</i>
Small-Spotted Cat	<i>Felis nigripes</i>
Bat-Eared Fox	<i>Otocyon megalotis</i>
Striped Weasel	<i>Poecilogale albinucha</i>

These species are normally rare and do not inhabit areas near human activities although it still remains possible that some of these may occur on the site.

5. ANTICIPATED IMPACTS

Anticipated impacts that the development will have is primarily concerned with the loss of habitat and species diversity.

The site still consists largely of natural vegetation. A few impacts are present on and adjacent to the site and does cause some disturbance. The vegetation type on the site consists of Central Free State Grassland (Gh 6). This vegetation type is currently listed as being of Least Concern (LC) under the National List of Threatened Ecosystems and can therefore not be considered to have a high conservation value (Notice 1477 of 2009) (National Environmental Management Biodiversity Act, 2004) (Map 2). The site is also listed as an Ecological Support Area 1 (ESA 1) under the Free State Province Biodiversity Management Plan (2015) (Map 3). Although this is not a Critical Biodiversity Area (CBA) which has a high conservation value it still functions in the support of such areas and would therefore still have some conservation value. The site is situated on the border of a National Protected Areas Expansion Strategy (NPAES) Focus Area (Map 2). These areas have a high conservation value though being situated on its border and having a small extent the development should not have a significant impact on this area. Furthermore, the site does not have an exceptional habitat and species diversity. As a result of the above, the loss of habitat and vegetation on the site is not considered to exceed a moderate impact.

No rare or endangered species were identified on the site. However, a bulb species of significant conservation value, *Gladiolus permeabilis*, forms a small colony along the eastern border (Map 1). This species is relatively widespread but rather rare and consequently is of significant conservation value. The loss of this colony will therefore have a relatively high impact. However, as long as the colony is excluded from the development footprint the impact should remain negligible (Appendix C). Where this is not possible the necessary permits must be obtained to transplant it to an adjacent area where it will remain unaffected.

To the east of the site a small drainage line and stream is situated (Map 1). Should the development have an impact on them this will result in a relatively high impact. However, as long as the poultry facility is located further than 100 meters from these watercourses it is unlikely that the development will affect them. Furthermore, due to the direction of runoff on the site, eastwards, runoff should not be able to enter these watercourses. If the facility should occur closer than 100 meters to these watercourses the need to apply for a Water Use License (WUL) should be determined. In addition, adequate storm water management systems should be implemented and is especially relevant where runoff from the poultry facility with high nutrient values may affect these watercourses.

Disturbance caused by the proposed development may cause susceptible conditions for the establishment of exotic weeds. This can be easily managed by simply implementing an exotic weed monitoring and eradication programme which can be initiated during construction and incorporated into the management of the facility during operation.

The proposed development will transform the majority of the vegetation on the site and thus also the available habitat to fauna. However, the extent of the proposed development is small and therefore this impact cannot be considered as high.

The impact significance has been determined and will mostly be moderate with the loss of protected species being moderate-high. With adequate mitigation as described these can mostly be decreased low-moderate.

Please refer to Appendix D for the impact methodology.

Significance of the impact:

Impact	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Before Mitigation								
Loss of vegetation type and clearing of vegetation	3	5	2	3.3	4	3	3.5	11.5
Loss of protected species	4	5	2	3.6	5	4	4.5	15.1
Impact on watercourses	3	4	3	3.3	4	5	4.5	14.8
Infestation with weeds and invaders	3	4	2	3	5	3	4	12
Impact on Terrestrial fauna	2	5	2	3	3	3	3	9
After Mitigation								
Loss of vegetation type and clearing of vegetation	3	5	2	3.3	4	3	3.5	11.5
Loss of protected species	2	5	2	3	2	2	2	6
Impact on watercourses	1	4	2	2.3	2	2	2	4.6
Infestation with weeds and invaders	3	2	1	2	3	2	2.5	5
Impact on Terrestrial fauna	2	5	2	3	3	3	3	9

6. SITE SPECIFIC RESULTS

Habitat diversity and species richness:

The site does not cover a large footprint. Consequently, the amount of habitats on the site can also not be considered as high. The habitat on the site is dominated by a grassland with gentle slope and a few dolerite outcrops. The habitat diversity is therefore considered as moderate. As a result, the species diversity is also considered moderate.

Presence of rare and endangered species:

No rare or endangered species were identified on the site. However, a bulb species of significant conservation value, *Gladiolus permeabilis*, forms a small colony along the eastern border (Map 1). This species is relatively widespread but rather rare and consequently is of significant conservation value. This colony should be excluded from the development footprint as far as possible (Appendix C). Where this is not possible the necessary permits must be obtained to transplant it to an adjacent area where it will remain unaffected.

Ecological function:

The ecological function of the site is largely natural though altered to a low degree. The site functions as habitat to fauna, sustains a specific vegetation type, i.e. Central Free State Grassland and forms part of the catchment of adjacent watercourses. The site still provide habitat to fauna although the proximity of human activities will decrease this to some degree. The site still supports the natural vegetation type and this function is considered largely intact. Due to linear impacts such as the pipeline trench, railway line and gravel road this influences the runoff patterns on the site to a significant degree and alters this functioning. Furthermore, the function of the site is not paramount to the continued functioning of the surrounding natural areas. In other words, development of the site should not impair the functioning of the surrounding area to a large extent. This is also a result of the small extent of the site.

Degree of rarity/conservation value:

The vegetation type on the site consists of Central Free State Grassland (Gh 6). This vegetation type is currently listed as being of Least Concern (LC) under the National List of Threatened Ecosystems and can therefore not be considered to have a high conservation value (Notice 1477 of 2009) (National Environmental Management Biodiversity Act, 2004) (Map 2). The site is also listed as an Ecological Support Area 1 (ESA 1) under the Free State Province Biodiversity Management Plan (2015) (Map 3). Although this is not a Critical Biodiversity Area (CBA) which has a high conservation value it still functions in the support of such areas and would therefore still have some conservation value. The site is situated on the border of a National Protected Areas Expansion Strategy (NPAES) Focus Area (Map 2). These areas have a high conservation value though being situated on its border and having a small extent the development should not have a significant impact on this area. The conservation value of the site is therefore relatively low.

Aspects of high conservation value, i.e. the adjacent watercourses and colony of protected bulbs, *Gladiolus permeabilis*, should remain unaffected as long recommended mitigation is applied (Map 1).

Percentage ground cover:

The percentage vegetation cover is moderate. The grass layer is well-developed although overgrazing does cause a low amount of decrease in the vegetation cover.

Vegetation structure:

The vegetation structure on the site consists of a grass layer with a significant dwarf karroid shrub component which alters the natural vegetation structure to a small extent. This is most likely coupled with overgrazing.

Infestation with exotic weeds and invader plants:

The presence of exotic weeds on the site is still very low.

Degree of grazing/browsing impact:

Grazing by domestic stock is considered to be moderate. Indicators of overgrazing include an increase in dwarf karroid shrub component and a decrease in vegetation cover.

Signs of erosion:

Signs of erosion is still relatively low although the decrease in vegetation cover causes some sheet erosion.

Terrestrial animals:

Tracks and signs of mammals occur on the site and include soil mounds of the Common Molerat (*Cryptomys hottentotus*), burrows of a small unidentified mammal and shallow foraging excavations possibly from the same mammal. The mammal population is anticipated to be largely natural, however, due to the proximity to human activities such as the powerline, railway, gravel road and nearby poultry facility this will decrease the population to some extent and will likely dissuade sensitive species from occurring near human activities.

Table 2: Biodiversity Sensitivity Rating for the proposed poultry facility.

	Low (3)	Medium (2)	High (1)
Vegetation characteristics			
Habitat diversity & Species richness		2	
Presence of rare and endangered species		2	
Ecological function	3		
Uniqueness/conservation value	3		
Vegetation condition			
Percentage ground cover		2	
Vegetation structure		2	
Infestation with exotic weeds and invader plants or encroachers			1
Degree of grazing/browsing impact		2	
Signs of erosion		2	
Terrestrial animal characteristics			
Presence of rare and endangered species		2	
Sub total	6	14	1
Total		21	

7. BIODIVERSITY SENSITIVITY RATING (BSR) INTERPRETATION

Table 3: Interpretation of Biodiversity Sensitivity Rating.

Site	Score	Site Preference Rating	Value
Poultry facility	21	Acceptable	3

8. DISCUSSION AND CONCLUSION

The site proposed for the poultry facility has been rated as being acceptable for this development though this is dependant on the identified sensitive areas being avoided and recommended mitigation implemented.

The vegetation type on the site consists of Central Free State Grassland (Gh 6). This vegetation type is currently listed as being of Least Concern (LC) under the National List of Threatened Ecosystems and can therefore not be considered to have a high conservation value (Notice 1477 of 2009) (National Environmental Management Biodiversity Act, 2004) (Map 2). The site is also listed as an Ecological Support Area 1(ESA 1) under the Free State Province Biodiversity Management Plan (2015) (Map 3). Although this is not a Critical Biodiversity Area (CBA) which has a high conservation value it still functions in the support of such areas and would therefore still have some conservation value. The site is situated on the border of a National Protected Areas Expansion Strategy (NPAES) Focus Area (Map 2). These areas have a high conservation value though being situated on its border and having a small extent the development should not have a significant impact on this area. The conservation value of the site is therefore relatively low.

The site consists almost exclusively of indigenous vegetation with a few areas where disturbance is evident. The site is bordered to the north and east by a small gravel road, railway line and associated servitudes (Map 1). These areas are degraded and has an effect on the site along its borders. An overhead powerline crosses the site from east to west and has also caused local disturbance underneath it and especially at the pylon locations. A trench crosses the site and an underground pipeline is in the process of being installed. This also causes local disturbance along the pipeline. An existing poultry facility is also located to the north of the site but does not seem to affect the site itself. The site is currently being used as grazing for domestic stock.

The proposed poultry facility will be located on the Farm Fransina 2060/0 which is situated approximately 2 km to the west of the Rustfontein Dam (Map 2). The site consists of natural vegetation without any significant alterations to its condition. The vegetation structure on the site is dominated by a grass layer with a significant component of dwarf karroid shrubs and small shrubs present where dolerite outcrops occur.

The topography of the site consists of a moderate to gentle slope from west to east. A few low dolerite outcrops occur along the western border of the site and also explains the slope of the site. To the east of the outcrops the area slopes toward the west and a small drainage line and stream is located here (Map 1). As long as the poultry facility is located further than 100 meters from these watercourses it is unlikely that the development will affect them. Furthermore, due to the direction of runoff on the site, eastwards, runoff should not be able to enter these watercourses. If the facility should occur closer than 100 meters to these watercourses the need to apply for a Water Use License (WUL) should be determined. In addition, adequate

storm water management systems should be implemented and is especially relevant where runoff from the poultry facility with high nutrient values may affect these watercourses.

Disturbance caused by the proposed development may cause susceptible conditions for the establishment of exotic weeds. This can be easily managed by simply implementing an exotic weed monitoring and eradication programme which can be initiated during construction and incorporated into the management of the facility during operation.

From the survey of the site and the recorded species composition and vegetation structure the following conclusions can be made about the vegetation on the site. The vegetation type present on the site is not considered to be a Threatened Ecosystem (Map 2). It does however still consist of natural vegetation which must be considered to have a significant conservation value but owing to the small extent of the proposed development this will not have a high impact in terms of the transformation of natural vegetation. The site does not form part of a Critical Biodiversity Area (CBA) in terms of the Free State Province Biodiversity Management Plan (2015) but is located in an Ecological Support Area 1 (ESA 1) which still functions in the support of such areas (Map 3). The proposed development is however not envisaged to alter the ecological support functioning to a large degree. The habitat and species diversity on the site is considered moderate in terms of this region and does not contain any rare or endangered species. However, a bulb species of significant conservation value, *Gladiolus permeabilis*, forms a small colony along the eastern border (Map 1). This colony should be excluded from the development footprint as far as possible and where this is not possible the necessary permits must be obtained to transplant it to an adjacent area where it will remain unaffected (Appendix C). A small drainage line and stream is located to the west of the site (Map 1). They should remain unaffected by the development as long as its footprint is located further than 100 meters from these watercourses. If the facility should occur closer than 100 meters to these watercourses the need to apply for a Water Use License (WUL) should be determined. Should the above recommendations be adhered to the proposed development will not have a high impact on the ecology of the area.

The impact significance has been determined and will mostly be moderate with the loss of protected species being moderate-high. With adequate mitigation as described these can mostly be decreased low-moderate.

9. RECOMMENDATIONS

- The hunting, capturing and trapping of fauna should be prevented by making this a punishable offense during the construction phase and operation of the development.
- After construction has ceased all construction materials should be removed from the area.
- Adequate monitoring of weed establishment and their continued eradication must be maintained.
- The colony of protected bulb, *Gladiolus permeabilis*, should be excluded from the development footprint as far as possible and where this is not possible the necessary permits must be obtained to transplant it to an adjacent area where it will remain unaffected (Map 1, Appendix C).
- The small drainage line and stream adjacent to the site should be treated as no-go areas (Map 1). They should remain unaffected by the development as long as its footprint is located further than 100 meters from these watercourses. If the facility should occur closer than 100 meters to these watercourses the need to apply for a Water Use License (WUL) should be determined.
- The site should be regularly inspected for erosion and this remedied where required. Comprehensive storm water management measures should be implemented to ensure that clean and dirty storm water is kept separate and that this does not affect the watercourses adjacent to the site. This is especially relevant where runoff from the poultry facility with high nutrient values may affect the adjacent watercourses (Map 1).
- Monitoring of construction including weed establishment and erosion should take place and should also specifically include any impacts or alterations to the adjacent watercourses.

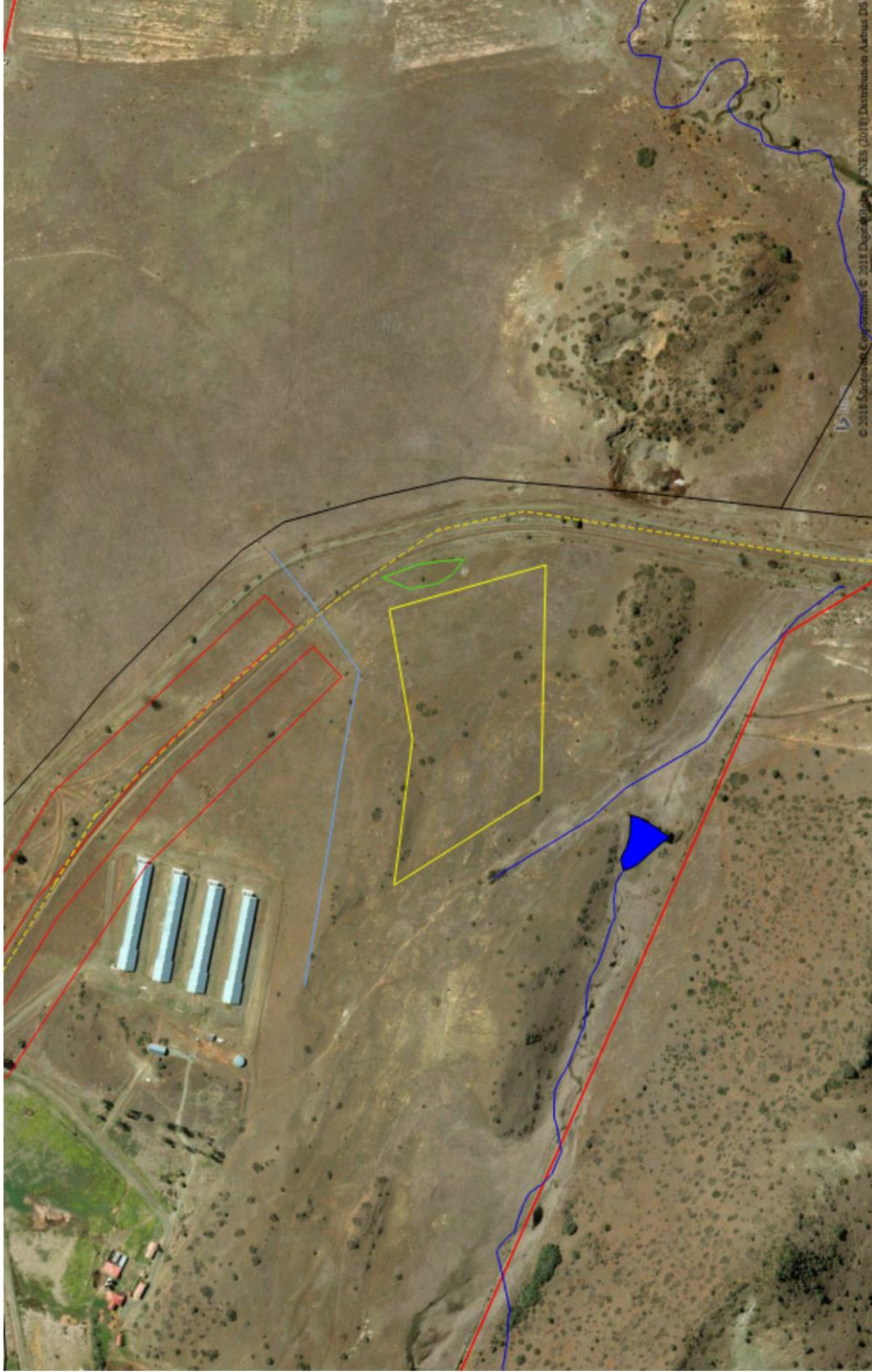
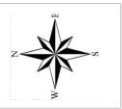
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Annexure A: Maps and Site photos

Layout map for the proposed poultry facility on the Farm Fransina 2060/0 near the Rustfontein Dam, Free State Province.



Map 1: Layout map of the proposed poultry facility on the Farm Fransina 2060/0 near the Rustfontein Dam. Note that the site layout is only approximate. The location of the protected bulb colony is indicated as well as the adjacent watercourses, these areas should be managed as recommended within the report.



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- Legend:**
- Approximate site boundary
 - Property boundaries
 - Watercourses
 - Road network
 - - - Railway lines
 - Powerline section
 - Wetlands and impoundments
 - Protected species

Map Information

Spheroid: WGS 84

Quantum GIS

Scale: 1:7 500

DPR Ecologists

Contact Darius van Rensburg at:

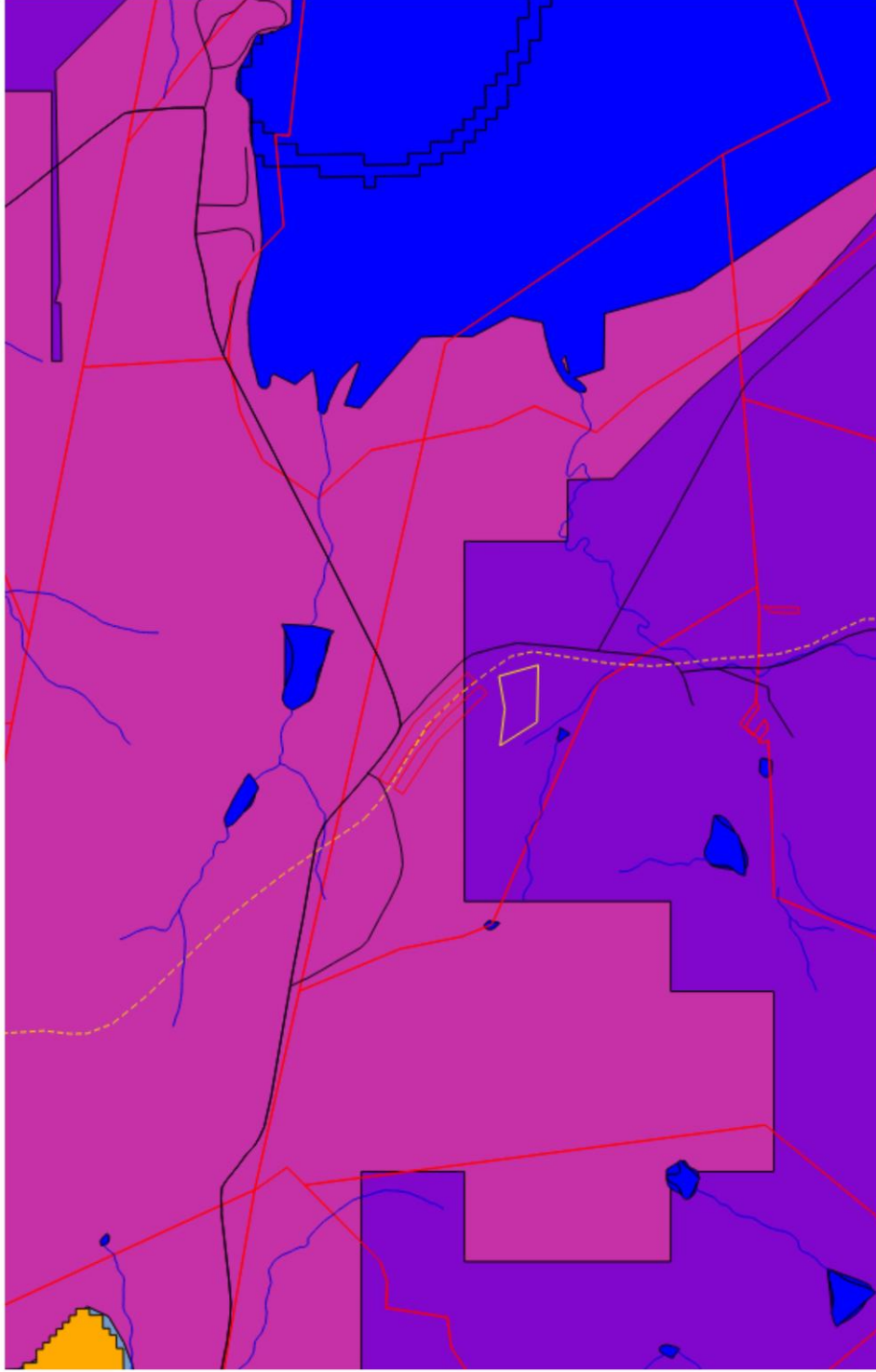
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General ecology map for the proposed poultry facility on the Farm Fransina 2060/0 near the Rustfontein Dam, Free State Province.



Map 2: General ecology map of the proposed poultry facility on the Farm Fransina 2060/0 near the Rustfontein Dam. Note that the site does fall within a Threatened Ecosystem and is situated on the border of a National Protected Areas Expansion Strategy (NPAES) Focus Area. Surrounding watercourses, wetlands, impoundments and the Rustfontein Dam to the east of the site is clearly visible.



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- Legend:**
- Approximate site boundary
 - Property boundaries
 - Watercourses
 - Road network
 - Railway lines
 - Wetlands and impoundments
 - Threatened Ecosystem
 - Central Free State Grassland
 - NPAES Focus Areas

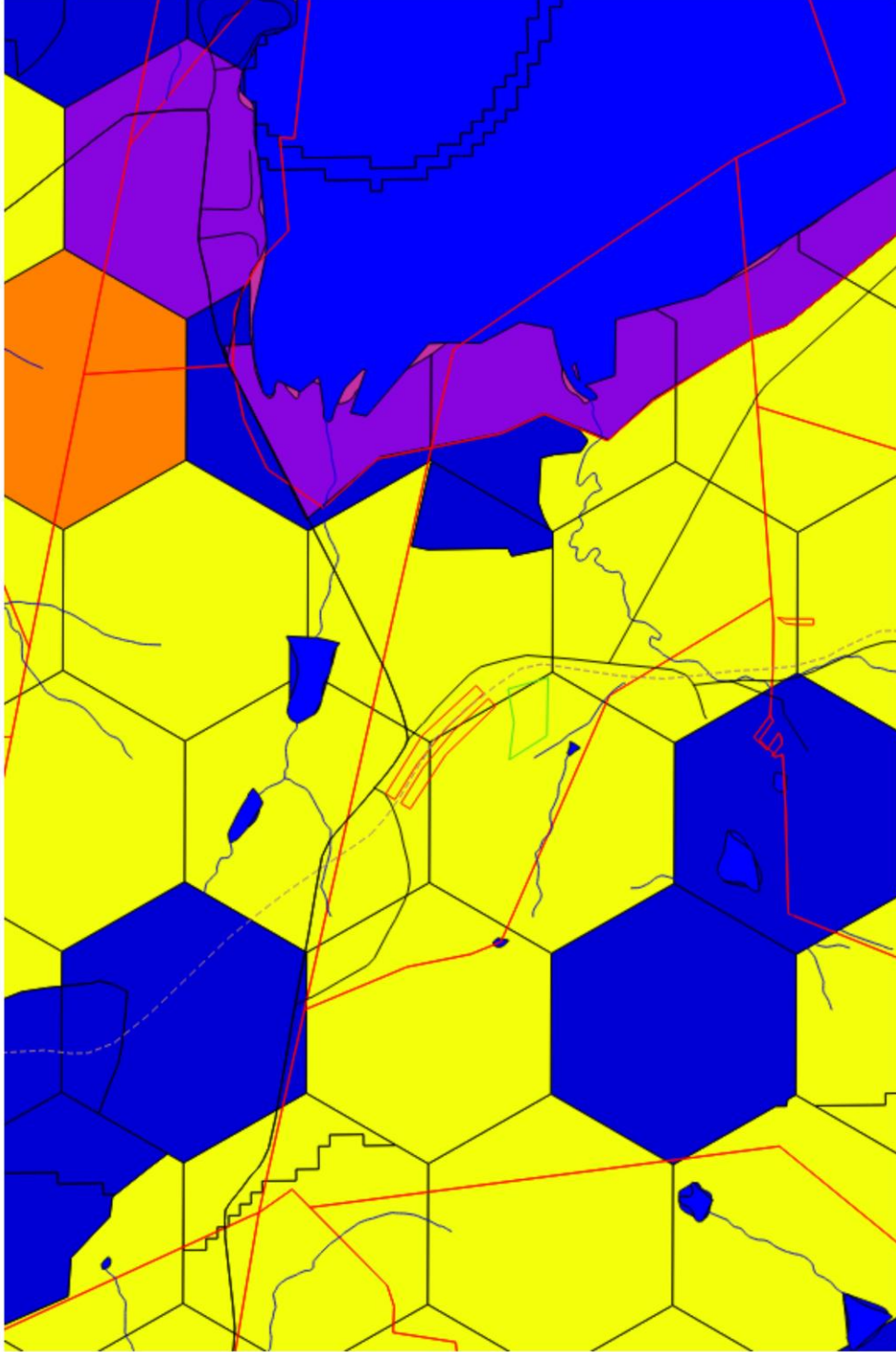
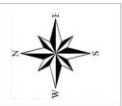
Map Information

Spheroid: WGS 84
Quantum GIS
Scale: 1:30 000

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Free State Biodiversity Plan map for the proposed poultry facility on the Farm Fransina 2060/0 near the Rustfontein Dam, Free State Province.



Map 3: Free State Biodiversity Plan map of the proposed poultry facility on the Farm Fransina 2060/0 near the Rustfontein Dam. The site is clearly situated in an Ecological Support Area 1 (ESA 1). Note also the protected areas surrounding the Rustfontein Dam.



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- Legend:**
- Approximate site boundary
 - Property boundaries
 - Watercourses
 - Road network
 - Railway lines
 - Wetlands and impoundments
 - Critical Biodiversity Area 1
 - Critical Biodiversity Area 2
 - Degraded
 - Ecological Support Area 1
 - Ecological Support Area 2
 - Other
 - Protected Areas

Map Information

Spheroid: WGS 84
Quantum GIS
Scale: 1:30 000

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Figure 1: General panorama of the development site. The railway line (red), Powerline (yellow) and adjacent poultry facility (blue) is indicated.



Figure 2: Panorama of the site illustrating the natural vegetation dominated by a grass layer.



Figure 3: Panorama of the site with the pipeline trench (red) indicated. The adjacent watercourse is also indicated (blue). Note the higher percentage dwarf karroid shrubs in the foreground.



Figure 4: Panorama of the adjacent drainage line and stream (blue).

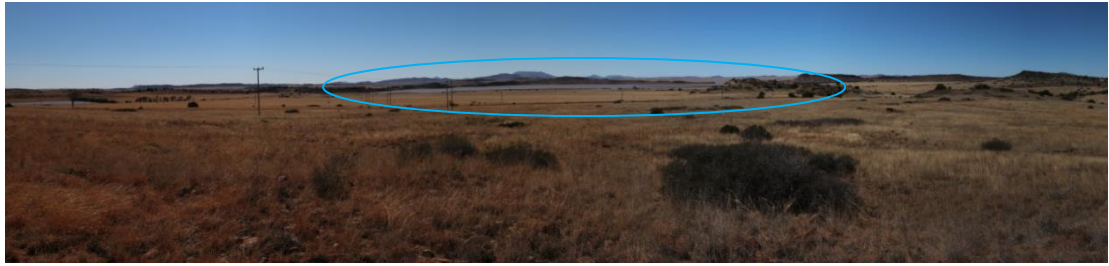


Figure 5: Panorama of the site with the Rustfontein Dam visible in the background (blue).



Figure 6: View of one of the areas of the site where dolerite outcrops occur. The high percentage surface rock is visible.



Figure 7: Signs of mammal on the site include from the top, soils mounds of the Common Molerat (*Cryptomys hottentottus*), shallow foraging excavations of a small mammal and burrows of a small unidentified mammal.

Appendix B: Species list

Species indicated with an * are exotic.

Protected species are coloured orange and Red Listed species red.

Species	Growth form
* <i>Tagetes minuta</i>	Herb
<i>Amphiglossa triflora</i>	Dwarf shrub
<i>Arctotis arctotooides</i>	Herb
<i>Arctotis venusta</i>	Herb
<i>Aristida adscensionis</i>	Grass
<i>Aristida congesta</i>	Grass
<i>Aristida diffusa</i>	Grass
<i>Berkheya onopordifolia</i>	Herb
<i>Chasmatophyllum musculinum</i>	Succulent
<i>Chrysocoma ciliata</i>	Dwarf shrub
<i>Crassula capitella</i>	Succulent
<i>Cymbopogon pospischillii</i>	Grass
<i>Cynodon dactylon</i>	Grass
<i>Dicoma anomala</i>	Herb
<i>Digitaria eriantha</i>	Grass
<i>Diospyros austro-africana</i>	Shrub
<i>Eragrostis lehmanniana</i>	Grass
<i>Eragrostis nindensis</i>	Grass
<i>Eragrostis obtusa</i>	Grass
<i>Eragrostis superba</i>	Grass
<i>Eriospermum porpyrium</i>	Geophyte
<i>Felicia muricata</i>	Dwarf shrub
<i>Gazania krebsiana</i>	Herb
<i>Gladiolus permeabilis</i>	Geophyte
<i>Hermannia coccocarpa</i>	Herb
<i>Heteropogon contortus</i>	Grass
<i>Melolobium candicans</i>	Dwarf shrub
<i>Moraea palida</i>	Geophyte
<i>Nenax microphylla</i>	Dwarf shrub
<i>Nolletia ciliaris</i>	Dwarf shrub
<i>Osteospermum scariosum</i>	Herb
<i>Ruschia unidens</i>	Succulent
<i>Salvia verbenaca</i>	Herb
<i>Searsia ciliata</i>	Shrub
<i>Senecio consanguineus</i>	Herb
<i>Themeda triandra</i>	Grass
<i>Tragus koelerioides</i>	Grass
<i>Triraphis andropogonoides</i>	Grass

Appendix C: Protected species on the site

Protected species on the site may not be limited to these species but these species have identified on and around the site. Additional sources should be consulted to confirm the presence of protected species.



Gladiolus permeabilis
Patrysuintjie

Protected in the Free State Province.

National Red List Status: **Least Concern**

Method: **Forming a distinct colony on the site. Should be excluded as far as possible and only transplanted as a last resort. Does not transplant easily and necessary caution should be taken. Will not be visible during winter months.**

Appendix D: Impact methodology

The environmental significance assessment methodology is based on the following determination:

Environmental Significance = Overall Consequence x Overall Likelihood

Determination of Consequence

Consequence analysis is a mixture of quantitative and qualitative information and the outcome can be positive or negative. Several factors can be used to determine consequence. For the purpose of determining the environmental significance in terms of consequence, the following factors were chosen: **Severity/Intensity, Duration and Extent/Spatial Scale**. Each factor is assigned a rating of 1 to 5, as described below and in tables 6, 7, 9 and 10.

Determination of Severity

Severity relates to the nature of the event, aspect or impact to the environment and describes how severe the aspects impact on the biophysical and socio-economic environment.

Table 7 will be used to obtain an overall rating for severity, taking into consideration the various criteria.

Table 7: Rating of severity

Type of criteria	Rating				
	1	2	3	4	5
Quantitative	0-20%	21-40%	41-60%	61-80%	81-100%
Qualitative	Insignificant / Non-harmful	Small Potentially harmful	Significant / Harmful	Great / Very harmful	Disastrous Extremely harmful
Social/ Community response	Acceptable / I&AP satisfied	Slightly tolerable / Possible objections	Intolerable/ Sporadic complaints	Unacceptable / Widespread complaints	Totally unacceptable / Possible legal action
Irreversibility	Very low cost to mitigate/ High potential to mitigate impacts to level of insignificance / Easily reversible	Low cost to mitigate	Substantial cost to mitigate / Potential to mitigate impacts / Potential to reverse impact	High cost to mitigate	Prohibitive cost to mitigate / Little or no mechanism to mitigate impact Irreversible
Biophysical (Air quality, water quantity and quality, waste production, fauna and flora)	Insignificant change / deterioration or disturbance	Moderate change / deterioration or disturbance	Significant change / deterioration or disturbance	Very significant change / deterioration or disturbance	Disastrous change / deterioration or disturbance

Determination of Duration

Duration refers to the amount of time that the environment will be affected by the event, risk or impact, if no intervention e.g. remedial action takes place.

Table 8: Rating of Duration

Rating	Description
1: Low	Almost never / almost impossible
2: Low-Medium	Very seldom / highly unlikely
3: Medium	Infrequent / unlikely / seldom
4: Medium-High	Often / regularly / likely / possible
5: High	Daily / highly likely / definitely

Determination of Extent/Spatial Scale

Extent refer to the spatial influence of an impact be local (extending only as far as the activity, or will be limited to the site and its immediate surroundings), regional (will have an impact on the region), national (will have an impact on a national scale) or international (impact across international borders).

Table 9: Rating of Extent / Spatial Scale

Rating	Description
1: Low	Immediate, fully contained area
2: Low-Medium	Surrounding area
3: Medium	Within Business Unit area of responsibility
4: Medium-High	Within Mining Boundary area
5: High	Regional, National, International

Determination of Overall Consequence

Overall consequence is determined by adding the factors determined above and summarised below, and then dividing the sum by 4.

Table 10: Example of calculating Overall Consequence

Consequence	Rating
Severity	Example 4
Duration	Example 2
Extent	Example 4
SUBTOTAL	10
TOTAL CONSEQUENCE:(Subtotal divided by 4)	3.3

Likelihood

The determination of likelihood is a combination of Frequency and Probability. Each factor is assigned a rating of 1 to 5, as described below and in Table 11 and Table 12.

Determination of Frequency

Frequency refers to how often the specific activity, related to the event, aspect or impact, is undertaken.

Table 11: Rating of frequency

Rating	Description
1: Low	Once a year or once/more during operation/LOM
2: Low-Medium	Once/more in 6 Months
3: Medium	Once/more a Month
4: Medium-High	Once/more a Week
5: High	Daily

Determination of Probability

Probability refers to how often the activity/event or aspect has an impact on the environment.

Table 12: Rating of probability

Rating	Description
1: Low	Almost never / almost impossible
2: Low-Medium	Very seldom / highly unlikely
3: Medium	Infrequent / unlikely / seldom
4: Medium-High	Often / regularly / likely / possible
5: High	Daily / highly likely / definitely

Overall Likelihood

Overall likelihood is calculated by adding the factors determined above and summarised below, and then dividing the sum by 2.

Table 13: Example of calculating the overall likelihood

Consequence	Rating
Frequency	Example 4
Probability	Example 2
SUBTOTAL	6
TOTAL LIKELIHOOD (Subtotal divided by 2)	3

Determination of Overall Environmental Significance

The multiplication of overall consequence with overall likelihood will provide the environmental significance, which is a number that will then fall into a range of LOW, LOW-MEDIUM, MEDIUM, MEDIUM, MEDIUM-HIGH or HIGH, as shown in the table below.

Table 14: Determination of overall environmental significance

Significance or Risk	Low	Low-Moderate	Moderate	Moderate-High	High
Overall Consequence X Overall Likelihood	1 - 4.9	5 - 9.9	10 - 14.9	15 - 19.9	20 - 25

Qualitative description or magnitude of Environmental Significance

This description is qualitative and is an indication of the nature or magnitude of the Environmental Significance. It also guides the prioritisations and decision making process associated with this event, aspect or impact.

Table 15: Description of the environmental significance and the related action required.

Significance	Low	Low-Moderate	Moderate	Moderate-High	High
Impact Magnitude	Impact is of very low order and therefore likely to have very little real effect. Acceptable.	Impact is of low order and therefore likely to have little real effect. Acceptable.	Impact is real, and potentially substantial in relation to other impacts. Can pose a risk to the company	Impact is real and substantial in relation to other impacts. Pose a risk to the company. Unacceptable	Impact is of the highest order possible. Unacceptable. Fatal flaw.
Action Required	Maintain current management measures. Where possible improve.	Maintain current management measures. Implement monitoring and evaluate to determine potential increase in risk. Where possible improve	Implement monitoring. Investigate mitigation measures and improve management measures to reduce risk, where possible.	Improve management measures to reduce risk.	Implement significant mitigation measures or implement alternatives.