



DRAFT ENVIRONMENTAL IMPACT ASSESSMENT

REPORT:

THE PROPOSED ESTABLISHMENT OF AN EMULSION PLANT ON ERF 1559, HARDUSTRIA, HARRISMITH, FREE STATE

MARCH 2020

DESTEA Ref. No.: EMS/4,6/19/05

NEAS Ref. No.: FSP/EIA/0000324/2019



Report prepared by:



Environmental Assessment Practitioner (EAP) : Louis De Villiers

Assistant to the EAP and project contact person : Ansuné Weitsz

Postal Address : Suite 221
Private Bag X01
Brandhof
9324

Physical Address : 21 Dromedaris Street
Dan Pienaar
Bloemfontein
9301

Tel : 072 873 6665

Cell : 072 838 8189/
072 967 7962

E-mail : admin@turn180.co.za
ansune@turn180.co.za

Applicant:

South African Road Binders (Pty) Ltd

Applicant Contact Person : Marius Prinsloo
Postal Address : P.O. Box 13125
Noordstad
Bloemfontein
9302
Physical Address : 25 Bloemendal Road
Rayton
Bloemfontein
9302
Cell : 082 4508957
Tel : 051 436 4891
E-mail : mprinsloo@taupele.co.za/
admin@taupele.co.za

Site Information:

Erf number : 1559
21 Digit Surveyors Code : F01500020000155900000
District : Harrismith
District Municipality : Thabo Mofutsanyana District
Municipality
Local Municipality : Maluti-A-Phofung Local
Municipality
Site coordinates (Centre of site) : 28° 17'46.80"S and 29° 8'15.25"E

EXECUTIVE SUMMARY

South African Road Binders (Pty) Ltd ("**the applicant**") ("**SARB**") seeks to apply for Environmental Authorisation ("**EA**") with the Department of Economic, Small Business Development, Tourism and Environmental Affairs ("**DESTE**A") in terms of the 2014 Environmental Impact Assessment ("**EIA**") Regulations as amended, under the National Environmental Management Act (Act 107 of 1998) ("**NEMA**"), as well as for an Atmospheric Emission License ("**AEL**") with Province (DESTE) for the establishment of an Emulsion Plant on erf 1559, Hardustria, Harrismith, Free State ("**site**").

The development will entail the establishment of an Emulsion Plant for which approximately 0.74 ha of vegetation will need to be cleared. Bitumen emulsion that is produced during the operational phase of the proposed plant will be sold commercially to be used in projects involving the construction and repair of roads or will be used for the applicant's own projects. The basic operation of the Plant includes mixing heated raw bitumen with water, emulsifiers, chemicals and additives in a colloid mill. The product is then stored in cold storage tanks, ready to be sold or transported to sites. The Emulsion Plant will have the capacity to store approximately a total of 1 102 000 L of dangerous substances. This will include 816 000 L Raw Bitumen, 9 000 L Diesel, 23 000 L Paraffin and 254 000 L Bitumen Emulsion. Approximately 5 tons of Caustic Soda and 5 000 L of Hydrochloric Acid will also be stored on site.

The proposed development is also scheduled as a Macadam preparation process that also needs an AEL in terms of the National Environmental Management Air Quality Act (Act 39 of 2004) ("**NEM:AQA**").

The following activities will be applied for:

GN. R. 893 of the NEM: AQA 2013 Regulations:

- Category 2: Subcategory 2.4: Storage and Handling of Petroleum Products: "*All permanent immobile liquid storage facilities at a single site with a combined storage capacity of greater than 1000 cubic meters.*"
- Category 5: Mineral Processing, Storage and Handling, Subcategory 5.10: Macadam Preparation - "*Permanent facilities used for mixtures of aggregate; tar or bitumen to produce road-surfacing materials.*"

GN. R. 325 of the NEMA 2014 Regulations as amended:

- Activity 4 – "*The development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.*"

- Activity 6 – “The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent”.

The site is located within an industrial area of the town of Harrismith and is currently vacant. The zoning of the site is currently “General Industrial”. An application for rezoning is in process, due to the Emulsion Plant requiring a “Noxious Industrial” zoning.

The site falls within the Eastern Free State Sandy Grassland (Gm 4) vegetation type, which is classified as Least Concern according to the National List of Threatened Ecosystems (Notice 1477 of 2009) (National Environmental Management Biodiversity Act, 2004). The site also falls within an Ecological Support Area 1 as per the Free State Biodiversity Management Plan (2015). However, it should be noted that the site is situated within an industrial area of the town and thus the site is degraded. The area that will be cleared is also smaller than 1 ha (0.74ha). According to the Ecological Assessment, the conservation value of the site is considered to be low, as the natural vegetation has been transformed and degraded by numerous activities on site and in the surrounding area. Consequently, no rare or threatened species were observed on site and it is unlikely that such species would occur on site. However, two protected geophytic species, *Asclepias gibba* and *A. multicaulis* were observed on site. No viable mammal population was observed on site and it is highly unlikely that any rare or endangered animal species would occur here (Van Rensburg 2020).

Furthermore, there are no wetlands or watercourses on the site. The nearest surface water feature is the Wilge River, which is located approximately 1.3 km to the southwest of the site. The groundwater of the Harrismith area consists of a minor aquifer system which has a vulnerability rating of moderate. According to the Aquifer Classification of South Africa, the Harrismith area mostly gets its water from surface water features and not from groundwater. The groundwater quality of the area is classified as being of moderate quality with a slightly salty taste and having an electrical conductivity of between 70-150 mSm (Department of Water and Sanitation, 2012).

The geology of the site mainly consists of Tarkastad mudstone and sandstone with narrow dolerite dykes and sills in places. The soil of the site mainly consists of plinthic catena, dystrophic and/or mesotrophic soils (ENPAT, 2001).

The site is situated within the Upper Vaal Water Management Area and is located in Rainfall Zone C8A and has a Mean Annual Rainfall (“**MAR**”) between 600 mm and 700 mm per annum. The site also falls within the C81E Quaternary Catchment. Furthermore, the property is located in Evaporation Zone 12A with a Mean Annual Evaporation (“**MAE**”) of between 1 200 mm to

1 300 mm. Mean maximum daily temperatures vary from 26°C in the summer to 16°C in winter and the prevailing wind direction in the area is a West North Westerly wind.

The main economic activities in Harrismith centres around industry. Industrial activities include agro-processing, metal fabrication and textile fabrication (SANEC 2012). Therefore, there are numerous contributors towards air emissions and the ambient air quality in Harrismith is not expected to be very good. During operation the Emulsion Plant does not generate a lot of noise and the emissions into the atmosphere are minimal. Thus, the impact of the proposed project on these aspects is expected to be low. This was confirmed in the Atmospheric Impact Report (refer to Annexure 5) which stated that the impact of modelled concentrations of emissions associated with the emulsion plant are well below the national health-based ambient air quality standards and guidelines (uMoya-Nilu Consulting 2019).

As mentioned, the proposed site is vacant and disturbed due to it being located within an industrial area. Thus, there are no buildings older than 60 years on the proposed site and it is highly unlikely that there are any heritage objects or palaeontological remains on site. According to the Heritage Impact Assessment ("**HIA**"), "any surface signs of archaeological remains of any era on the proposed site for the emulsion plant would have been obliterated by the clearing of the natural vegetation and installation of electrical, water and sewerage infrastructure for this suburb." (Philip 2020). Furthermore, no fossiliferous outcrop was found in the proposed site and the overall palaeontological sensitivity is considered to be low (Butler 2020). Refer to the Palaeontological Impact Assessment ("**PIA**").

Alternatives

The preferred site for the proposed development is erf 1559, Hardustria, Harrismith, Free State. The applicant has an agreement with the landowner to utilise the site.

(The alternatives are discussed in more detail in Section 6 of this report)

Baseline Assessments

A baseline site assessment was undertaken by Mr. Louis De Villiers ("**EAP**") and Ms. Ansuné Weitsz ("**EAP Assistant**") to identify and assess any potential impacts associated with establishing the proposed Emulsion Plant. This was followed by numerous discussions with specialists and the operations manager.

Desktop studies regarding sensitive environmental features located in close proximity to the site have also been done.

The following Specialist studies were undertaken:

- Atmospheric Impact Assessment
- Ecological Assessment

- Heritage Impact Assessment
- Paleontological Impact Assessment

Public Participation

The Public Participation Process ("PPP") was conducted according to the 2014 EIA Regulations, as amended.

Comments, responses and proof of notifications sent during the PPP are included in Section 3 and **Annexure 3** of this Report (refer to attached document in **Annexure 3**).

Impact Assessment

The following impacts identified during the Scoping Phase were evaluated and assessed using a quantitative rating system.

Impact	Preferred Alternative (Erf 1559)	
	Construction phase	Operational phase
Geology and Soil	3.10 (Low)	4.9 (Low)
Land Use	5 (Low-Moderate)	10.485 (Moderate)
Plant & Animal Life	4.431 (Low)	6.995 (Low-Moderate)
Surface Water	3.325 (Low)	5.81 (Low-Moderate)
Groundwater	3.495 (Low)	5.828 (Low-Moderate)
Air Quality	3.99 (Low)	4 (Low)
Noise	5.81 (Low – Moderate)	3.5 (low)
Archaeological, Palaeontological and Cultural Resources	2.49 (Low)	No Impact

Aesthetics	6 (Low-Moderate)	9.31 (Low-Moderate)
Socio-economics	Positive Impact	Positive Impact

Conclusion

The proposed establishment of an Emulsion Plant on erf 1559, Hardustria, Harrismith, Free State is an initiative by South African Road Binders (Pty) Ltd. The proposed development will entail the establishment of an Emulsion Plant to produce bitumen emulsion to be sold commercially to be used in projects involving the construction and repair of roads or will be used for the applicant's own projects.

The proposed site falls within a vegetation type that is classified as being Least Threatened. The site is also located within an industrial area and is degraded. No archaeological material or historic buildings were observed on site and the geology underlying the site is also not considered to be paleontologically significant. Furthermore, there are no watercourses or wetlands present on the proposed site.

By implementing the proposed development, numerous job opportunities will be created, which will have a positive impact on the local economy. It is estimated that the project will have an approximate capital value of R10 245 000 upon completion.

All impacts related to the preferred site will be Low or Low-Moderate. Only the impact on Land Use during the operational phase will have a Moderate impact, due to the development being permanent. It should be noted that the alternative 1 site (erf 1560) is situated directly next to the preferred site and is expected to have the same environmental features and impacts. However, the applicant already has a Lease Agreement with the landowner for the preferred site.

Therefore, after assessing all alternatives, the preferred site, erf 1559, was considered as the best suited site for the establishment of an Emulsion Plant.

TABLE OF CONTENTS

TABLE OF FIGURES	XII
1 INTRODUCTION.....	1
1.1 The Applicant.....	1
1.2 The Landowner	1
1.3 The Project Team	1
1.4 Property and Site	2
2 DESCRIPTION OF THE EXISTING ENVIRONMENT.....	5
2.1 Geology and soil.....	5
2.2 Climate	5
2.3 Land Use	10
2.4 Vegetation and Animal Life	10
2.5 Surface Water	11
2.6 Groundwater.....	11
2.7 Air Quality and Noise	14
2.8 Cultural Heritage and Archaeology and Palaeontology.....	15
2.9 Aesthetics	15
2.10 Demographics and Regional Socio-economic Structure	15
3 PUBLIC PARTICIPATION	16
3.1 Project initiation	16
3.2 Interested and Affected Parties (“I&AP”) / Stakeholders	16
3.3 Authorities.....	16
3.4 List of all I&AP	17
3.5 Summary of Comments and Responses	20
3.5.1 Comments and Concerns received from I&AP	20
3.5.2 Feedback on Comments and Concerns from I&AP	21
4 MOTIVATION FOR THE PROPOSED PROJECT	25

5	LEGAL REQUIREMENTS	26
5.1	Aspects that were assessed as part of the Environmental Impact Assessment Process.	27
6	CONSIDERATION OF ALTERNATIVES	29
6.1	Site Alternatives	29
6.1.1	Preferred Alternative: Erf 1559	29
6.1.2	Alternative 1: Erf 1560	31
6.2	Design/Layout Alternatives	33
6.3	Technological Alternative	33
6.4	No Go Alternative	34
7	PROJECT DESCRIPTION	34
7.1	Emulsion production	34
8	ENVIRONMENTAL IMPACT ASSESSMENT	38
8.1	Assessment Methodology	38
8.1.1	Determination of Consequence	38
8.1.1.1	Determination of Severity	38
8.1.1.2	Determination of Duration	39
8.1.1.3	Determination of Extent/Spatial Scale	40
8.1.1.4	Determination of Overall Consequence	40
8.1.2	Determination of Likelihood	40
8.1.2.1	Determination of Frequency	41
8.1.2.2	Determination of Probability	41
8.1.2.3	Determination of Overall Likelihood	41
8.1.3	Determination of Overall Environmental Significance	42
8.1.3.1	Quantitative description or magnitude of Environmental Significance	42
8.1.3.2	Qualitative description or magnitude of Environmental Significance	42
8.2	Environmental Impact Assessment	44
8.1.2	Geology and Soil	44
8.1.3	Land Use	51
8.1.4	Vegetation and Animal Life	54
8.1.5	Surface Water	61
8.1.6	Groundwater	65
8.1.7	Air Quality	70
8.1.8	Noise	74
8.1.9	Archaeological, Palaeontological and Cultural Resources	77
8.1.10	Aesthetics	80
8.1.11	Socio-economics	83

9	CONCLUSION	84
9.1	Summary of Significance Rating after mitigation	85
9.2	Motivation for proposed site alternative	86
10	PROPOSED CONDITIONS OF APPROVAL.....	86
11	EAP DECLARATION.....	87
12	REFERENCES	88

Table of Figures

Figure 1: Locality map for the proposed project	4
Figure 2 Sensitivity map for the proposed project.....	5
Figure 3: Map indicating the MAR of Harrismith.	7
Figure 4: Map indicating the MAE of Harrismith.	8
Figure 5: Figure indicating the average maximum and minimum temperatures and rainfall for Harrismith.	9
Figure 6: Harrismith Wind Rose that indicates how many hours per year the wind blows from the indicated direction.	9
Figure 7: Figure showing the aquifer classification of Harrismith	12
Figure 8: Figure showing the aquifer vulnerability of Harrismith.	13
Figure 9: Figure showing the groundwater quality of Harrismith.	14
Figure 10 Map indicating the locality of erf 1559 (preferred site), Harrismith, Free State.....	30
Figure 11: Map indicating the locality of erf 1560 (alternative 1), Harrismith, Free State.....	32
Figure 12: Map indicating the Preferred Site and Alternative 1.	32
Figure 13 Layout Map for the proposed project.....	33
Figure 14: Basic process flow diagram for the Emulsion Plant.	37

List of Tables

Table 1: Property description.	3
Table 2: List of all I&AP	17
Table 3: Rating of Severity	38
Table 4: Rating of Duration	39
Table 5: Rating of Extent	40
Table 6: Example of calculating Overall Consequence	40
Table 7: Rating Frequency	41
Table 8: Rating Probability	41
Table 9: Example of calculating the Overall Likelihood	41
Table 10: Determination of Overall Environmental Significance	42
Table 11: Description of the Environmental Significance and the related action required	42

List of Annexures

Annexure 1	Project Team
Annexure 2	Maps & Layout Plans
Annexure 3	Public Participation Process

Annexure 4 Environmental Management Programme (EMPr)

Annexure 5 Specialist Reports

Annexure 6 Other Information

1 Introduction

1.1 The Applicant

Applicant: South African Road Binders (Pty) Ltd

Registration number: 2012/102841/07

Address: 25 Bloemendal Road

Rayton

Bloemfontein

9302

Telephone: 051 436 4891

1.2 The landowner

Name: Staresimul (Pty) Ltd

Contact Person: Mr. A.F. Boucher

Postal Address: P.O. Box 13125

Noordstad

9302

Telephone: 051 436 0103

E-mail: fboucher@taupele.co.za

1.3 The Project Team

The Environmental Assessment Practitioner ("EAP"):

Company: Turn 180 Environmental
Consultants

Contact person: Louis De Villiers (EAP)

Ansuné Weitsz (Assistant
EAP)

Postal address: Suite 221
Private Bag X01
Brandhof
9324

Tel: 072 873 6665

Cell: 072 838 8189/072 967
7962

E-mail: ansune@turn180.co.za /
admin@turn180.co.za

Specialists:

Ecological Assessment DPR Ecologists (Mr.
Darius Van Rensburg)

Heritage Assessment Ms. Loudine Philip

Palaeontological
Assessment Banzai Environmental

Air Quality Assessment uMoya-NILU Consulting
(Pty) Ltd

Refer to **Annexure 1** attached hereto for the expertise of the EAP and EAP Assistant. Specialist reports are attached in **Annexure 5**.

1.4 Property and Site

1.4.1 Property and Site Description

The proposed development will take place on erf 1559, Hardustria, Harrismith, Free State (refer to figure 1 below and the Locality Map in **Annexure 2**). The site measures 0.74 ha and is currently vacant and not being used for anything. The applicant has a lease agreement with the

landowner in order to establish the Plant on this property (please refer to the lease agreement attached in **Annexure 6**). This property is also situated directly next to the N3 National Road.

Table 1: Property description.

Erf number	Area (ha)	Title deed
1559	0.74	T14987/2019

District Municipality: Thabo Mofutsanyana District Municipality

Local Municipality: Maluti-A-Phofung Local Municipality

Province: Free State

21 Digit Surveyor General Code:

F01500020000155900000

Coordinates of the corners of the site:

Corner	Latitude (S)	Longitude (E)
A	28° 17'44.55"S	29° 8'15.16"E
B	28° 17'46.55"S	29° 8'13.20"E
C	28° 17'48.54"S	29° 8'15.19"E
D	28° 17'46.50"S	29° 8'17.64"E

The coordinates of the centre of the site:

Centre of site	Latitude (S)	Longitude (E)
	28° 17'46.80"S	29° 8'15.25"E

The site falls within the Eastern Free State Sandy Grassland (Gm 4) vegetation type, which is classified as Least Concern according to the National List of Threatened Ecosystems (Notice 1477 of 2009) (National Environmental Management Biodiversity Act, 2004) (refer to figure 2 below and the Sensitivity Map in **Annexure 2**). The site also falls within an Ecological Support Area 1 as per

the Free State Biodiversity Management Plan (2015). However, it should be noted that the site is situated within an industrial area of a town and thus the site is degraded (refer to figure 2 below and the Sensitivity Map in **Annexure 2**).

There are no surface water features, including wetlands, located on the proposed site. The nearest water feature is the Wilge River, which is located approximately 1.3 km to the southwest of the site.

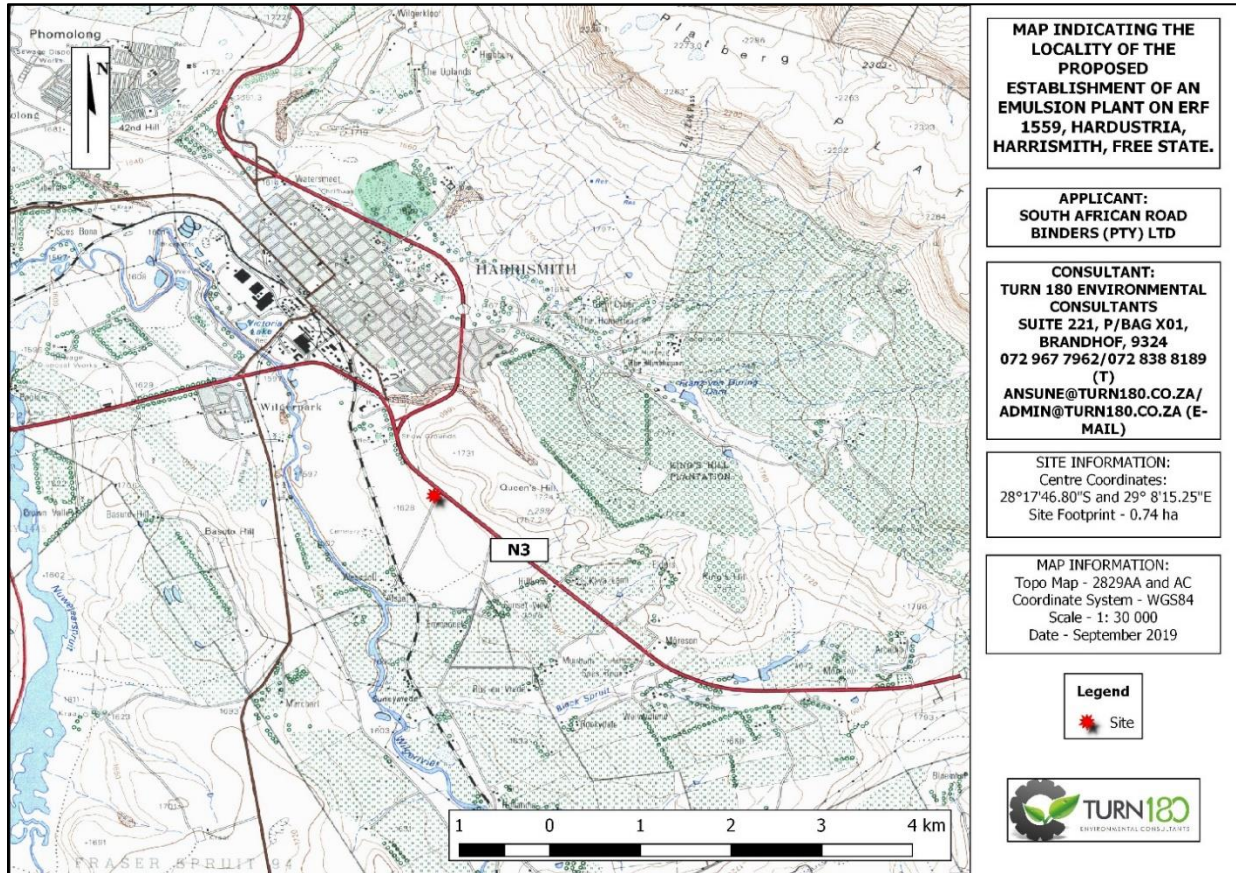


Figure 1: Locality map for the proposed project

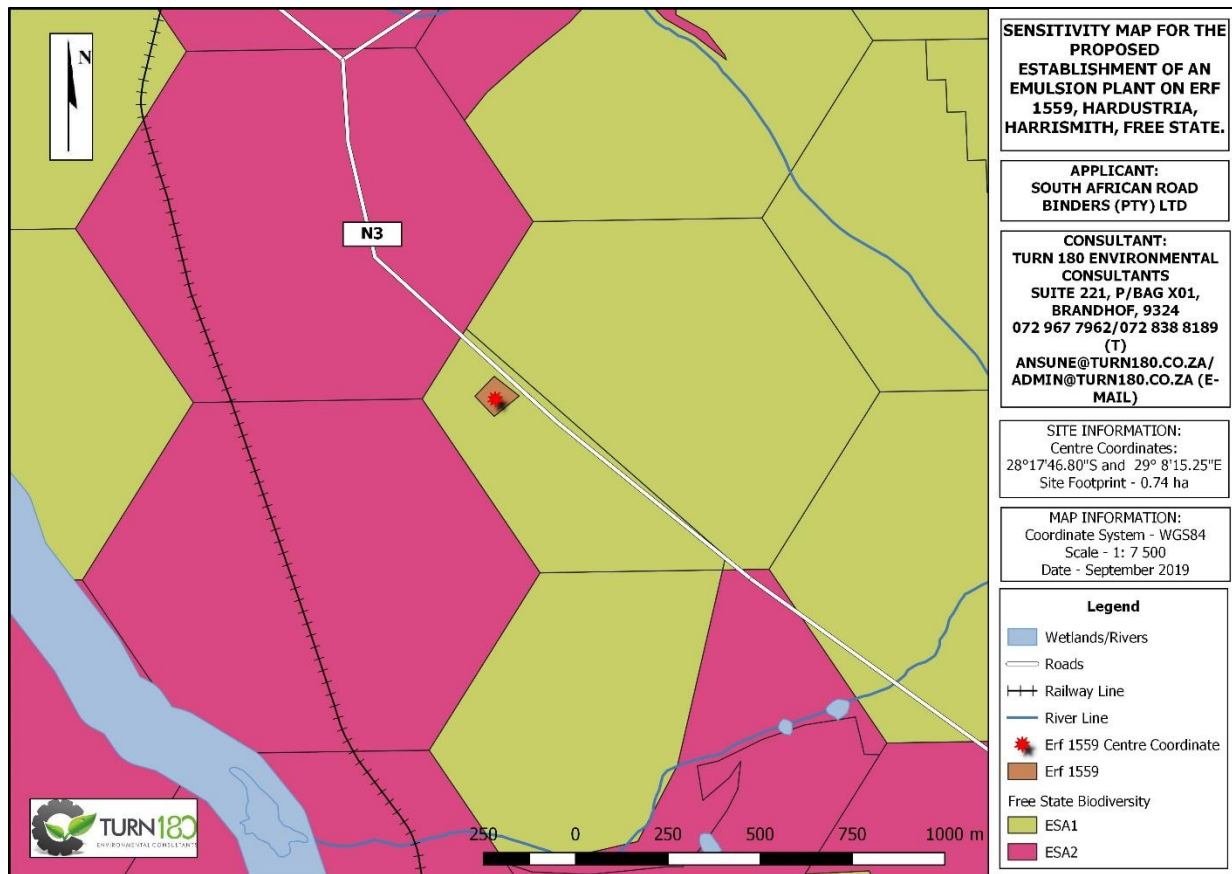


Figure 2 Sensitivity map for the proposed project.

1.4.2. Zoning

The site is currently zoned as “General Industrial” and may need to be rezoned in order to allow the Emulsion Plant, which falls under “Noxious Industrial”. Town Planners have been appointed who are handling this process.

2 Description of the existing environment

2.1 Geology and soil

The geology of the site mainly consists of Tarkastad mudstone and sandstone with narrow dolerite dykes and sills in places. The soil of the site mainly consists of plinthic catena, dystrophic and/or mesotrophic soils (ENPAT, 2001). It should be noted that the proposed project will not include any blasting or deep excavation.

2.2 Climate

The site is situated within the Upper Vaal Water Management Area and is located within Rainfall Zone C8A and has a Mean Annual Rainfall (“MAR”) between 600 mm and 700 mm per annum

(refer to figure 3 below). The site also falls within the C81E Quaternary Catchment. Furthermore, the site is located within Evaporation Zone 12A with a Mean Annual Evaporation (“**MAE**”) of between 1 200 mm to 1 300 mm (refer to figure 4 below) (Water Resource Council 2005). Mean maximum daily temperatures vary from 26°C in the summer to 16°C in winter (refer to figure 5 below). Figure 6 below indicates that the prevailing wind direction in the area is a West North Westerly wind (Meteoblue 2019).

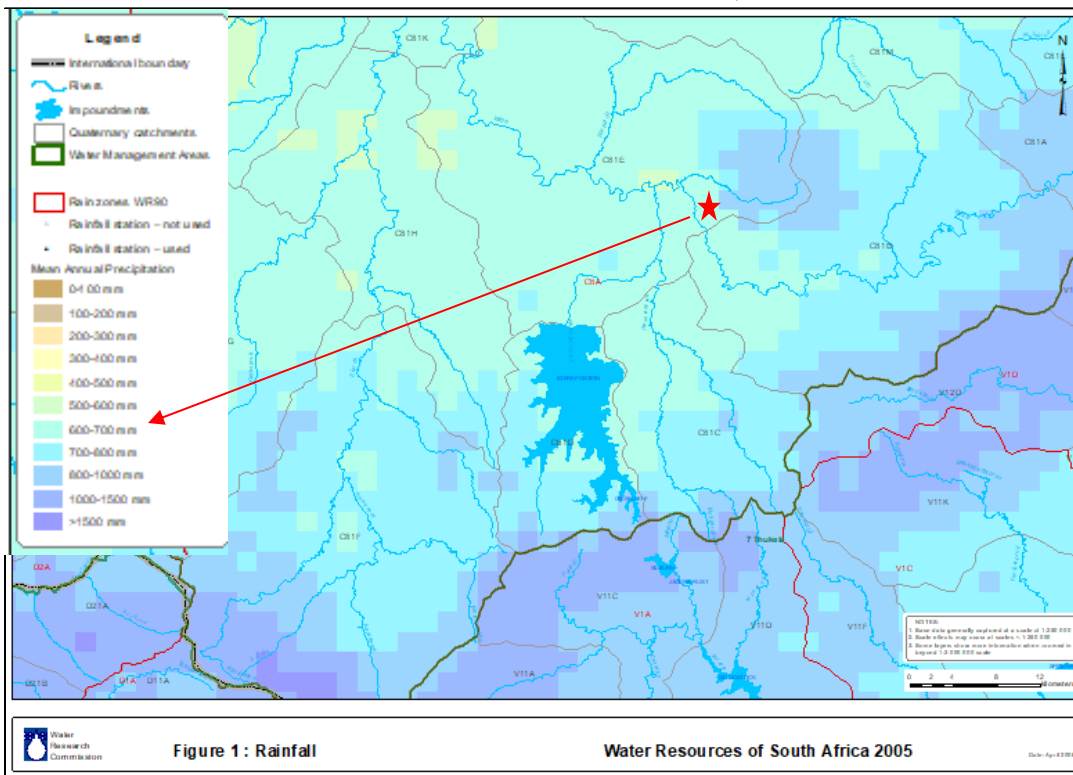
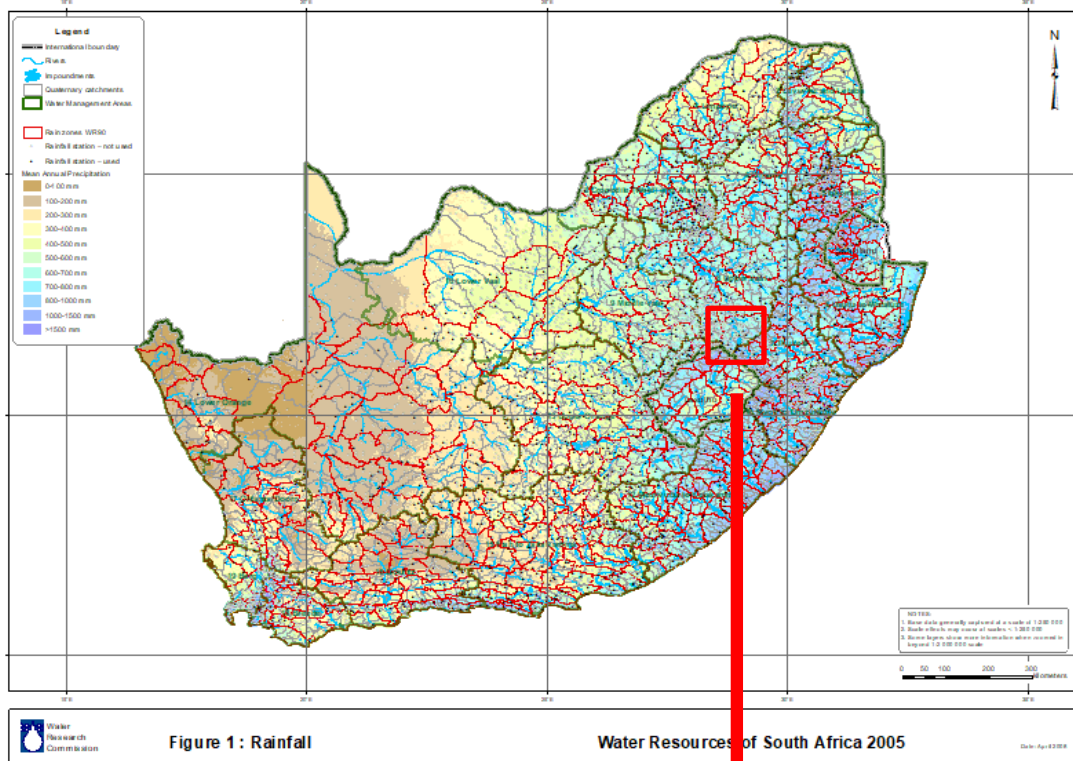


Figure 3: Map indicating the MAR of Harrismith.

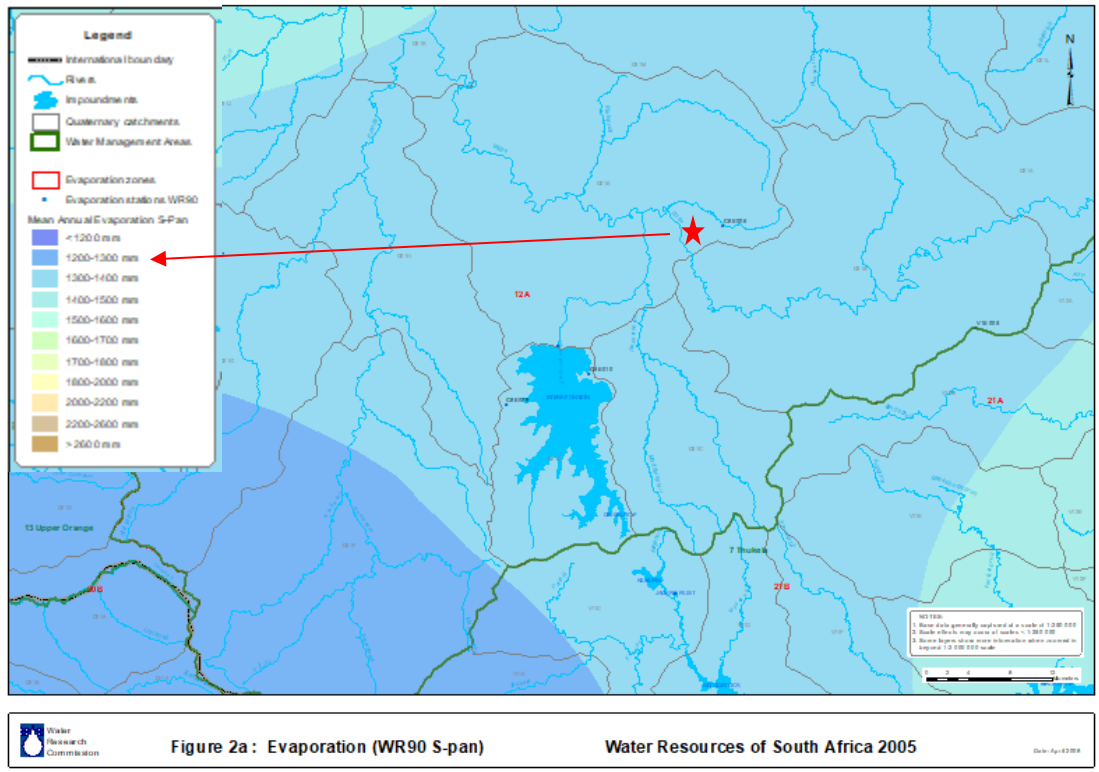
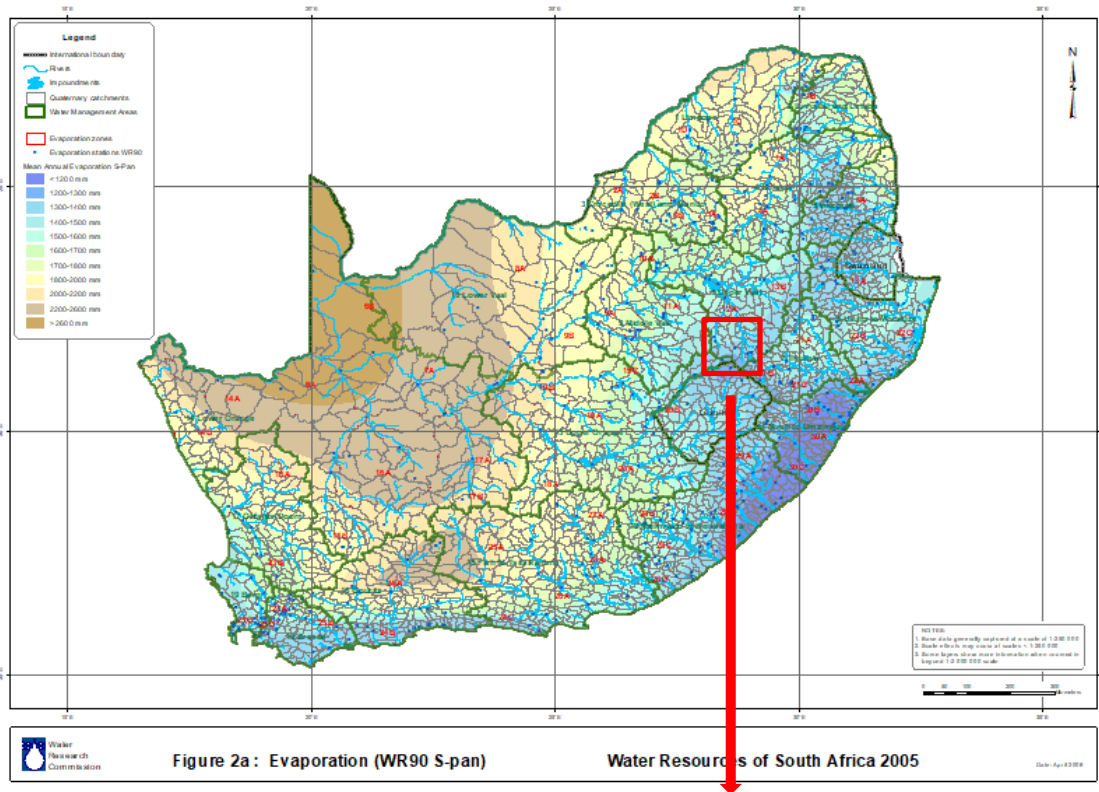


Figure 4: Map indicating the MAE of Harrismith.

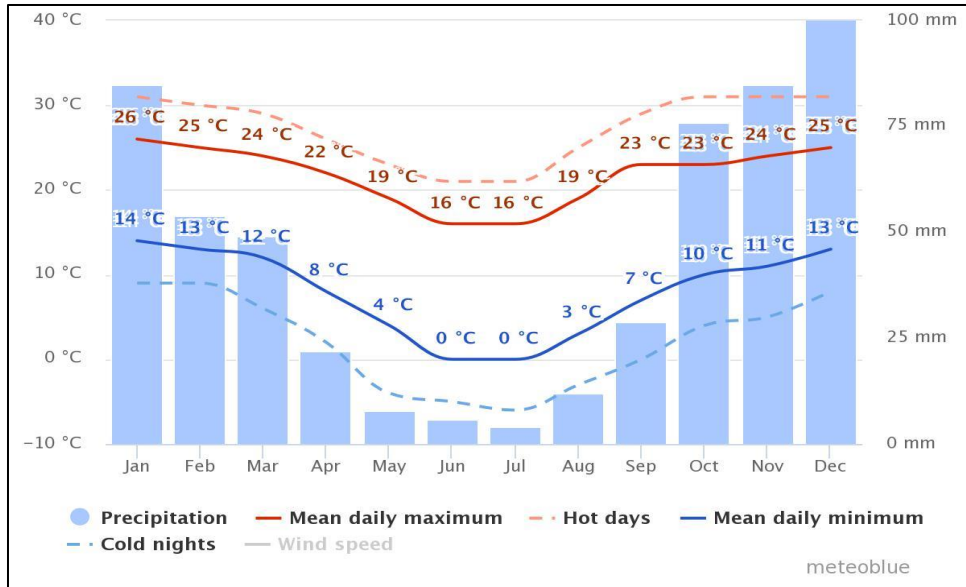


Figure 5: Figure indicating the average maximum and minimum temperatures and rainfall for Harrismith.

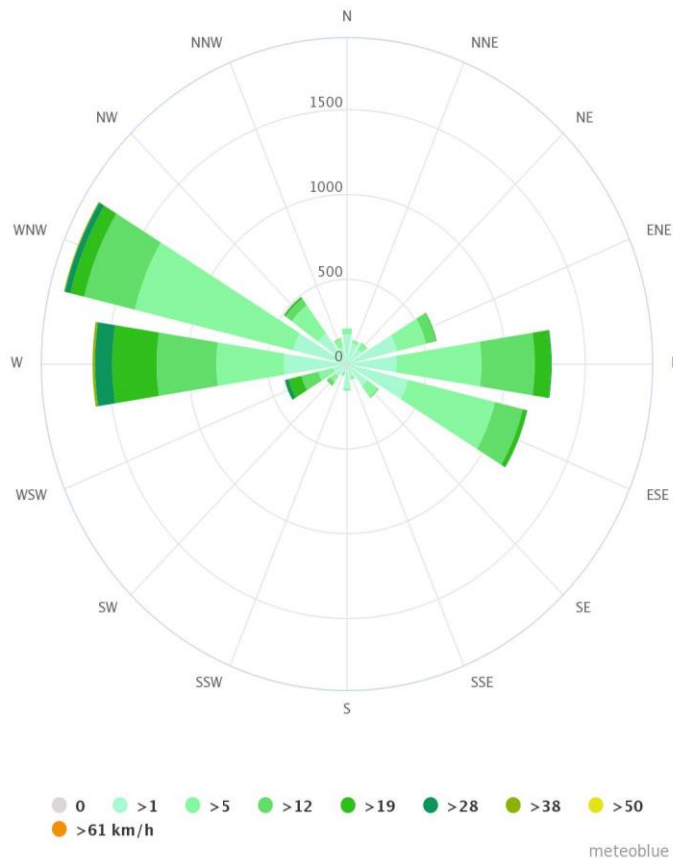


Figure 6: Harrismith Wind Rose that indicates how many hours per year the wind blows from the indicated direction.

2.3 Land Use

Currently the property is vacant. The applicant has a lease agreement with the landowner to utilise the property (refer to **Annexure 6**). The landowner recently bought the property specifically for this purpose.

A portion of the site is transformed by heavy vehicles using it as a turning point and rubbish dumping is also present on site. The site is also located adjacent to communal grazing land and it was observed that overgrazing by domestic stock does occur on site (Van Rensburg 2020).

The site is zoned as "General Industrial" and may need to be rezoned to allow for the Emulsion Plant. Town Planners have been appointed who are handling this process. Due to the property being located within an industrial area and being degraded, the potential to use it for other activities is low.

2.4 Vegetation and Animal Life

The site falls within the Eastern Free State Sandy Grassland (Gm 4) vegetation type, which is classified as Least Concern according to the National List of Threatened Ecosystems (Notice 1477 of 2009) (National Environmental Management Biodiversity Act, 2004). According to Mucina *et al.* (2006, 394) this vegetation type usually consists of closed grassland with numerous herb species. The site also falls within an Ecological Support Area 1 as per the Free State Biodiversity Management Plan (2015).

According to the Ecological Assessment, the site still consists of natural grassland. However, it has been degraded by surrounding activities and on-site disturbance (vehicle turning point, rubbish dumping, overgrazing and industrial activities) and the conservation value of the site is considered to be low. Furthermore, due to the transformed nature of the vegetation, no rare or threatened species were observed on site and it is unlikely that such species would occur on site. However, two protected geophytic species, *Asclepias gibba* and *A. multicaulis* were observed on site (Van Rensburg 2020).

Due to the degraded state of the site and it being located within an industrialised area, it is highly unlikely that a viable mammal population will be present on site. However, it is still likely that some small rodents may be present on site. Due to the degraded condition of the site it is highly unlikely that any rare or endangered species would occur here (Van Rensburg 2020).

Please refer to the Ecological Assessment in **Annexure 5**.

2.5 Surface Water

There are no surface water features, including wetlands, located on the proposed site. The closest watercourse is the Wilge River, which is located approximately 1.3 km to the southwest of the site (ENPAT 2001). However, there are drainage lines in the surrounding area and runoff from site will follow the gradual slope of the site and these drainage lines towards the Wilge River (Van Rensburg 2020).

Please refer to the Ecological Assessment in **Annexure 5**.

2.6 Groundwater

The Harrismith area consists of a minor aquifer system (refer to Figure 7) with a moderate vulnerability (refer to Figure 8). Minor aquifers normally yield moderate quantities of groundwater with a variable quantity. These aquifers can normally be found in fractured rocks without a high primary permeability. According to the Aquifer Classification of South Africa, the Harrismith area mainly receives its water from surface water features and not from groundwater. The groundwater quality of the Harrismith area is classified as being of moderate quality with a slightly salty taste and having an electrical conductivity of between 70-150 mSm (refer to Figure 9) (Department of Water and Sanitation, 2012).

It is not planned that any groundwater be used for the development. If this changes, a Water Use License will be applied for.

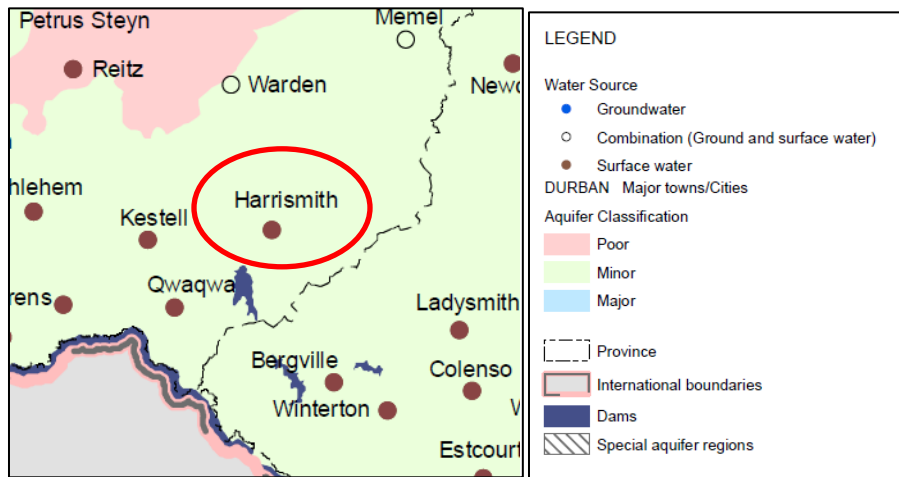
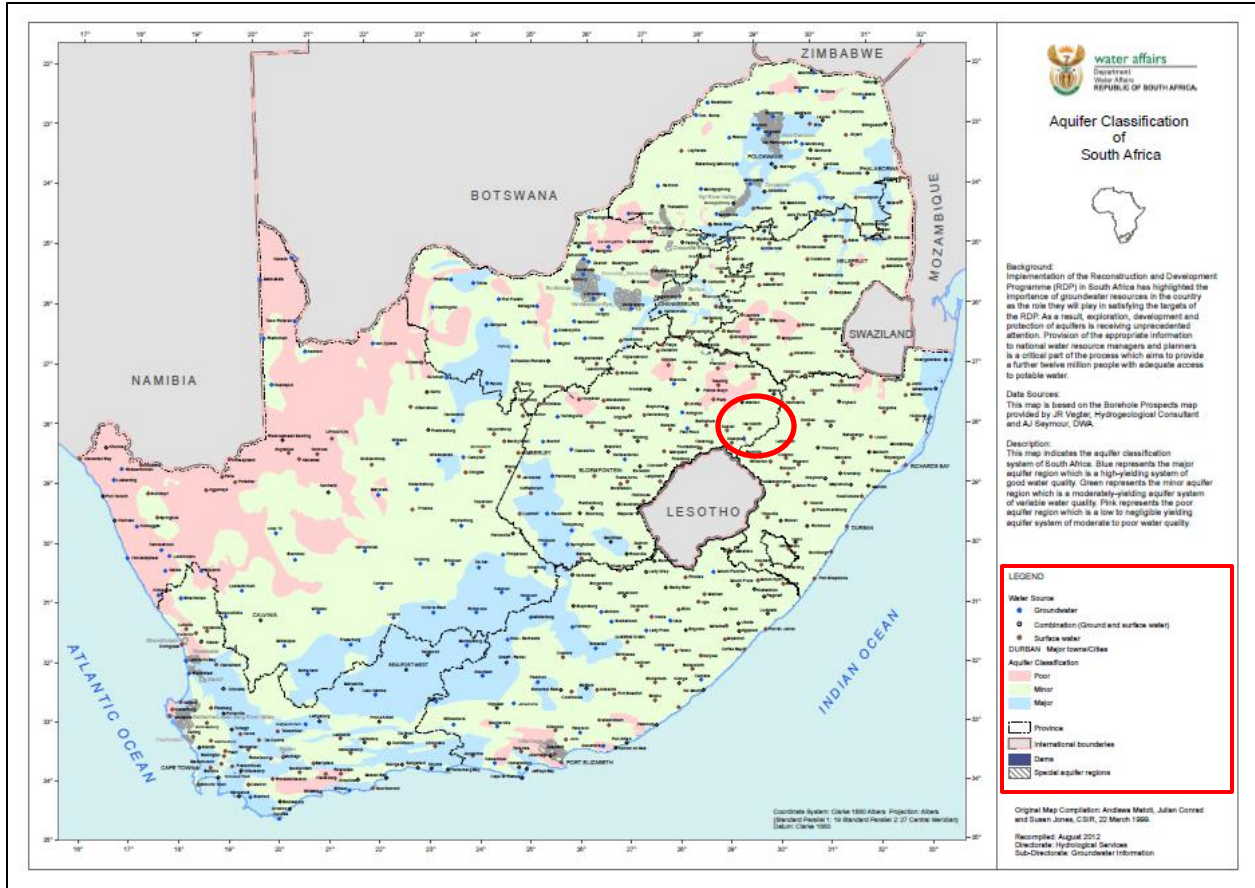


Figure 7: Figure showing the aquifer classification of Harrismith

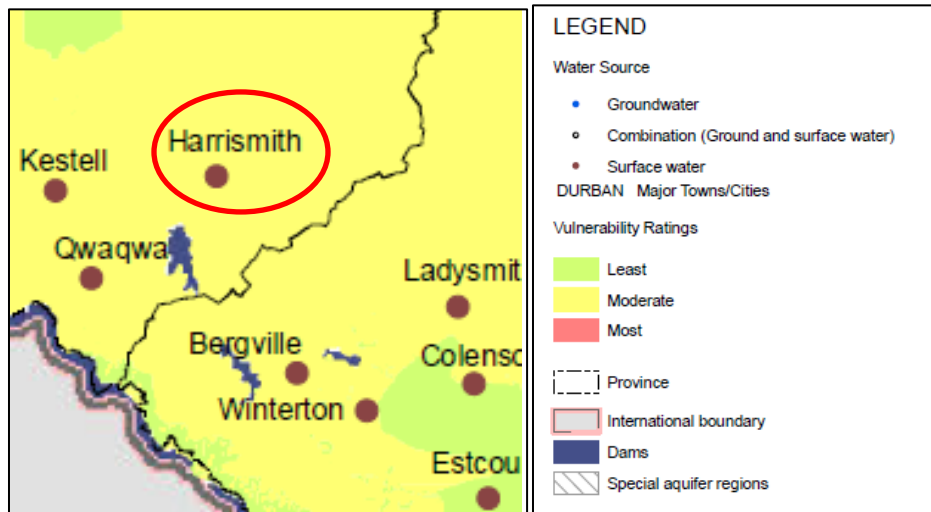
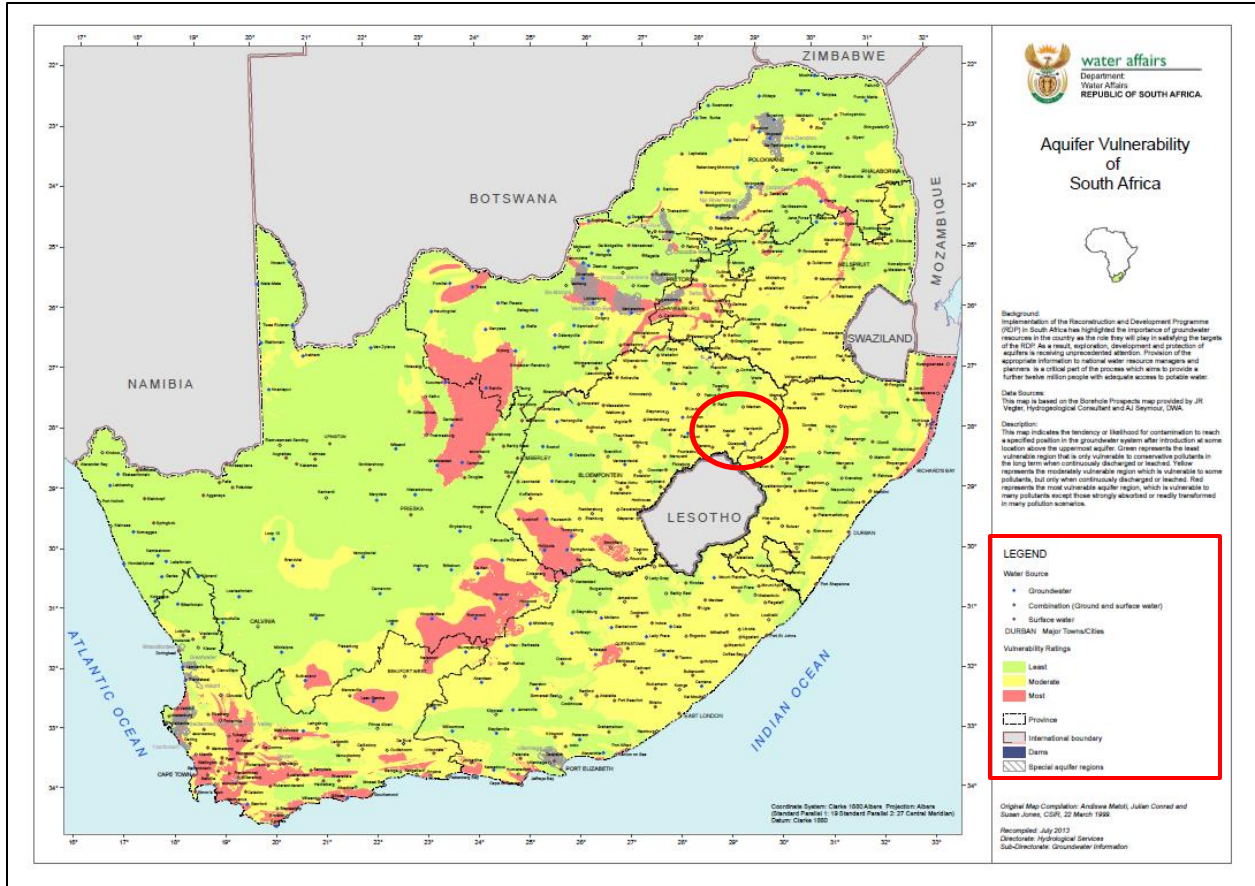


Figure 8: Figure showing the aquifer vulnerability of Harrismith.

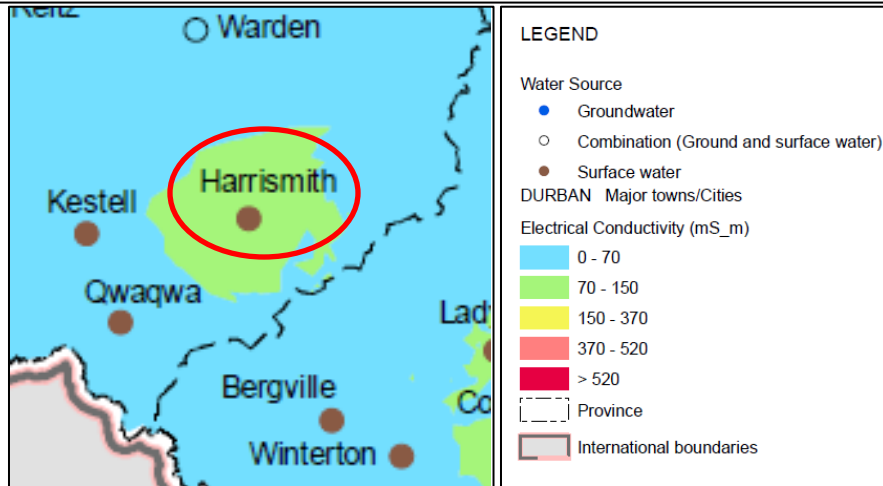
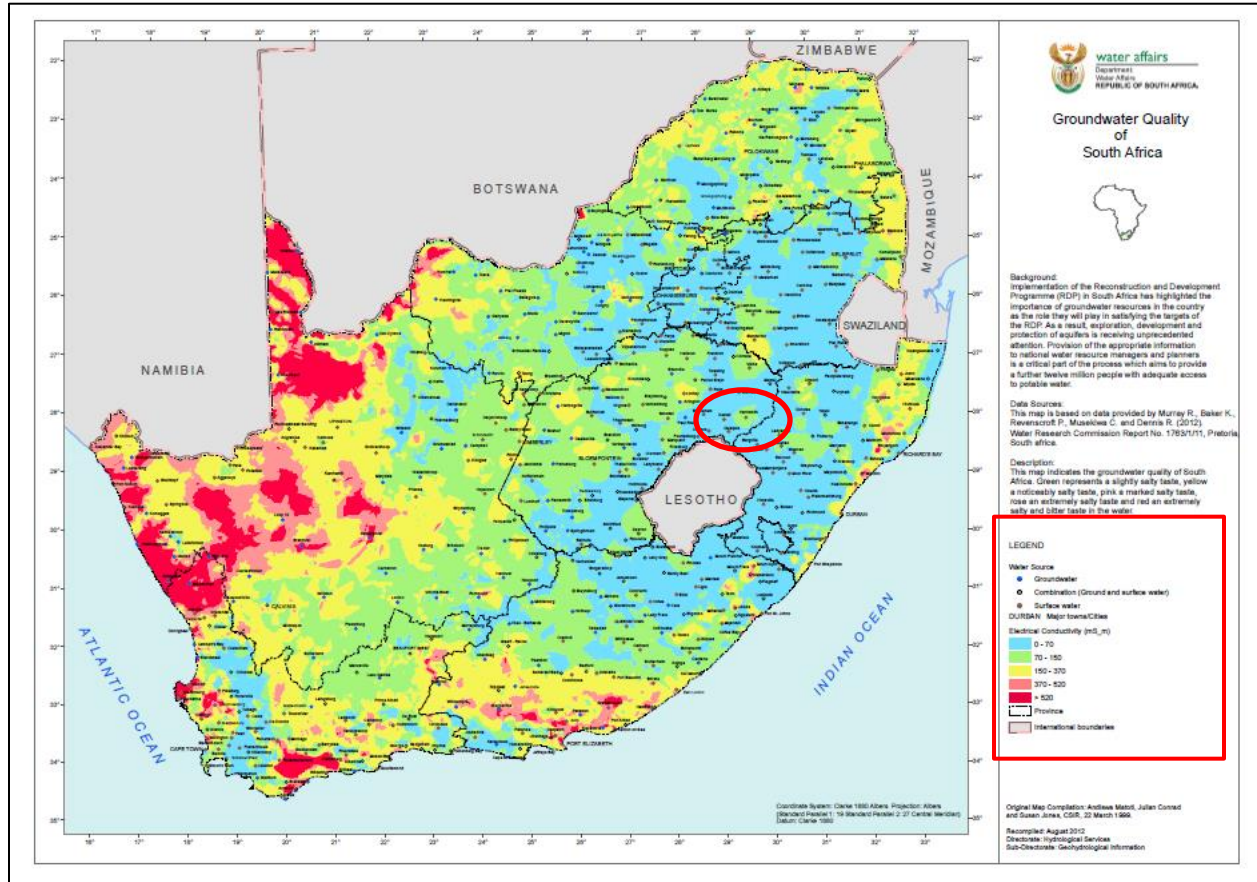


Figure 9: Figure showing the groundwater quality of Harrismith.

2.7 Air Quality and Noise

There are numerous contributors to atmospheric emissions in the area, as the town of Harrismith is known for its industry. The Hardustria area also has numerous truck stops, including the largest truck stop in Africa, namely the Highway Junction truck stop, which is located approximately 780 m from the proposed site. These truck stops also contribute towards emissions in the form of vehicle

exhaust emissions and dust fallout. Therefore, it is expected that the ambient air quality of Harrismith is not in a good condition.

“Particulate and gaseous emissions generated during the production of bitumen emulsion mainly originate from diesel burners that are used to keep the bitumen warm in the hot storage tanks. VOCs are released from the hot storage tanks through “breathing losses” (uMoya-Nilu Consulting 2019). Gaseous pollutant emissions are SO₂, NO_x, CO, and VOCs.” However, according to the Atmospheric Impact Report, the impact of modelled concentrations of these emissions are well below the national health-based ambient air quality standards and guidelines (uMoya-Nilu Consulting 2019).

These surrounding activities also contribute to noise in the area. The noise of the Emulsion Plant itself is expected to be low. There are also no residential areas within close proximity of the site and therefore the overall impact of noise is expected to be low.

2.8 Cultural Heritage and Archaeology and Palaeontology

No physical signs of any buildings older than 60 years or any archaeological remains were observed on site. According to the HIA “any surface signs of archaeological remains of any era on the proposed site for the emulsion plant would have been obliterated by the clearing of the natural vegetation and installation of electrical, water and sewerage infrastructure for this suburb.” Also, the literature research did not indicate that any activities took place on the property prior to the establishment of the industrial suburb (Philip 2020). Furthermore, no fossiliferous outcrop was found in the proposed site and the overall palaeontological sensitivity is considered to be low (Butler 2020).

Refer to the HIA and PIA in **Annexure 5**.

2.9 Aesthetics

The site is located within an industrial area and is degraded. The site is also surrounded by numerous other industries and businesses. However, the proposed site is located directly next to the N3 National Road and therefore may have a negative aesthetic impact on passing motorists.

2.10 Demographics and Regional Socio-economic Structure

The site is situated within an industrial area of the town of Harrismith, which has a total population of 27 869. Of this, 66.2% is considered to be of working age (15-64), while 28.6% of the population is young (0-14) and 5.1% is elderly (65+). The population consists of 87.1% Black Africans, followed by 10.7% Whites, 1.3% Indian/Asian, 0.8% Coloured and 0.2% Other. Only 13% of the population has a higher education and 5.3% has no schooling at all (STATS SA, 2011).

3 Public Participation

3.1 Project initiation

A Public Participation Process ("PPP") in terms of the EIA Regulations that was undertaken as part of the Scoping Phase, included the following:

- Placing site notices at the entrance to the site and on site;
- Placing adverts in the Express (25 September 2019) and the Bloem News (26 September 2019) newspapers;
- A Notification and Background Information Document ("**BID**") regarding the project were sent to all identified Interested and Affected Parties ("**I&APs**"). This included the adjacent landowners, stakeholders and relevant authorities (refer to **Annexure 3**).

A time period of 30 days was allowed for the public to register and / or send their issues and concerns regarding the Project to Turn 180 Environmental Consultants.

All authorities and registered I&AP also received a copy of the Draft Scoping Report and Final Scoping Report.

3.2 Interested and Affected Parties ("**I&AP**") / Stakeholders

Adjacent landowners, relevant stakeholders and authorities were notified of the project via written notifications and the BID. The main purpose of this is to inform the potential I&APs of the project and obtain insight into any related issues they may have.

A comments and response register will be compiled and updated to include all comments received from I&APs. This register will also record the responses from the consultants and how comments are addressed.

3.3 Authorities

The following departments and / or organs of state were consulted during the PPP:

- Thabo Mofutsanyana District Municipality;
- Maluti-A-Phofung Local Municipality;
- The Department of Economic, Small Business Development, Environmental Affairs and Tourism ("**DESTEA**");
- The Free State Heritage Authority;
- South African Heritage Resources Authority ("**SAHRA**").

- N3 Toll Concession

3.4 List of all I&AP

Table 2: List of all I&AP

Contact Person	Organisation	Contact detail
Authorities		
Ms. Takatso Lebenya (Municipal Manager)	Thabo Mofutsanyana District Municipality	Private Bag X810 Witsieshoek 9870 1 Mampoi Street Old Parliament Building Phuthaditjhaba 9869 058 718 1089/36 (Tel)
Mr. Pierre Swart (Air Quality Management)	Thabo Mofutsanyana District Municipality	Private Bag X810 Witsieshoek 9870 1 Mampoi Street Old Parliament Building Phuthaditjhaba 9869 058 718 1089/36 (Tel) 084 513 3100 (Cell)
Robert Tsupa (Municipal Manager)	Maluti -A-Phofung Local Municipality	Private Bag X805 Witsieshoek 9870 Cnr Moremoholo & Motloun Streets Setsing Complex Phuthaditjhaba 9869 058 718 3700 (Tel)
Ward Councillor (Ward 6)	Maluti -A-Phofung Local Municipality	Private Bag X805 Witsieshoek 9870 Cnr Moremoholo & Motloun Streets Setsing Complex Phuthaditjhaba 9869 058 718 3700 (Tel)
Ms Nthabaleng Mohase Mr. David Mofokeng	Department of Economic, Small Business Development, Tourism and Environmental Affairs (Air Quality)	Private Bag X20801 Bloemfontein 9300 113 St. Andrews Street Bloemfontein 9301 051 400 4812 (Tel)

Ms. G. Mkhosana Ms. Boipelo Mogorosi	Department of Economic, Small Business Development, Tourism and Environmental Affairs	Private Bag X20801 Bloemfontein 9300 113 St. Andrews Street Bloemfontein 9301 051 400 4812 (Tel) mkhosana@destea.gov.za (E-mail) mogorosib@destea.gov.za (E-mail)
Ms. Ragna Redelstorff	SAHRA	021 462 4502 (Tel) P.O. Box 4637 Cape Town 8000 rredelstorff@sahra.org.za (E-mail)
Ragna Redelstorff	SAHRA	021 462 4502 (Tel) P.O. Box 4637 Cape Town 8000
Ms. L. Philip	Free State Heritage Authority	078 448 9307 (Cell) 051 447 9609 (Tel) National Museum 36 Aliwal Street Bloemfontein 9301 loudinep@gmail.com loudine.philip@nasmus.co.za (E-mail)
Mr Anesh Madanlal (Manager)	N3 Toll Concession	PO Box 1052 Harrismith 9880 Bergview Complex, Warden Street Harrismith 9880 058 623 0860 (Tel) aneshm@n3tc.co.za (E-mail)
Adjacent Landowners and Stakeholders		
Maxipres Mr. Barry Arndt	Erf 1555	16 Nywerheids Road Hardustria Harrismith 9880 079 868 1413 (C) williamh@bridgestone.co.za (E-mail)
Mr. Willie Richards	Erf 2441	19 Nywerheids Road Hardustria Harrismith 9880 072 196 4506 (C)

		Harrismithra247@gmail.com (E-mail)
Capstone Seeds SA Mr. Hennie de Winnaar	Erf 1593	21 Nywerheids Road Hardustria Harrismith 9880 033 330 4474 (T) hennie@capstoneseeds.com (E-mail)
Shiptech	Erf 1594 Erf 1596	23 Nywerheids Road Hardustria Harrismith 9880 073 150 2648 (C) jacques@shiptech.co.za (E-mail)
Mr. Steven Gottschalk (landowner) Mr. Guy Nicolson (Consultant acting on behalf of landowner)	Erf 4919 (Erf 1556, Erf 1557, Erf 1558)	147 North Reef Road Bedfordview 2008 011 929 6819 (T) 082 411 4980 (C) (Mr. Gottschalk) 082 772 9941 (C) (Mr. Nicolson) steveng@value.co.za (E-mail) guyn@saol.com (E-mail)
GSF	Erf 1561 Erf 1562	28 Nywerheids Road Hardustria Harrismith 9880 082 327 3383 (C) merkitemba@gmail.com (E-mail)
Mr. Mano Padiyachy (Tenant of property) Mr. Guy Nicolson (Consultant acting on behalf of landowner) Mr. Steven Gottschalk (landowner)	Portion 1 of erf 1913	10 Essex Street Tunney Industrial Elandsfontein manop@value.co.za (E-mail) RikaK@value.co.za (E-mail) 147 North Reef Road Bedfordview 2008 011 929 6819 (T) 082 411 4980 (C) (Mr. Gottschalk) 082 772 9941 (C) (Mr. Nicolson) steveng@value.co.za (E-mail) guyn@saol.com (E-mail)

The I&AP list with the manner of notification and comments is also attached in **Annexure 3**.

3.5 Summary of Comments and Responses

3.5.1 Comments and Concerns received from I&AP

- Ms. Nthabaleng Mohase from DESTEA informed Turn 180 that the District Municipality does not have an official to handle the Atmospheric Emission License (“**AEL**”) application. Therefore, the AEL application must be submitted to province (DESTEA). After receiving the Draft Scoping Report, Ms. Mohase indicated that all future reports should be submitted to Mr. David Mofokeng.
- SAHRA indicated that they will await the Heritage Impact Assessment (“**HIA**”) and the Paleontological Impact Assessment (“**PIA**”) to be submitted before providing a final comment. They indicated that a field-based PIA is required as the proposed area falls within an area of very high palaeontological sensitivity.
- Mr. Madanlal asked that the N3 Toll Concession be registered as an Interested and Affected Party.

He had the following comments:

- Provide intended detail of access on to the N3 and impact of traffic on the N3.
- Provide a Traffic Impact Assessment.
- Impact of dust on the N3
- Impact of lighting on the adjacent N3 traffic.
- Impact of Emissions/smoke on the safety of the road user on the N3 taking cognisance of change in prevailing wind.
- Impact of fire hazard
- Impact of Spillage of hazardous materials on environment and N3TC road reserve.
- Impact of potential widening of the N3 Road Reserve to accommodate a future Van Reenen Development Project as identified by the Minister of Transport in 2017.
- Acceptance of storm water runoff from the N3.
- Building line restriction, both SANRAL and municipal requirements
- Impact of security and boundary wall/fence. N3TC / SANRAL will not be responsible for maintenance / accident damage.

- Mr. de Winnaar commented that Capstone Seeds is a company that distributes seeds to farmers for the planting of crops. They are concerned about the danger air emissions from the proposed plant holds for their products and their personnel.
- Mr. Gottschalk is concerned about the impact that the proposed development will have on the value of the properties, as well as future development.
- Mr. Padiyachy is concerned about the impact of the proposed plant on the health of their employees.
- Mr. Nicolson also commented that there is a concern that the proposed plant will reduce the value of the property and the viability of the property's intended use.
- Mr. Forbes asked to be registered as an Interested and Affected Party. Mr. Forbes also noted that Turn 180 did not respond directly to Mr. Nicolson's comment of the impact on the value of adjacent properties. Mr. Forbes also commented that the Final Scoping Report does not shed any more light on the town planning aspects of the proposal.
 - When the special consent for a non-primary land use is to be sought,
 - By whom, and their contact details,
 - The contact details of the planning department responsible for Harrismith within the Matutia-a-Phofung Municipality with whom the special consent application has been, or is to be, lodged.

3.5.2 Feedback on Comments and Concerns from I&AP

- The AEL application will be submitted to DESTEA.
- A HIA and PIA will be included in the EIA phase of the project and the EIA reports will be submitted to SAHRA.
- Turn 180 confirmed that the N3 Toll Concession will be registered as an I&AP and will receive all reports. Turn 180 also responded:

- The existing access road where Nywerheids Road connects with the N3 will be used. No new access road is planned.
- The project will not have an impact on the traffic of the N3, as the site will not be directly accessed from the N3. Please refer to the previous point.
- Dust monitoring will be implemented to ensure that dust fallout does not exceed the limits. It is planned that the site be paved in the future. If dust proves to be problematic, it will be advised that the site be paved sooner.
- Lights will be placed so that they face away from the N3 to avoid having impacts on the traffic on the N3.
- An emulsion plant does not have a stack with smoke emissions. An emulsion plant is primarily a collection of storage tanks. The primary emissions associated with an emulsion plant are fugitive emissions originating from “working and breathing losses” from the storage tanks. The emissions are not to an extent that they will have an impact on traffic in terms of visibility. However, an Atmospheric Impact Assessment will be done as part of the EIA phase and will be included in the EIA reports.
- An emulsion plant has very strict safety regulations and best practices will be followed at all times during the storage of hazardous substances. The applicant has a Fire Safety Management Plan that will be included in the Scoping and EIA reports.
- Best practices will be followed at all times for the storage of hazardous substances. All potentially hazardous substances will be stored in a bunded area with an impermeable surface that can contain 110% of the volume of the substance. If any spills of hazardous substances occur, these spills will be cleaned

- immediately by disposing of the contaminated soil as hazardous waste. Tanks will be inspected regularly for leaks and if any are found, they will be fixed immediately.
- Could you perhaps provide us with more information on the potential widening of the N3 Road Reserve to accommodate a future Van Reenen Development Project as identified by the Minister of Transport in 2017?
 - Storm water management measures in the form of berms and/or culverts will be constructed around the site to divert clean storm water originating from the N3 road around the site into natural drainage lines.
 - A surveyor was appointed to delineate the site according to the Title Deed.
 - The site will be surrounded by a 2.5 to 3 m tall wall. This will reduce the visual impact of the plant and also provide security. A security guard will also be present on site, especially during night time.
- Turn 180 responded with the following to Mr. de Winnaar's comments:
 - The developer will make health, safety and environmental aspects a priority during the construction and operational phases of the project.
 - Best practices will be followed at all times for the storage of hazardous substances.
 - The developer will implement measures to reduce the visual impacts of the plant. A wall of 2.5 to 3 m high will be built around the site. If necessary, other measures such as planting trees along the wall will be investigated.
 - It should be noted that an Emulsion Plant does not have a stack that releases smoke into the atmosphere. An Emulsion Plant is essentially a collection of tanks that stores, heats and mixes bitumen emulsion, a substance that is used during road surfacing. The only emissions associated with an Emulsion Plant are fugitive emissions due to breathing and working losses originating from the tanks that heat the bitumen.
 - An Atmospheric Impact Assessment will be conducted as part of the EIA phase of the project in order to assess the possible impacts, including health impacts, of the plant.
 - The specialist conducting this assessment was also notified of your concern regarding the impact on your seeds and they will investigate this.
 - A Dust Fallout Monitoring Programme will also be implemented if dust generation proves to be problematic. This programme will be implemented up until the site and all roads are paved.

- All potential impacts of the proposed development, along with mitigation and management measures for these impacts, will be discussed in detail in the Scoping and EIA Reports for the project.
- Turn 180 responded to Mr. Gottschalk's comments with the following:
 - The developer will make health, safety and environmental aspects a priority during the construction and operational phases of the project.
 - Best practices will be followed at all times for the storage of hazardous substances.
 - The developer will implement measures to reduce the visual impacts of the plant. A wall of 2.5 to 3 m high will be built around the site. If necessary, other measures such as planting trees along the wall will be investigated. - It should be noted that an Emulsion Plant does not have a stack that releases smoke into the atmosphere. An Emulsion Plant is essentially a collection of tanks that stores, heats and mixes bitumen emulsion, a substance that is used during road surfacing. The only emissions associated with an Emulsion Plant are fugitive emissions due to breathing and working losses originating from the tanks that heat the bitumen.
 - An Atmospheric Impact Assessment will be conducted as part of the EIA phase of the project in order to assess the possible impacts, including health impacts, of the plant.
 - A Dust Fallout Monitoring Programme will also be implemented if dust generation proves to be problematic. This programme will be implemented up until the site and all roads are paved.
 - All potential impacts of the proposed development, along with mitigation and management measures for these impacts, will be discussed in detail in the Scoping and EIA Reports for the project.
- Turn 180 responded to Mr. Padiyachy's and Mr. Nicolson's comments with the following:
 - The developer will make health, safety and environmental aspects a priority during the construction and operational phases of the project.
 - Best practices will be followed at all times for the storage of hazardous substances.
 - The developer will implement measures to reduce the visual impacts of the plant. A wall of 2.5 to 3 m high will be built around the site. If necessary, other measures such as planting trees along the wall will be investigated. - It should be noted that an Emulsion Plant does not have a stack that releases smoke into the atmosphere. An Emulsion Plant is essentially a collection of tanks that stores, heats and mixes bitumen emulsion, a substance that is used during road surfacing. The only

- emissions associated with an Emulsion Plant are fugitive emissions due to breathing and working losses originating from the tanks that heat the bitumen.
- An Atmospheric Impact Assessment will be conducted as part of the EIA phase of the project in order to assess the possible impacts, including health impacts, of the plant.
 - A Dust Fallout Monitoring Programme will also be implemented if dust generation proves to be problematic. This programme will be implemented up until the site and all roads are paved.
 - - All potential impacts of the proposed development, along with mitigation and management measures for these impacts, will be discussed in detail in the Scoping and EIA Reports for the project.
- Turn 180 responded to Mr. Forbes' comments with the following:
 - Mr. Nicolson's comment regarding the impact on the value of adjacent properties has been noted. However, this is seen as an issue that relates more to the Town Planning side of the project. The Town Planners for the project have been notified about this comment as an application for rezoning will be made.
 - It should be noted that the property for the proposed project does fall within an industrial area.
 - However, we attempted to respond to Mr. Nicolson's comment by addressing measures of how aesthetic impacts will be reduced, as this may be related to the impact on property values.
 - Turn 180 also responded by stating that they do not handle the town planning aspects of the project and therefore it was not discussed in the Scoping Report. Turn 180 deals with the Environmental aspects. Mr. Forbes' comments have been forwarded to the Town Planners for this project.

4 Motivation for the Proposed Project

The Emulsion Plant produces bitumen emulsion for use in tarring of roads and is therefore very important for construction and rehabilitation of roads. This benefits society directly by improving access and connectivity for communities and businesses. It would also benefit society by providing local people with jobs. The site is located in a favourable position, as Harrismith is located at a major junction of the N5 National Road and the N3 National Road, which ensures mobility in all directions. It is also located relatively close to the export harbour at Durban (SANEC

2012), from which the applicant receives their raw bitumen which is used in the emulsion production process.

It is estimated that the project will have an approximate capital value of R10 245 000 upon completion. Approximately 10 new employment opportunities will be created by the establishment of the Emulsion Plant, namely 1 Plant Supervisor, 1 Plant Operator, 1 Clerk (weigh bridge, admin, sales, stock), 1 Clerk (debtors and creditors), 2 Skilled Labourers, 2 Unskilled Labourers, 1 Domestic Cleaner and 1 Fork Lift Operator.

The Project will benefit society in that:

- Job opportunities for local people will be created (at least 10 new jobs as indicated above).
- Upgrading/construction of roads will improve access and connectivity for communities and businesses.
- The project will have a positive impact on Harrismith's economy.

Negative aspects associated with the Project include the following:

- The Emulsion Plant may have a negative aesthetic impact on adjacent landowners and passing motorists using the N3 National Road. However, it should be noted that the proposed site is located in an industrial area and is already degraded.
- The Emulsion Plant may release some emissions into the atmosphere, which will have an impact on ambient air quality. However, an Atmospheric Impact Assessment will be conducted as part of the EIA phase.
- Increased levels of dust and noise may occur during transportation of materials and the product. However, these impacts are expected to be low, as all roads are paved, and the site will be overlain with gravel initially and then paved later on. Operational activities will also only take place during normal working hours.

5 Legal Requirements

The aim of this section is to provide an overview of the legal framework and administrative requirements applicable to the licensing of the activity to ensure compliance with environmental legislation.

5.1 Aspects that were assessed as part of the Environmental Impact Assessment Process.

- The identification of threatened as well as alien plant species on site.
- Identification of any possible watercourses on the site.
- Identification of any sensitive natural areas on site.
- Identification of any heritage areas or artefacts on site.
- The storage of general and hazardous waste.
- Determination of air quality and the impact of emissions on the ambient air quality.

- **NEMA:**

A S&EIR process must be followed in terms of the 2014 EIA Regulations as amended in 2017 and in terms of the 2013 NEM: AQA Regulations. The following activities are being applied for:

Number and date of the relevant notice	Activity No(s) in terms of the relevant notice	Description of each listed activity
GN. R. 893 of the NEM: AQA 2013 Regulations	Category 2 Subcategory 2.4	Category 2: Subcategory 2.4: Storage and Handling of Petroleum Products: <i>"All permanent immobile liquid storage facilities at a single site with a combined storage capacity of greater than 1000 cubic meters."</i>
GN. R. 893 of the NEM: AQA 2013 Regulations	Category 5 Subcategory 5.10	Category 5: Mineral Processing, Storage and Handling, Subcategory 5.10: Macadam Preparation - <i>"Permanent facilities used for mixtures of aggregate; tar or bitumen to produce road-surfacing materials."</i>
GN. R. 325 7 April 2017	Activity 4	<i>"The development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres."</i>
GN. R. 325 7 April 2017	Activity 6	<i>"The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent."</i>

- **National Heritage Resources Act ("NHRA"):**

The site has not been given any formal protection by the SAHRA or the Free State Heritage Authority under the NHRA. Heritage and Paleontological Impact Assessments were conducted by specialists as part of the EIA process and are included in **Annexure 5**.

6 Consideration of Alternatives

Two site alternatives were considered and weighed up against each other during the study which included the following:

6.1 Site Alternatives

6.1.1 Preferred Alternative: Erf 1559

Site Coordinates:

Property description	Coordinates	
	Latitude	Longitude
Hardustria, erf 1559	28°17'46.80"S	29° 8'15.25"E

The proposed property has an extent of 0.74 ha and is located in the Hardustria industrial area in Harrismith. The proposed site is currently vacant and not being used for anything. It is situated within an industrial area and zoned as "General Industrial". The applicant also has permission to utilise this site from the landowner

Positive attributes of the preferred site for the establishment of an emulsion plant:

- The proposed site is already transformed and disturbed by numerous activities on site and in the surrounding area. A portion of the site is transformed by heavy vehicles using it as a turning point and rubbish dumping is also present on site. The site is also located adjacent to communal grazing land and it was observed that overgrazing by domestic stock does occur on site.
- The proposed site is also located within an industrial area and numerous other industrial activities occur in the surrounding area.
- There are no watercourses or other sensitive environmental features located on, or within close proximity to the proposed site. The nearest watercourse is the Wilge River which is located approximately 1.3 km from the site.
- The site falls within the Eastern Free State Sandy Grassland (Gm 4) vegetation type, which is classified as Least Concern according to the National List of Threatened Ecosystems (Notice 1477 of 2009) (National Environmental Management Biodiversity Act, 2004).
- According to the Ecological Assessment (refer to **Annexure 5**) the conservation value of the site is considered to be low.

- No rare or threatened species were observed on site during the Ecological Assessment and it is unlikely that such species would occur on site
- The proposed site is not located close to any residential areas.
- The site has low palaeontological significance and no surface evidence of archaeological remains were observed (refer to the HIA and PIA in **Annexure 5**).

Negative attributes of the preferred site for the establishment of an emulsion plant:

- Two protected geophytic species, *Asclepias gibba* and *A. multicaulis* were observed on site (Van Rensburg 2020).
- There are drainage lines in the surrounding area and runoff from site will follow the gradual slope of the site and these drainage lines towards the Wilge River (Van Rensburg 2020).
- The proposed site is located directly next to the N3 National Road, which may have a negative visual impact on passing motorists.



Figure 10 Map indicating the locality of erf 1559 (preferred site), Harrismith, Free State.

6.1.2 Alternative 1: Erf 1560

Site Coordinates:

Property description	Coordinates	
	Latitude	Longitude
Hardustria, Erf 1560	28°17'48.52"S	29° 8'17.34"E

This alternative is also located in the Hardustria industrial area of Harrismith, directly next to the proposed site. The site has an approximate extent of 0.71 ha.

Positive attributes of the alternative site 1 for the establishment of an emulsion plant:

- The site falls within the Eastern Free State Sandy Grassland (Gm 4) vegetation type, which is classified as Least Concern according to the National List of Threatened Ecosystems (Notice 1477 of 2009) (National Environmental Management Biodiversity Act, 2004).
- There are no watercourses or other sensitive environmental features located on, or within close proximity to the site. The nearest watercourse is the Wilge River which is located approximately 1.3 km from the site.
- The alternative site is also located within an industrial area and numerous other industrial activities occur in the surrounding area.
- The alternative site is not located close to any residential areas.

Negative attributes of the alternative site 1 for the establishment of an emulsion plant:

- Even though it can be assumed that this site has the same environmental condition as the preferred site, this site has not been investigated by specialists and uncertainty regarding this matter exists.
- Impacts relating to aesthetics and noise may be greater as this site is located directly next to another business.
- The proposed site is located directly next to the N3 National Road, which may have a negative visual impact on passing motorists



Figure 11: Map indicating the locality of erf 1560 (alternative 1), Harrismith, Free State.

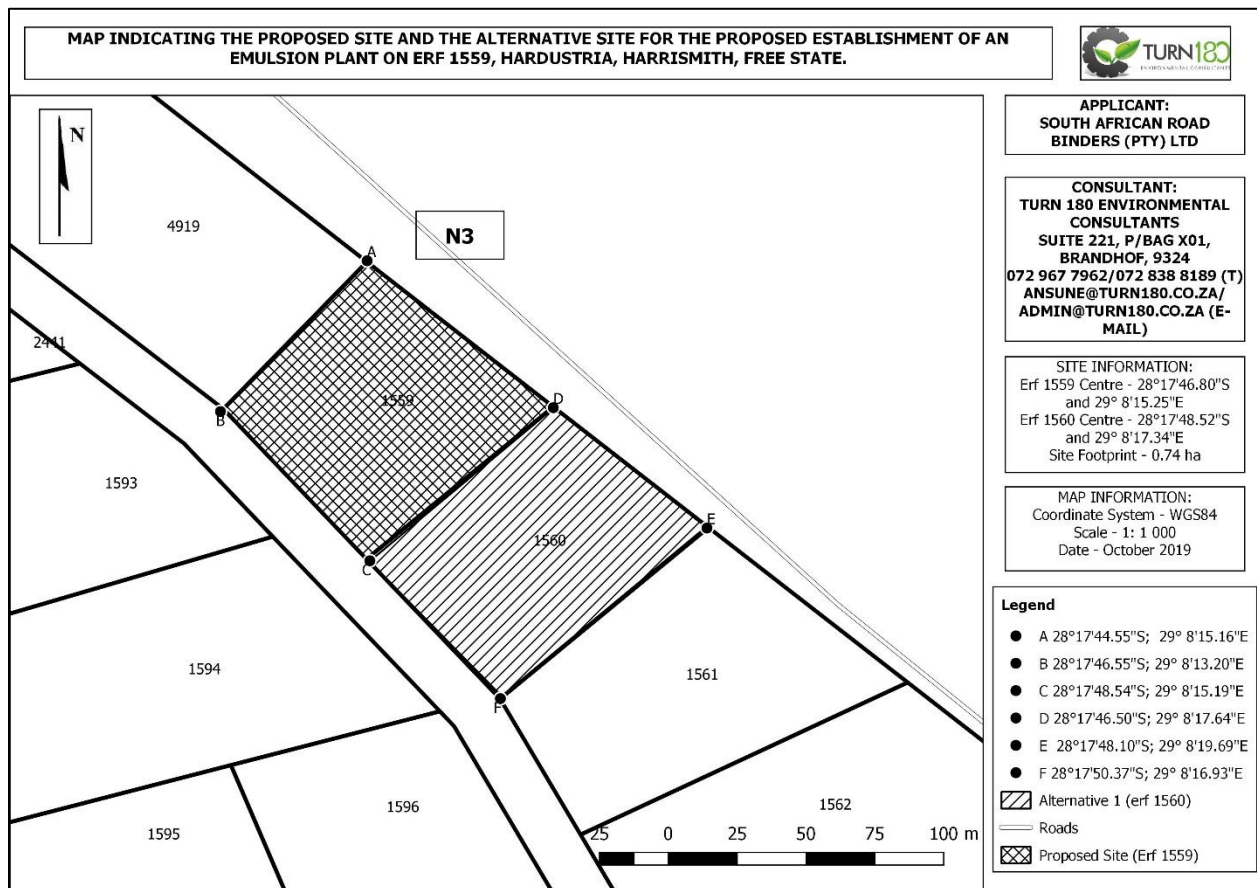


Figure 12: Map indicating the Preferred Site and Alternative 1.

6.2 Design/Layout Alternatives

There is no feasible design/layout alternative for this project that will be assessed due to the following reasons:

The applicant has extensive knowledge and experience in the operation of the Emulsion Plant and the layout of the site is usually designed in a manner to allow the most efficient and safest way of operation, storage of goods and transportation of material to and product from the plant.

Please refer to figure 13 below and the Layout Plan attached in **Annexure 2**.



Figure 13 Layout Map for the proposed project.

6.3 Technological Alternative

As far reasonably possible, the best technology will be utilised to limit and / or prevent impact on the environment. The type of tanks that will be used for the storage of goods on site will be of such nature as to minimise “breathing losses” into the atmosphere. All dangerous substances stored at the Plant will be stored in a bunded area which can contain 110% of the volume of the substance. Emissions originating from the Emulsion Plant were very low and were well below the limits set for the relevant listed activity during previous emission monitoring, when the Plant was located at a

different site. An air emission monitoring program and dust monitoring program will be implemented to verify compliance to the air emission standards in terms of the NEM:AQA. Therefore, there is no technological alternative at this time, as the latest and best technology available to the applicant is used in the Plant.

6.4 No Go Alternative

The “no-go” alternative will be considered throughout the assessment of the proposed project. If the project is not authorised, no bitumen emulsion will be produced at the site, which will result in road construction projects in the surrounding area needing to transport bitumen emulsion from somewhere else. This will increase the cost of repairing the roads in the area in future. No new job opportunities will be created by leaving the site vacant, which won't benefit the economy of the area.

7 Project description

7.1 Emulsion production

The development will entail the establishment of an Emulsion Plant. Bitumen emulsion, that is produced during the operational phase of the proposed Plant, will be sold commercially for road construction projects involving the construction and repair of public roads or will be used by the applicant for their own road construction projects.

The basic operation includes raw bitumen being pumped into a Polymer Modifier Plant where polymer is added to the bitumen. The addition of polymers improves the paving properties of bitumen, making it more suitable to handle high stress. The finished product gets pumped into hot storage tanks. In chemical mixing tanks, water, emulsifiers, chemicals and additives are mixed. The hot bitumen (140°C) and the prepared “soap” are both pumped into the Emulsion Plant or colloid mill where they get mixed. The finished bitumen emulsion is pumped into storage tanks. (Please refer to figure 2 below for a diagram indicating the basic process of the Emulsion Plant).

The Emulsion Plant will operate approximately 12 hours a day, 300 days per year. Raw materials that can be used to produce the emulsion mix may include raw bitumen, Vinex powder (emulsifier), caustic soda flakes, EM44 (emulsifier), 33.3 % hydrochloric acid, paraffin, E11 (emulsifier), Indulin Latex, Alvaloy Polymer and water. The products resulting from this process are different bitumen emulsions that include SS60, CAT65, MC30, PRECOAT, S-E1 and A-E2. In total, approximately 16 tons of bitumen emulsion (any type) is produced per hour.

Specific processes for these products:

SS60 @ 10 ton/h

Bitumen goes from hot storage (@140°C) to the mill inside the plant (@5900 litre/h). Inside the mill, it gets mixed with water (4100 litre/h) and 1% Vinex and Caustic Soda dilution 320 kg/h. Bitumen gets shredded and emulsified and then stored in cold storage ready to send to site.

CAT65 @ 6 ton/h

Bitumen goes from hot storage (@140°C) to the mill inside the plant (@ 3870 litre/h) Inside the mill, it gets mixed with water (2130 litre/h) and EM44 (@18kg/h) and hydrochloric acid (@18kg/h). Bitumen gets shredded and emulsified and then stored in cold storage ready to send to site.

S-E1

Mix containing bitumen (28 tons) and 500kg of Alvaloy polymer.

A-E2

Mix containing bitumen (29 tons) and 725kg Alvaloy polymer.

PRECOAT

Mix containing bitumen 15.636 tons and paraffin 11.250 tons, diesel 3.003 tons and EM44 165kg.

MC30

Mix containing bitumen 21.150 tons and paraffin 8.856 tons.

Some other products also get made as the demand requires and these include CAT70, PRIME and ACE2. The Emulsion Plant will have the capacity to store approximately a total of 1 102 000 L of dangerous substances. This will include 816 000 L Raw Bitumen, 9000 L Diesel, 23 000 L Paraffin and 254 000 L Bitumen Emulsion. Approximately 5 tons of Caustic Soda and 5000 L of Hydrochloric Acid will also be stored on site.

Some emissions are generated during the production of bitumen emulsion. The primary fugitive emission sources for the Emulsion Plant operations include storage tanks containing hot bitumen, diesel storage tanks, paraffin storage tanks and diesel burners. Key emissions include NO_x, SO₂, CO and Volatile Organic Compounds (VOCs). However, these emissions are very low and were

well below the limits set for the listed activity 5.10: Macadam Preparation for the previous emission monitoring conducted on the plant when it was located at a different site. Nonetheless, an air emission monitoring program will be implemented to verify compliance with the air emission standards in terms of the NEM:AQA.

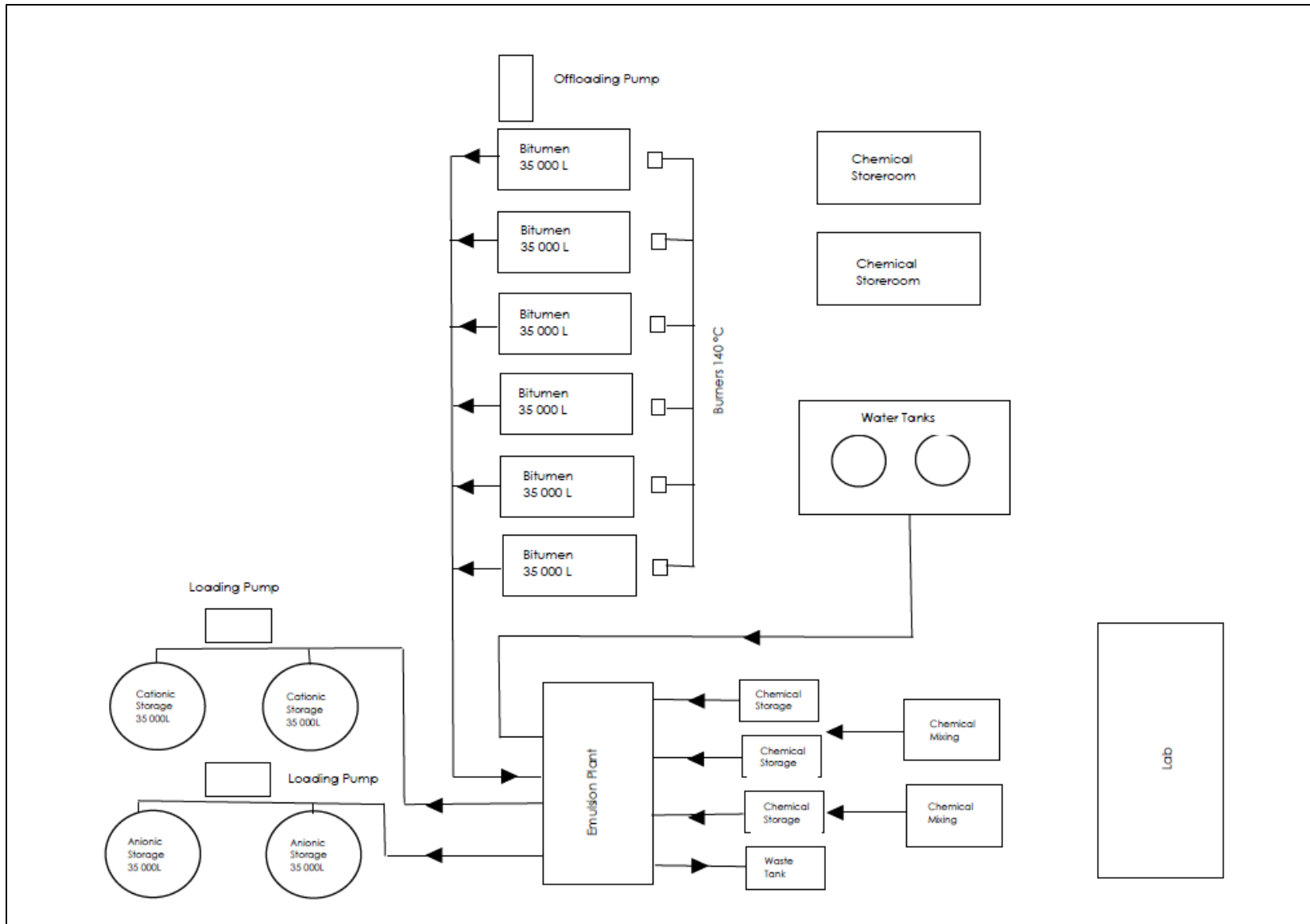


Figure 14: Basic process flow diagram for the Emulsion Plant.

8 Environmental Impact Assessment

8.1 Assessment Methodology

The main objective of the EIA process will be to assess and quantify the potential impacts that were identified by the project team, specialists and I&AP during the Scoping Phase.

The concept of "significance" is at the core of impact identification, evaluation and decision-making during the EIA process and can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. intensity, duration and likelihood), while impact significance is the value placed on the change by different affected parties (i.e. level of acceptability) (DEAT, 2002).

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

Environmental Significance = Overall Consequence x Overall Likelihood

8.1.1 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.

8.1.1.1 Determination of Severity

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

Table 3: 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 /	Intolerable / Sporadic complaints	Unacceptable / Widespread complaints	Totally unacceptable

Type of criteria	Rating				
	1	2	3	4	5
		Possible objections			/ 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

8.1.1.2. 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 4: Rating of Duration

Rating	Description
1: Low	One month
2: Low-Moderate	Between 1 and 3 months (Quarter)
3: Moderate	3 months to 1 year
4: Moderate-High	1 to 10 years

Rating	Description
5: High	More than 10 years

8.1.1.3. Determination of Extent/Spatial Scale

Extent refers to the spatial influence of an impact. It will be: a) limited to the site and its immediate surroundings; b) extending to the surrounding local area, c) regional (will have an impact on the region) c) national (will have an impact on a national scale); or d) or international (impact across international borders).

Table 5: Rating of Extent

Rating	Description
1: Low	Immediate, fully contained area
2: Low-Moderate	Surrounding area
3: Moderate	Regional
4: Moderate-High	National
5: High	International

8.1.1.4. Determination of Overall Consequence

Overall consequence is determined by adding the factors determined above and summarised below, and then dividing the sum by 3.

Table 6: Example of calculating Overall Consequence.

Consequence	Rating
Severity	Example 4
Duration	Example 2
Extent	Example 4
SUBTOTAL	10
TOTAL CONSEQUENCE:(Subtotal divided by 3)	3.3

8.1.2. Determination of 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.

8.1.2.1. Determination of Frequency

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

Table 7: Rating of Frequency

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

8.1.2.2. Determination of Probability

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

Table 8: Rating of Probability

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

8.1.2.3. Determination of Overall Likelihood

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

Table 9: Example of calculating the Overall Likelihood.

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

8.1.3. Determination of Overall Environmental Significance

8.1.3.1. Quantitative description or magnitude of 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-MODERATE, MODERATE, MODERATE-HIGH or HIGH, as shown in the table below.

Table 10: 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

8.1.3.2. 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 11: 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 I&AP.	Impact is real and substantial in relation to other impacts. Pose a risk to the I&AP. Unacceptable.	Impact is of the highest order possible. Unacceptable. Fatal flaw.
Action Required	Maintain current management	Maintain current	Implement monitoring. Investigate	Improve management	Implement significant mitigation

Significance	Low	Low-Moderate	Moderate	Moderate-High	High
	ent measures. Where possible improve.	management measures. Implement monitoring and evaluate to determine potential increase in risk. Where possible improve	mitigation measures and improve management measures to reduce risk, where possible.	measures to reduce risk.	measures or implement alternatives.

8.2. Environmental Impact Assessment

8.1.2 Geology and Soil

The following impacts may occur on the soil as a result of the construction and operational phase of the activity:

- Loss of topsoil during construction,
- A change in soil characteristics as a result of the disturbance of the soil,
- Contamination of soil due to spillage, leakage of storage tanks and pollution.

It should be noted that there will be no impact on geology, as the development will not involve any blasting or deep excavation

1. Loss of topsoil								
Erf 1559 (Preferred Alternative)								
Potential Impact Description:	During the initial stages of vegetation clearance, removal of topsoil and levelling of site, some topsoil may be lost due to incorrect storage thereof or wind and/or water erosion.							
Duration of Impact:	During the construction phase.							
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	3	1	2.33	2	1	1,5	3.495
With Mitigation	2	1	1	1.33	1	1	1	1.33
Mitigation Measures	<ul style="list-style-type: none"> • Topsoil that is removed should be stockpiled to be used for levelling and in gardens. • No topsoil may be used for construction purposes. • Clearance of the site and removal of topsoil will be limited to the area under construction. • Appropriate storm water management measures should be implemented in order to avoid erosion. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	No impact							

With Mitigation	No impact
Mitigation Measures	None
Alternative 1 – Erf 1560	
Impacts on loss of topsoil will be the same as for the Preferred Alternative.	
Can the Impact be reversed	Yes, the impact can be reversed. However, it is highly unlikely that the impact will have a significant effect on topsoil loss with or without mitigation. The reversing of topsoil loss involves the sourcing of topsoil from other areas.
Will the impact cause irreplaceable loss of resource	No, topsoil can be sourced from various sources at high expense. If mitigation measures are followed correctly it is anticipated that there will be a minimal to insignificant loss of topsoil during construction.
Cumulative Impacts	None

2. Change in soil characteristics as a result of disturbance of the soil								
Erf 1559 (Preferred Alternative)								
Potential Impact Description:	Construction activities and movement of construction vehicles can lead to compaction of soil, which can cause changes to the natural storm water drainage patterns and water infiltration rates. The construction of an impermeable material over the soil (paving and concrete) can remove an area's ability to support vegetation and can also damage the natural drainage characteristics.							
Duration of Impact:	During construction and operational phases							
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	3	2	2.66	4	4	4	10.64
With Mitigation	2	1	1	1.33	2	4	3	3.99

Mitigation Measures	<ul style="list-style-type: none"> • Implement appropriate storm water management measures to compensate for the removal of the area's natural drainage patterns. It should be noted that a culvert that runs underneath the N3 National Road drains into the proposed site. Therefore, storm water management measures are essential. • Keep the footprint of the site as small as practicable possible in order to limit the impact. • Topsoil stockpiles should be kept small in order to prevent compaction of stored topsoil. 							
Operational Phase								
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	4	3	2	3	4	5	4.5	13.5
With Mitigation	2	1	1	1.33	3	3	3	3.99
Mitigation Measures	<ul style="list-style-type: none"> • Maintain appropriate storm water management measures that were implemented during construction to compensate for the removal of the area's natural drainage patterns. • Keep the footprint of the site as small as practicable possible in order to limit the impact – no extension of the initial site footprint. 							
Alternative 1 – Erf 1560								
Impacts on changes in soil characteristics will be the same as for the Preferred Alternative.								
Can the impact be reversed	No. Soil compaction and change in natural drainage patterns cannot be avoided during construction and operation of this development. However, the impact can be kept Low if the correct mitigation and management measures are followed. If rehabilitation occurs, then this impact may be reversed. However, it is not anticipated that this development will be decommissioned and rehabilitated.							
Will the impact cause irreplaceable loss of resource	No. It is not anticipated that this development will lead to significant loss of soil. However, it will lead to changes in the soil characteristics (compaction of soil and changes in drainage patterns).							
Cumulative Impacts	Changes in the natural drainage patterns of this site can lead to changes in the drainage patterns of the entire area.							

3. Contamination of soil								
Erf 1559 (Preferred Alternative)								
Potential Impact Description:	During construction, construction vehicles and/or machinery can have leaks of petrochemical substances which can contaminate the soil. During operation, the Emulsion Plant will store a large amount of hazardous substances in the form of diesel, paraffin and bitumen. These tanks can leak and contaminate the soil.							
Duration of Impact:	During the construction and operational phases							
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	2	1	2	3	4	3.5	7
With Mitigation	2	1	1	1.33	2	4	3	3.99
Mitigation Measures	<ul style="list-style-type: none"> • Spillages of petrochemical substances will be cleaned immediately, and the contaminated soil will be disposed of as hazardous waste. • Drip trays will be placed underneath immobile construction vehicles and/or machinery. • Vehicles and construction machinery will be serviced regularly. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	4	3	2	3	3	5	4	12
With Mitigation	2	2	1	1.66	2	5	3.5	5.81
Mitigation Measures	<ul style="list-style-type: none"> • Spillages of petrochemical substances will be cleaned immediately, and the contaminated soil will be disposed of as hazardous waste. • Potentially hazardous substances will be stored inside a bunded area with an impermeable surface which has the capacity to store more than 110% of the volume of the substance. • Tanks will be inspected for leaks regularly. If leaks are recorded, they will be repaired. 							
Alternative 1 – Erf 1560								

Impacts on contamination of soil will be the same as for the Preferred Alternative.	
Can the impact be reversed	Yes. If contamination of soil occurs, it can be reversed by the correct cleaning procedures.
Will the impact cause irreplaceable loss of resource	No. It is not anticipated that this development will lead to significant loss of soil. However, it can lead to contamination of soil. However, if the correct mitigation and management measures are followed this impact can be kept Low – Moderate.
Cumulative Impacts	There are other industrial activities in the area which can also contribute to soil contamination. This activity can therefore contribute to an already worsening soil quality in the area.

Summary of impacts for the Preferred Alternative (Erf 1559)				
	Construction		Operational	
Potential Impacts	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
1. Loss of topsoil.	3.495	1.33	None	None
2. Change in soil characteristics as a result of disturbance of the soil.	10.64	3.99	13.5	3.99
3. Contamination of soil.	7	3.99	12	5.81
Grand Average Total:	7.045 (Low - Moderate)	3.10 (Low)	12.75 (Moderate)	4.9 (Low)
The overall environmental significance indicates that the impact on Soil and Geology will be LOW during the construction phase and the operational phase with mitigation.				

Note that the development will require the site to be cleared of vegetation, topsoil to be removed and the site to be levelled. An Emulsion Plant will then be constructed on the site. It is not anticipated that this development will undergo decommissioning and/or closure and that the site will be rehabilitated. Therefore, this development is permanent and will have an impact on soil. There will be no impact on geology, as no deep excavations of blasting will occur.

Anticipated impacts of this development on Soil and Geology include loss of topsoil, changes in the characteristics of the soil and contamination of soil.

The impact of loss of topsoil is expected to be LOW during the construction phase (with and without mitigation), with no expected impact during the operational phase. The impact is expected to be LOW because minimal topsoil will be removed during construction. Topsoil which is removed will be stockpiled and returned during levelling and/or used in gardens. Storm water management measures will be implemented in order to avoid erosion and consequent loss of soil. No topsoil will be removed again during the operational phase.

The impact of changes in the soil characteristics is expected to be LOW during the construction and operational phases with the correct mitigation and management measures. Without mitigation this impact will be MODERATE during both phases, due to the area of soil which will be compacted and sealed (due to paving and concrete). Also, there is a culvert that runs underneath the N3 National Road and which drains into the proposed site. Therefore, it is important that the footprint of the site be kept as small as practicable possible in order to limit the impact and that storm water management measures are implemented and maintained in order to compensate for the removal of the natural drainage patterns and to divert the storm water from the culvert around the operational area.

The impact of contamination of soil is expected to have a rating of LOW during the construction phase and a rating of LOW – MODERATE during the operational phase, with the correct mitigation and management measures. The impact during the operational phase is expected to be higher due to the storage of a large amount of hazardous substances in the form of diesel, paraffin and bitumen. These storage tanks have the potential to leak and contaminate the soil. However, if the correct mitigation and management measures are followed, this impact can be reduced from MODERATE, without mitigation, to LOW – MODERATE.

The impacts on Soil and Geology will be the same for Alternative 1. The Alternative 1 site is located directly adjacent to the Preferred site on erf 1560 and is expected to have the same environmental features relating to Soil and Geology. The same activities will be conducted on Alternative 1 as will be conducted on the Preferred Alternative.

As mentioned earlier in the report, there are no layout alternatives, as the applicant has extensive knowledge and experience in the operation of the Emulsion Plant and the layout of the site is usually designed in a manner to allow the most efficient and safest way of operation, storage of goods and transportation of material to and product from the plant.

Also, as mentioned earlier, there is no feasible technological alternative because as far reasonably possible, the best technology will be utilised to limit and / or prevent impact on the environment.

The only cumulative impacts that are expected are that changes in the natural drainage patterns on site may have an impact on the drainage patterns of the entire area. Also, contamination of soil on site may add to the worsening condition of the soil in the area due to the surrounding land uses.

Proposed mitigation:

- Topsoil will be removed before construction and stockpiled appropriately and in such a manner to prevent any loss thereof. Topsoil will not be used for any construction purposes.
- Topsoil stockpiles must not exceed a height of 1.5 m.
- Soil loss through erosion will be reduced by implementing storm water management practices.
- Equipment and machinery on site will be maintained and drip trays will be used to prevent spillages of petrochemical products which may cause contamination of soil. Any hazardous substances on the site will be stored in a bunded area which consists of an impermeable floor with walls which will have the capacity to contain 110% of the volume of the substance stored therein.
- Any spills of hazardous substances will be cleaned immediately by disposing of the affected soil as hazardous waste.

8.1.3 Land Use

The following impacts may occur on the land use and characteristics of the land as a result of the construction and operational phase of the activity:

- The potential to use the land for other activities will be lost.

1. Loss of potential to use land for other activities								
	Erf 1559 (Preferred Alternative)							
Potential Impact Description:	<p>Currently the proposed site is vacant. A portion of the site is transformed by heavy vehicles using it as a turning point and rubbish dumping is also present on site. The site is also located adjacent to communal grazing land and it was observed that overgrazing by domestic stock does occur on site (Van Rensburg 2020). The planned development will take away the potential to use the land for other activities.</p> <p>However, according to the Ecological Assessment (Van Rensburg, 2019) the natural vegetation on site is degraded and transformed. Thus, the potential of the land to be used for anything else, is low.</p>							
Duration of Impact:	During the construction and operational phases							
Construction phase								
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	2	4	1	2.33	4	1	2.5	5.825
With Mitigation	1	4	1	2	4	1	2.5	5
Mitigation Measures	<ul style="list-style-type: none"> • Keep construction activities within development boundaries to limit disturbance to surrounding land use. 							
Operational Phase								
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	2	5	1	2.66	5	5	5	13.3
With Mitigation	1	5	1	2.33	4	5	4.5	10.485

Mitigation Measures	<ul style="list-style-type: none"> • Keep operational activities within development boundaries to limit disturbance to surrounding land use.
Alternative 1 – Erf 1560	
Impacts on loss of land will be the same as for the Preferred Alternative	
Can the impact be reversed	No. It is not anticipated that the development will be decommissioned, and that rehabilitation will take place. The development will be permanent.
Will the impact cause irreplaceable loss to resource	No. Even though the potential to use the land for other activities will be taken away, most likely permanently, the site is small and degraded and the impact will be small on the larger scale.
Cumulative Impacts	The development will contribute to cumulative impacts, as the surrounding area is also mostly developed.

Summary of impacts for the Preferred Alternative (Erf 1559)				
	Construction		Operational	
Potential Impacts	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
1. Loss of potential to use land for other activities.	5.825	5	13.3	10.485
Grand Average Total:	5.825 (Low-Moderate)	5 (Low-Moderate)	13.3 (Moderate)	10.485 (Moderate)

The overall environmental significance indicates that the impact on Land Use will be LOW-MODERATE during the construction phase and MODERATE during the operational phase with mitigation.

The footprint to be developed will only be 0.74 ha, which is very small. The development which will consist of an Emulsion Plant, will be a permanent development for which decommissioning, and rehabilitation is not expected. Therefore, the impact of loss of land to use for other activities is unavoidable.

The impacts on the land use will be LOW -MODERATE during the construction phase and MODERATE during the operational phase, with and without mitigation. The impact of loss of land has a relatively high impact rating as destruction of land and redevelopment thereof is unavoidable. The reasons why the land use impacts are considered MODERATE during the operational phase is because the site will be used for more than 10 years. However, it should be noted that the site is small and degraded with minimal potential to be used for other activities.

The impacts on Land Use will be the same for Alternative 1. The Alternative 1 site is located directly adjacent to the Preferred site on erf 1560 and the same activities will be conducted on Alternative 1 as will be conducted on the Preferred Alternative.

As mentioned earlier in the report, there are no layout alternatives, as the applicant has extensive knowledge and experience in the operation of the Emulsion Plant and the layout of the site is usually designed in a manner to allow the most efficient and safest way of operation, storage of goods and transportation of material to and product from the plant.

Also, as mentioned earlier, there is no feasible technological alternative because as far reasonably possible, the best technology will be utilised to limit and / or prevent impact on the environment.

There may be a cumulative impact on Land Use due to the surrounding activities.

Proposed mitigation:

- Impacts on land use is unavoidable. However, rehabilitation afterwards may restore its potential to be used for other activities.

- Construction and operation activities will only take place within the site boundary to limit disturbance.

8.1.4 Vegetation and Animal Life

The following impacts may occur on the vegetation and animal life as a result of the construction and operational phase of the activity:

- Loss of natural occurring vegetation (Eastern Free State Sandy Grassland)
- Establishment of alien invasive plant species
- Destruction of habitat and loss of animal species

1. Loss of natural occurring vegetation (Eastern Free State Sandy Grassland)								
	Erf 1559 (Preferred Alternative)							
Potential Impact Description:	The development will require the site to be cleared of vegetation. This can lead to a loss of natural occurring vegetation. However, according to the Ecological Assessment (Van Rensburg, 2019) the vegetation type is classified as Least Concern and is in a degraded and condition. Although, two protected geophytic species were identified on site. The site also falls within an Ecological Support Area 1 as per the Free State Biodiversity Management Plan (2015).							
Duration of Impact:	During construction phase							
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	5	2	3.33	3	1	2	6.66
With Mitigation	2	5	1	2.66	2	1	1.5	3.99
Mitigation Measures	<ul style="list-style-type: none"> • Obtain the necessary permits to remove all identified protected species before construction. • Clearance of vegetation will be limited to the area under construction. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	No Impact							
With Mitigation	No Impact							
Mitigation Measures	There will be no further impact on natural occurring vegetation during the operational phase, as the entire site will be completely cleared and overlain with gravel/paved during construction. The surrounding area is also mostly developed and does not consist of natural vegetation.							
	Alternative 1 – Erf 1560							
	Impacts on loss of vegetation will be the same as for the Preferred Alternative							

Can the impact be reversed	No. It is not anticipated that the development will be decommissioned, and that rehabilitation will take place. The development will be permanent. If the site is to be rehabilitated in future, natural vegetation should re-establish.
Will the impact cause irreplaceable loss to resource	As it is not anticipated that the development will be decommissioned, and that rehabilitation will take place, loss of natural occurring vegetation will be permanent. If the site is to be rehabilitated in future, natural vegetation should re-establish.
Cumulative Impacts	A cumulative impact may occur, as the surrounding area has also been cleared of natural occurring vegetation for development.

2. Establishment of alien invasive plant species.

	Erf 1559 (Preferred Alternative)							
Potential Impact Description:	The development will require the site to be cleared of vegetation. This, along with construction activities will disturb the site and may lead to the establishment of invasive alien species.							
Duration of Impact:	During construction and operational phases							
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	4	2	3	3	4	3.5	10.5
With Mitigation	2	2	1	1.66	3	4	3.5	5.81
Mitigation Measures	<ul style="list-style-type: none"> Establishment of alien vegetation should be monitored and removed on a regular basis. Construction activities should be confined to the development footprint to limit disturbance. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	4	2	3	2	5	3.5	10.5

With Mitigation	2	3	1	2	2	5	3.5	7
Mitigation Measures	<ul style="list-style-type: none"> Regular removal of alien vegetation during site maintenance and inspection. 							
Alternative 1 – Erf 1560								
The impact of establishment of alien plant species will be the same as for the Preferred Alternative								
Can the impact be reversed	Yes. With regular removal of alien vegetation, the impact can be reversed.							
Will the impact cause irreplaceable loss to resource	No. The establishment of alien vegetation will not lead to a loss of natural vegetation as the site will already be cleared. And with regular removal of alien vegetation, the chance of complete take-over is minimal.							
Cumulative Impacts	There may be a cumulative impact as disturbance in the surrounding area has already led to the encroachment of alien vegetation in the area.							

3.Destruction of habitat and loss of animal species.	
Erf 1559 (Preferred Alternative)	
Potential Impact Description:	The development will lead to the clearance of vegetation and the transformation of suitable habitat for fauna, which may lead to the loss of animal species. Construction activities may also chase away or lead to the accidental killing of animals. However, according to the Ecological Assessment due to the degraded state of the site and it being located within an industrialised area, it is highly unlikely that a viable mammal population will be present on site and that any rare or endangered species would occur here (Van Rensburg 2020).
Duration of Impact:	During construction and operational phases

	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	4	2	3	3	1	2	6
With Mitigation	2	4	1	2.33	2	1	1.5	3.495
Mitigation Measures	<ul style="list-style-type: none"> • If any animals are found on site, they should be relocated. • No open fires will be allowed. • No hunting of animals may take place. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	4	2	3	2	5	3.5	10.5
With Mitigation	2	4	1	2.33	1	5	3	6.99
Mitigation Measures	<ul style="list-style-type: none"> • If any animals are found on site, they should be relocated. • No open fires will be allowed. • No hunting of animals may take place. 							
Alternative 1 – Erf 1560								
Impacts of destruction of habitat and loss of animals will be the same as for the Preferred Alternative								
Can the impact be reversed	No. It is not anticipated that the development will be decommissioned, and that rehabilitation will take place. The development will be permanent. Therefore, suitable habitat for animals will be permanently removed.							
Will the impact cause irreplaceable loss to resource	No. No animals will be killed. Animals found on site will be relocated. However, suitable habitat for these animals will be permanently removed.							
Cumulative Impacts	There may be a cumulative impact, as the surrounding area is also developed and suitable habitat for animals have been removed.							

Summary of impacts for the Preferred Alternative (Erf 1559)				
Potential Impacts	Construction		Operational	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
1. Loss of natural occurring vegetation (Eastern Free State Sandy Grassland)	6.66	3.99	None	None
2. Establishment of invasive alien plant species.	10.5	5.81	10.5	7
3. Destruction of habitat and loss of animal species.	6	3.495	10.5	6.99
Grand Average Total:	7.72 (Low – Moderate)	4.431 (Low)	10.5 (Moderate)	6.995 (Low – Moderate)
The overall environmental significance indicates that the impact on Vegetation and Animal Life will be LOW during the construction phase and LOW – MODERATE during the operational phase with the correct mitigation.				

The development will require natural vegetation to be cleared. However, the vegetation type is classified as Least Concern according to the National List of Threatened Ecosystems (Notice 1477 of 2009) (National Environmental Management Biodiversity Act, 2004). According to the Ecological Assessment, the site still consists of natural grassland. However, it has been degraded by surrounding activities and on-site disturbance (vehicle turning point, rubbish dumping, overgrazing and industrial activities) and the conservation value of the site is considered to be low. Furthermore, due to the transformed nature of the vegetation, no rare or threatened species were observed on site and it is unlikely that such species would occur on site. However, two protected geophytic species, *Asclepias*

gibba and *A. multicaulis* were observed on site. Due to the degraded state of the site and it being located within an industrialised area, it is highly unlikely that a viable mammal population will be present on site. However, it is still likely that some small rodents may be present on site. Due to the degraded condition of the site it is highly unlikely that any rare or endangered species would occur here (Van Rensburg 2020).

Anticipated impacts of this development on Vegetation and Animal Life include loss of natural occurring vegetation, establishment of invasive alien species and destruction of habitat and loss of animal species.

The impact of loss of natural occurring vegetation during construction is expected to be LOW-MODERATE, without mitigation. This can be lowered to LOW with mitigation. It should be noted that although two protected species were identified on site, the site is small, significantly degraded and the vegetation is of Least Concern and therefore the impact does not have a higher rating. There will be no impact during the operational phase, because the entire site will be cleared and mostly paved/overlain with gravel during the construction phase and therefore there will be no more loss of vegetation.

The impact of establishment of invasive alien plant species is expected to be LOW – MODERATE during the construction and operational phases with the correct mitigation. The rating for both phases is the same, as both phases will disturb the site which may lead to the establishment of invasive species.

The impact of destruction of habitat and loss of animal species is expected to have a LOW rating during the construction phase and a LOW-MODERATE rating during the operational phase with correct mitigation. The loss of habitat will be permanent. However, it should be noted that the site is small and severely degraded, and it is unlikely that many animal species, especially Threatened or Red Listed species will occur here.

The impacts on Vegetation and Animal Life will be the same for Alternative 1. The Alternative 1 site is located directly adjacent to the Preferred site on erf 1560 and is expected to have the same environmental features. The same activities will be conducted on Alternative 1 as will be conducted on the Preferred Alternative.

As mentioned earlier in the report, there are no layout alternatives, as the applicant has extensive knowledge and experience in the operation of the Emulsion Plant and the layout of the site is usually designed in a manner to allow the most efficient and safest way of operation, storage of goods and transportation of material to and product from the plant.

Also, as mentioned earlier, there is no feasible technological alternative because as far reasonably possible, the best technology will be utilised to limit and / or prevent impact on the environment.

There may be cumulative impacts, as the surrounding area is also developed and cleared of vegetation, which has contributed to the loss of natural occurring vegetation, the establishment of invasive species and the loss of animals in the area.

Proposed mitigation:

- Vegetation will only be cleared within the boundary of the Emulsion Plant area.
- Alien vegetation should be monitored and removed on a regular basis.
- Removal of alien plants must adhere to the Alien and Invasive Species Regulations.
- No hunting will occur of animals that are present.
- No fires will be allowed on site.
- Rehabilitation afterwards may restore disturbed habitats.

8.1.5 Surface Water

The following impacts may occur on the surface water as a result of the construction and operational phase of the activity:

- Contamination of nearby surface water resources through spillage of petrochemical substances.

1. Contamination of nearby surface water resources through spillage of petrochemical substances.	
	Erf 1559 (Preferred Alternative)
Potential Impact Description:	There are no watercourses and/or wetlands present on the proposed site. However, there is a risk of contamination of the Wilge River, which is located 1.3 km from the site, due to surrounding drainage lines that drain into this watercourse.

Duration of Impact:	During construction and operational phases							
Construction phase								
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	3	2	2.66	2	4	3	7.98
With Mitigation	2	1	1	1.33	1	4	2.5	3.325
Mitigation Measures	<ul style="list-style-type: none"> • Construction vehicles and machinery should be serviced regularly to prevent any leaks. • Drip trays should be placed underneath immobile vehicles and machinery. • Any spills of hazardous substances should be cleaned immediately by removing the contaminated soil and disposing of it as hazardous waste. • Appropriate storm water measures such as channels and/or culverts should be constructed around the construction site to prevent clean storm water, especially storm water from the culvert draining into the site, from entering the site during rainfall events and dirty storm water from leaving the site. 							
Operational Phase								
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	4	3	2	3	3	5	4	12
With Mitigation	2	2	1	1.66	2	5	3.5	5.81
Mitigation Measures	<ul style="list-style-type: none"> • Potentially hazardous substances relating to the Emulsion Plant will be stored inside a bunded area with an impermeable surface which has the capacity to store more than 110% of the volume of the substance. • Any spills of hazardous substances should be cleaned immediately by removing the contaminated soil and disposing of it as hazardous waste. • The storm water measures that were implemented during the construction phase should be maintained around the operational area to prevent clean storm water from entering the site during rainfall events and dirty storm water from leaving the site. • Dirty storm water may not leave the operational area and enter natural drainage lines. This water must first go through oil separators before leaving the site. 							

Alternative 1 – Erf 1560	
Impacts of contamination of surface water will be the same as for the Preferred Alternative. The storm water from the culvert running underneath the N3 road may also drain into the alternative site.	
Can the impact be reversed	Yes, the impact can be reversed by implementing the correct clean-up procedures.
Will the impact cause irreplaceable loss to resource	No.
Cumulative Impacts	There may be cumulative impacts due to the surrounding areas also being developed and potentially causing contamination of the surrounding water resources.

Summary of impacts for the Preferred Alternative (Erf 1559)				
Potential Impacts	Construction		Operational	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
1. Contamination of nearby surface water resources through spillage of petrochemical substances	7.98	3.325	12	5.81
Grand Average Total:	7.98 (Low-Moderate)	3.325 (Low)	12 (Moderate)	5.81 (Low – Moderate)

The overall environmental significance indicates that the impact on Surface Water will be LOW during the construction phase and LOW-MODERATE during the operational phase with the correct mitigation.

There are no surface water features, including wetlands, located on the proposed site. The closest watercourse is the Wilge River, which is located approximately 1.3 km to the southwest of the site (ENPAT 2001). However, there are drainage lines in the surrounding area and runoff from site will follow the gradual slope of the site and these drainage lines towards the Wilge River (Van Rensburg 2020).

The impact of contamination of nearby surface water resources through spillage of petrochemical substances is expected to have a LOW – MODERATE rating during the construction phase, without mitigation. Although, with the correct mitigation measures, the impact can be reduced to LOW, as it is not expected that large quantities of hazardous substances will be stored on site during the construction phase and there are no surface water features close to the site. During the operational phase this impact is expected to have a higher rating without mitigation (MODERATE), as the operational phase will include the bulk storage of hazardous substances. This impact can be lowered to LOW – MODERATE with the correct mitigation measures. It is important that an adequate storm water management system is implemented and maintained in order to prevent contamination of nearby surface water resources, especially as there is a culvert that runs underneath the N3 National Road and drains into the proposed site. Storm water from this culvert will also flow towards the Wilge River via the natural drainage lines in the surrounding area.

The impacts on Surface Water will be the same for Alternative 1. The Alternative 1 site is located directly adjacent to the Preferred site on erf 1560 and is expected to have the same environmental features. The same activities will be conducted on Alternative 1 as will be conducted on the Preferred Alternative. The culvert is located on the boundary between the two sites and storm water may also drain into the alternative site.

As mentioned earlier in the report, there are no layout alternatives, as the applicant has extensive knowledge and experience in the operation of the Emulsion Plant and the layout of the site is usually designed in a manner to allow the most efficient and safest way of operation, storage of goods and transportation of material to and product from the plant.

Also, as mentioned earlier, there is no feasible technological alternative because as far reasonably possible, the best technology will be utilised to limit and / or prevent impact on the environment.

There may be a high cumulative impact due to surrounding industrial activities which may also contaminate the Wilge River.

Proposed mitigation:

- Berms and/or channels will be constructed around the site, to divert clean water, especially from the culvert, around the site to drain into the natural drainage lines of the environment.
- Stormwater will not be allowed to drain into the natural drainage lines from the operational area as this area is regarded as a dirty area.
- All potentially hazardous substances will be stored in a bunded area which can contain 110% of the volume of the substance.
- Spillages of hydrocarbons will be prevented by using drip trays and a clean-up procedure will be implemented to clean any hydrocarbon spills as soon as possible.
- The site will be monitored for any erosion trenches. Trenches will be rectified, and erosion control measures will be implemented.

8.1.6 Groundwater

The following impacts may occur on the groundwater as a result of the construction and operational phases of the activity:

- Contamination as a result of spillages of hazardous substances.
- The development may induce surface runoff and therefore reduce infiltration. Lower infiltration will lead to lower groundwater recharge.

1. Contamination as a result of spillages of hazardous substances.								
Erf 1559 (Preferred Alternative)								
Potential Impact Description:	Hazardous substances from construction vehicles and machinery can seep into the groundwater and cause contamination during the construction phase. During operation, hazardous substances in the form of bitumen, diesel and paraffin will be stored on site. These tanks may leak and contaminate the groundwater resource.							
Duration of Impact:	During construction and operational phases							
Construction phase								
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	2	3	2	2.33	3	4	3.5	8.15

With Mitigation	1	2	1	1.33	2	4	3	3.99
Mitigation Measures	<ul style="list-style-type: none"> • Construction vehicles and machinery should be serviced regularly to prevent any leaks. • Drip trays should be placed underneath immobile vehicles and machinery. • Any spills of hazardous substances should be cleaned immediately by removing the contaminated soil and disposing of it as hazardous waste. 							
Operational Phase								
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	4	4	2	3.33	3	5	4	13.32
With Mitigation	3	3	1	2.33	2	5	3.5	8.155
Mitigation Measures	<ul style="list-style-type: none"> • Potentially hazardous substances will be stored inside a bunded area with an impermeable surface which has the capacity to store more than 110% of the volume of the substance. • Storage tanks should be inspected regularly for leaks and if any are detected they should be fixed immediately. • Any spills of hazardous substances should be cleaned immediately by removing the contaminated soil and disposing of it as hazardous waste. 							
Alternative 1 – Erf 1560								
Impacts of contamination of groundwater will be the same as for the Preferred Alternative								
Can the impact be reversed	Yes, the impact can be reversed by limiting the number of spillages and immediate clean-up of any hazardous substances. Any contamination to the aquifer itself as a result of hazardous substances infiltrating into the water can be remedied by natural attenuation if the aquifer isn't contaminated any further.							
Will the impact cause irreplaceable loss to resource	No.							

Cumulative Impacts	There may be a cumulative impact in conjunction with the surrounding land uses which can also contribute to contamination of the groundwater.
---------------------------	---

2. Induced surface runoff causing lower infiltration to the aquifer as a result of the development								
	Erf 1559 (Preferred Alternative)							
Potential Impact Description:	Clearance of vegetation and levelling of the site during construction may lead to water from rainfall events obtaining high flow velocities as there are no natural obstacles (vegetation) slowing down the flow of water. These high flow velocities won't allow water to seep into the ground and recharge the aquifer. During the operational phase the same will happen due to the site potentially being paved.							
Duration of Impact:	During construction and operational phases							
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	2	2	2	2	3	4	3.5	7
With Mitigation	1	1	1	1	2	4	3	3
Mitigation Measures	<ul style="list-style-type: none"> • Clearance of vegetation for this development is unavoidable and permanent. Therefore, the footprint of the site should be kept as small as practicable possible in order to limit the impact. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	2	2	2	2	3	5	4	8
With Mitigation	1	1	1	1	2	5	3.5	3.5

Mitigation Measures	<ul style="list-style-type: none"> • Clearance of vegetation for this development is unavoidable and permanent. Therefore, the footprint of the site should be kept as small as practicable possible in order to limit the impact.
Alternative 1 – Erf 1560	
Impacts of induced surface runoff and lower infiltration will be the same as for the Preferred Alternative	
Can the impact be reversed	Yes, through proper storm water management water can be diverted to surrounding areas that are not paved.
Will the impact cause irreplaceable loss to resource	No
Cumulative Impacts	None. Although the majority of the surrounding area is also developed, most of the area is not completely paved and still contains natural groundcover.

Summary of impacts for the Preferred Alternative (Erf 1559)				
Potential Impacts	Construction		Operational	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
1. Contamination as a result of spillages of hazardous substances.	8.15	3.99	13.32	8.155
2. Induced surface runoff causing lower infiltration to the aquifer as a result of the development	7	3	8	3.5

Grand Average Total:	7.575 (Low – Moderate)	3.495 (Low)	10.66 (Moderate)	5.828 (Low – Moderate)
The overall environmental significance indicates that the impact on Groundwater will be LOW during the construction phase and LOW – MODERATE during the operational phase with the correct mitigation				

It is planned that the development makes use of municipal water during the construction and operational phases. If any groundwater is to be used during construction and operation, the necessary licenses will be applied for. The Harrismith area consists of a minor aquifer system with a moderate vulnerability. Minor aquifers normally yield moderate quantities of groundwater with a variable quantity.

Anticipated impacts of this development on Groundwater will include contamination as a result of spillages of hazardous substances and induced surface runoff causing lower infiltration to the aquifer as a result of the development.

The impact of contamination as a result of spillages of hazardous substances is expected to be LOW - MODERATE during the construction phase and MODERATE during the operational phase, without mitigation. Spills during the construction phase may seep into the water table. During the operational phase, large quantities of hazardous substances will be stored on site. These tanks have the potential to leak and contaminate the aquifer. With the correct mitigation measures, the impact can be reduced to LOW during the construction phase and to LOW – MODERATE during the operational phase.

The impact of induced surface runoff causing lower infiltration to the aquifer as a result of the development is expected to have a LOW – MODERATE rating during both the construction and operational phases, without mitigation. The clearance of vegetation is permanent, and the entire footprint of the site will be paved. The development will also be present on the site for more than 10 years, as it is planned that the development will be permanent. However, if the footprint of the site is kept as small as practicable possible, the impact can be lowered to LOW, as the surrounding landscape still contains plenty areas that are not paved where groundwater recharge can take place.

The impacts on Groundwater will be the same for Alternative 1. The Alternative 1 site is located directly adjacent to the Preferred site on erf 1560 and is expected to have the same environmental features. The same activities will be conducted on Alternative 1 as will be conducted on the Preferred Alternative.

As mentioned earlier in the report, there are no layout alternatives, as the applicant has extensive knowledge and experience in the operation of the Emulsion Plant and the layout of the site is usually designed in a manner to allow the most efficient and safest way of operation, storage of goods and transportation of material to and product from the plant.

Also, as mentioned earlier, there is no feasible technological alternative because as far reasonably possible, the best technology will be utilised to limit and / or prevent impact on the environment.

There may be a cumulative impact on the groundwater due to the presence of other industrial activities in the area which may also lead to contamination.

Proposed mitigation:

- Hazardous substances will be stored inside a bunded area with an impermeable surface which has the capacity to store more than 110% of the volume of the substance.
- Spillages of hydrocarbons will be prevented by using drip trays and a clean-up procedure will be implemented to clean any hydrocarbon spills as soon as possible.
- Storage tanks will be inspected on a regular basis. If any leaks are detected, they will be fixed immediately.
- No water will be abstracted from groundwater for use for construction activities.
- Clearance of vegetation for this development is unavoidable and permanent. Therefore, the footprint of the site should be kept as small as practicable possible in order to limit the impact.

8.1.7 Air Quality

The following impacts may occur on the air quality as a result of the construction and operational phases of the activity:

- Generation of dust and emissions due to construction and operational activities.

According to the Atmospheric Impact Assessment (refer to **Annexure 5**) the predicted ambient concentrations of pollutants comply with the national health-based ambient air quality standards.

1. Generation of dust and emissions due to construction and operational activities.								
	Erf 1559 (Preferred Alternative)							
Potential Impact Description:	Construction activities such as clearing the land of vegetation, removing topsoil and movement of construction vehicles may lead to dust generation. There may also be some emissions from construction vehicles. However, this is expected to be insignificant. During operation, there will be some emissions associated with the Emulsion Plant.							
Duration of Impact:	During the construction and operational phases							
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	2	2	2.33	4	4	4	9.32
With Mitigation	2	1	1	1.33	2	4	3	3.99
Mitigation Measures	<ul style="list-style-type: none"> • Speed limits should be enforced on construction vehicles in order to limit dust generation. • Effort will be made to limit construction activities during very windy conditions. • If dust generation proves to become problematic, dust control measures will be investigated (such as water spraying). 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	3	2	2.66	3	5	4	10.64
With Mitigation	1	1	1	1	3	5	4	4
Mitigation Measures	<ul style="list-style-type: none"> • Dust suppression should be implemented on the site to reduce emissions of dust from the site, especially from the movement of vehicles. - Dust control measures must adhere to Dust Control Regulations. 							

	<ul style="list-style-type: none"> • Construction and operational activities, especially activities contributing to dust emissions should be avoided during windy conditions. • The type of tanks that will be used in the emulsion plant will be of such nature to reduce “breathing losses”. • An air emission monitoring programme will be implemented to ensure compliance to air quality standards and guidelines.
Alternative 1 – Erf 1560	
Impacts of generation of dust and emissions will be the same as for the Preferred Alternative	
Can the impact be reversed	Yes. The impact will not be significant enough to affect the climate in large scale.
Will the impact cause irreplaceable loss to resource	No
Cumulative Impacts	A cumulative impact can occur as there are surrounding industrial activities which can contribute towards dust generation and emissions. Harrismith is also known for its industry.

Summary of impacts for the Preferred Alternative (Erf 1559)				
Potential Impacts	Construction		Operational	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
1. Generation of dust and emissions due to construction and operational activities.	9.32	3.99	10.64	4

Grand Average Total:	9.32 (Low-Moderate)	3.99 (Low)	10.64 (Moderate)	4 (Low)
The overall environmental significance indicates that the impact on Air Quality will be LOW during the construction phase and the operational phase with the correct mitigation.				

There are numerous contributors to atmospheric emissions in the area, as the town of Harrismith is known for its industry. The proposed site also falls within an industrial area. "Particulate and gaseous emissions generated during the production of bitumen emulsion mainly originate from diesel burners that are used to keep the bitumen warm in the hot storage tanks. VOCs are released from the hot storage tanks through "breathing losses". Gaseous pollutant emissions are SO₂, NO_x, CO, and VOCs." However, according to the Atmospheric Impact Report, the impact of modelled concentrations of these emissions are well below the national health-based ambient air quality standards and guidelines (uMoya-Nilu Consulting 2019).

Anticipated impacts of this development on Air Quality will include generation of dust and emissions due to construction and operational activities.

The impact of generation of dust and emissions due to construction and operational activities is expected to be LOW-MODERATE during the construction phase without mitigation. Even though construction activities will lead to dust generation, the proposed site is located within an industrial area and is not located close to any residential areas. This impact can be lowered to LOW with the correct mitigation. During the operational phase, the impact is expected to be MODERATE without mitigation, as the Emulsion Plant will release some emissions. This can be lowered to LOW with mitigation, as the Atmospheric Impact Report indicated that modelled concentrations of these emissions are well below the national health-based ambient air quality standards and guidelines.

The impacts on Air Quality will be the same for Alternative 1. The Alternative 1 site is located directly adjacent to the Preferred site on erf 1560 and is expected to have the same environmental features. The same activities will be conducted on Alternative 1 as will be conducted on the Preferred Alternative.

As mentioned earlier in the report, there are no layout alternatives, as the applicant has extensive knowledge and experience in the operation of the Emulsion Plant and the layout of the site is usually designed in a manner to allow the most efficient and safest way of operation, storage of goods and transportation of material to and product from the plant.

Also, as mentioned earlier, there is no feasible technological alternative because as far reasonably possible, the best technology will be utilised to limit and / or prevent impact on the environment.

There may be a cumulative impact on the air quality, as the proposed site is located within an industrial area and surrounded by numerous other industrial activities and businesses.

Proposed mitigation:

- Speed limits should be enforced on construction vehicles in order to limit dust generation.
- Effort will be made to limit construction activities during very windy conditions.
- If dust generation proves to become problematic, dust control measures will be investigated (such as water spraying).
- The type of tanks that will be used in the emulsion plant will be of such nature to reduce “breathing losses”.
- An air emission monitoring programme and dust fallout monitoring programme will be implemented to reduce the potential impact.
- Dust control measures must adhere to Dust Control Regulations.

8.1.8 Noise

The following impacts may occur on the noise levels as a result of the construction and operational phases of the activity:

- Generation of noise due to construction and operational activities.

1. Generation of noise due to construction and operational activities.	
	Erf 1559 (Preferred Alternative)

Potential Impact Description:	Construction activities such as clearing the land of vegetation, constructing buildings and infrastructure and movement of construction vehicles may lead to noise generation. Movement of vehicles during operation and the operation of the plant may also contribute towards noise.							
Duration of Impact:	During the construction and operational phases							
	Construction phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	2	3	2	2.33	4	4	4	9.32
With Mitigation	1	2	2	1.66	3	4	3.5	5.81
Mitigation Measures	<ul style="list-style-type: none"> Construction will be limited to daytime working hours to limit any disturbance to neighbouring landowners. 							
	Operational Phase							
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	2	2	1	1.66	3	5	4	6.64
With Mitigation	1	1	1	1	2	5	3.5	3.5
Mitigation Measures	<ul style="list-style-type: none"> Operation will be limited to daytime working hours to limit any disturbance to neighbouring landowners. <p>It should be noted that noise generated by the Emulsion Plant is minimal.</p>							
Alternative 1 – Erf 1560								
Impacts of generation of noise will be the same as for the Preferred Alternative								
Can the impact be reversed	No. The development is permanent and noise due to construction activities, traffic and human movement is unavoidable. However, the impact during the construction phase is temporary and the impact during the operational phase will be Low.							

Will impact cause irreplaceable loss to resource	No
Cumulative Impacts	There may be some cumulative impacts as there are surrounding activities, such as traffic that also contribute to noise.

Summary of impacts for the Preferred Alternative (Erf 1559)				
	Construction		Operational	
Potential Impacts	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
1. Generation of noise due to construction and operational activities.	9.32	5.81	6.64	3.5
Grand Average Total:	9.32 (Low-Moderate)	5.81 (Low - Moderate)	6.64 (Low-Moderate)	3.5 (Low)
The overall environmental significance indicates that the impact on Noise will be LOW - MODERATE during the construction phase and LOW during the operational phase with the correct mitigation.				

There are numerous contributors to noise in the area, including truck stops and other businesses. The town of Harrismith is also known for its industry and the proposed site also falls within an industrial area.

Anticipated impacts of this development on Noise will include generation of noise due to construction and operational activities.

The impact of generation of noise due to construction and operational activities is expected to be LOW-MODERATE with and without mitigation, as construction activities may generate nuisance noise and the site is surrounded other businesses. During the operational

phase, the impact is expected to be LOW with mitigation, as the Emulsion Plant will generate minimal noise and there are no residential areas in close proximity.

The impacts on Noise will be the same for Alternative 1. The Alternative 1 site is located directly adjacent to the Preferred site on erf 1560 and is expected to have the same environmental features. The same activities will be conducted on Alternative 1 as will be conducted on the Preferred Alternative.

As mentioned earlier in the report, there are no layout alternatives, as the applicant has extensive knowledge and experience in the operation of the Emulsion Plant and the layout of the site is usually designed in a manner to allow the most efficient and safest way of operation, storage of goods and transportation of material to and product from the plant.

Also, as mentioned earlier, there is no feasible technological alternative because as far reasonably possible, the best technology will be utilised to limit and / or prevent impact on the environment.

There may be a cumulative impact on the noise, as the proposed site is located within an industrial area and surrounded by numerous other industrial activities and businesses.

Proposed mitigation:

- Vehicles and machinery will be serviced regularly to avoid noise associated with machines and vehicles working incorrectly.
- Construction will be limited to daytime working hours to limit any disturbance to neighbouring landowners.

8.1.9 Archaeological, Palaeontological and Cultural Resources

The following impacts may occur on the archaeological, palaeontological and cultural resources as a result of the construction and operational phases of the activity:

- There may be accidental unearthing, damage and/or loss of heritage and/or palaeontological resources as a result of construction or operational activities.

It should be noted that this is not expected to happen, as no heritage and/or palaeontological resources of significant value were observed. Also, there is not expected to be an impact during the operational phase, as no activities will take place that may lead to unearthing.

1. Loss of culturally significant resources								
Erf 1559 (Preferred Alternative)								
Potential Impact Description:	Although no significant cultural resources were found during the HIA (Philip 2020) and the palaeontological significance of the site was rated Low according to the PIA (Butler 2020), it's entirely possible that significant heritage or paleontological resources may be unearthed during construction activities.							
Duration of Impact:	During the construction phase.							
Construction phase								
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	2	1	2	2	1	1.5	3
With Mitigation	2	2	1	1.66	2	1	1.5	2.49
Mitigation Measures	<ul style="list-style-type: none"> • If any significant heritage or paleontological resources are discovered during construction, work must stop immediately, and a specialist must be contacted. • SAHRA will also be notified should traces of any palaeontological/archaeological heritage be found during construction. • The Chance Finds Procedures must be adhered to at all times. 							
Operational Phase								
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	No impact							
With Mitigation	No impact							
Mitigation Measures	None							
Alternative 1 – Erf 1560								
Impacts of loss of culturally significant resources will be the same as for the Preferred Alternative								

Can the impact be reversed	No. Once an artefact has been unearthed or damaged it cannot be replaced. However, it is not anticipated that this will happen.
Will the impact cause irreplaceable loss to resource	No. The site has been identified as having insignificant paleontological resources and no evidence of archaeological material or historically significant structures were identified. The activities planned for the site also have little to no chance of unearthing any significant heritage resources.
Cumulative Impacts	None

Summary of impacts for the Preferred Alternative (Erf 1559)				
Potential Impacts	Construction		Operational	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
1. Loss of culturally significant resources	3	2.49	None	None
Grand Average Total:	3 (Low)	2.49 (Low)	None	None
The overall environmental significance indicates that the impact on Archaeological, Palaeontological and Cultural Resources will be LOW during the construction phase with the correct mitigation.				

No physical signs of any buildings older than 60 years or any archaeological remains were observed on site. According to the HIA "any surface signs of archaeological remains of any era on the proposed site for the emulsion plant would have been obliterated by the clearing of the natural vegetation and installation of electrical, water and sewerage infrastructure for this suburb." Also, the literature research did not indicate that any activities took place on the property prior to the establishment of the industrial suburb (Philip 2020). Furthermore, no fossiliferous outcrop was found in the proposed site and the overall palaeontological sensitivity is considered to be low (Butler 2020).

The impact of loss of culturally significant resources is expected to be LOW during the construction phase, with and without mitigation. The impact is expected to be LOW as there will be no activities that will require deep excavations and thus the chances of unearthing

any culturally significant resources are minimal. Also, no evidence of culturally significant heritage was observed on site and the palaeontology of the site was found to be insignificant (Please refer to the HIA and PIA in **Annexure 5**).

It is not expected that there will be any impact during the operational phase, as no activities are planned for this phase which can lead to accidental unearthing.

The impacts on Archaeological, Palaeontological and Cultural Resources will be the same for Alternative 1. The Alternative 1 site is located directly adjacent to the Preferred site on erf 1560 and is expected to have the same environmental features. The same activities will be conducted on Alternative 1 as will be conducted on the Preferred Alternative.

As mentioned earlier in the report, there are no layout alternatives, as the applicant has extensive knowledge and experience in the operation of the Emulsion Plant and the layout of the site is usually designed in a manner to allow the most efficient and safest way of operation, storage of goods and transportation of material to and product from the plant.

Also, as mentioned earlier, there is no feasible technological alternative because as far reasonably possible, the best technology will be utilised to limit and / or prevent impact on the environment.

It is not expected that there will be any cumulative impacts.

Proposed mitigation:

- No deep excavation will take place.
- If any archaeological objects or palaeontological remains are found, work will stop immediately and SAHRA will be notified.
- The Chance Finds Procedure must be adhered to at all times.

8.1.10 Aesthetics

The following impacts may occur on the aesthetics as a result of the construction and operational phases of the activity:

- Negative aesthetic impact due to construction and operational activities

1. Negative aesthetic impact								
	Erf 1559 (Preferred Alternative)							
Potential Impact Description:	Construction activities such as clearance of vegetation and construction of buildings and infrastructure may have a negative aesthetic impact. However, construction activities are temporary. During the operational phase, there may also be a negative aesthetic impact, as the site will be permanently developed from its natural setting to an industrial setting.							
Duration of Impact:	During the construction and operational phases.							
Construction phase								
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	3	2	2.66	2	4	3	7.98
With Mitigation	2	3	1	2	2	4	3	6
Mitigation Measures	<ul style="list-style-type: none"> • Clearance of vegetation and other construction activities will be limited to the area under construction. • The site will always be kept clean and neat by correct housekeeping and waste disposal. • Any spills and/or leakages should be cleaned immediately in the correct manner. 							
Operational Phase								
	Severity	Duration	Extent	Consequence	Probability	Frequency	Likelihood	Significance
Without Mitigation	3	5	2	3.33	3	5	4	13.32
With Mitigation	2	5	1	2.66	2	5	3.5	9.31
Mitigation Measures	<ul style="list-style-type: none"> • Operational activities will be limited to the operational area. • The site will always be kept clean and neat by correct housekeeping and waste disposal. • Any spills and/or leakages should be cleaned immediately in the correct manner. 							
Alternative 1 – Erf 1560								
Impacts on aesthetics will be the same as for the Preferred Alternative								

Can the impact be reversed	No. The development is permanent and there will be a permanent aesthetic impact, as decommissioning and rehabilitation is not anticipated.
Will the impact cause irreplaceable loss to resource	Yes. The aesthetic impact will be permanent. However, the impact is not expected to be high.
Cumulative Impacts	There may be a cumulative impact, as the surrounding area is also developed, which has contributed to negative aesthetics in the area. The proposed site is also located within an industrial area.

Summary of impacts for the Preferred Alternative (Erf 1559)				
	Construction		Operational	
Potential Impacts	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
1. Negative aesthetic impact	7.98	6	13.32	9.31
Grand Average Total:	7.98 (Low - Moderate)	6 (Low - Moderate)	13.32 (Moderate)	9.31 (Low - Moderate)
The overall environmental significance indicates that the impact on Aesthetics will be LOW - Moderate during the construction and operational phases with the correct mitigation.				

The site is located within an industrial area and is degraded. The site is also surrounded by numerous other industries and businesses. However, the proposed site is located directly next to the N3 National Road and therefore may have a negative aesthetic impact on passing motorists.

The negative aesthetic impact of this development is expected to be LOW - MODERATE during the construction phase, with and without mitigation. Construction activities are temporary, and the site is already situated within a degraded area. The impact is expected to be MODERATE during the operational phase without mitigation, as the development will be permanent, and no rehabilitation is

planned. The site is also located next to the N3 National Road. However, this impact can be reduced to LOW-MODERATE with the correct mitigation. It should be noted that the site is already disturbed and located within an industrial area.

The impacts on Aesthetics will be the same for Alternative 1. The Alternative 1 site is located directly adjacent to the Preferred site on erf 1560 and is expected to have the same environmental features. The same activities will be conducted on Alternative 1 as will be conducted on the Preferred Alternative.

As mentioned earlier in the report, there are no layout alternatives, as the applicant has extensive knowledge and experience in the operation of the Emulsion Plant and the layout of the site is usually designed in a manner to allow the most efficient and safest way of operation, storage of goods and transportation of material to and product from the plant.

Also, as mentioned earlier, there is no feasible technological alternative because as far reasonably possible, the best technology will be utilised to limit and / or prevent impact on the environment.

There may be cumulative impacts, as the proposed site is located within an industrial area, surrounded by other developments.

Proposed mitigation:

- Alien vegetation should be cleared regularly.
- Waste should be disposed of in the correct manner regularly.
- Separate skips and/or bins should be available for the separate waste streams.
- Any spills and/or leakages should be cleaned immediately in the correct manner.

8.1.11 Socio-economics

The development will have a positive impact on the socio-economic structure of the surrounding areas. The development will create multiple jobs during construction and the lifetime of the project. It is anticipated that approximately 10 new permanent jobs will be created. It is estimated that the project will have an approximate capital value of R10 245 000 upon completion.

9 Conclusion

The proposed establishment of an Emulsion Plant on erf 1559, Hardustria, Harrismith, Free State is an initiative by South African Road Binders (Pty) Ltd. The proposed development will entail the establishment of an Emulsion Plant to produce bitumen emulsion to be sold commercially to be used in projects involving the construction and repair of roads or will be used for the applicant's own projects.

The basic operation of the Plant includes mixing heated raw bitumen with water, emulsifiers, chemicals and additives in a colloid mill. The product is then stored in cold storage tanks, ready to be sold or transported to sites. The Emulsion Plant will have the capacity to store approximately a total of 1 102 000 L of dangerous substances. This will include 816 000 L Raw Bitumen, 9 000 L Diesel, 23 000 L Paraffin and 254 000 L Bitumen Emulsion. Approximately 5 tons of Caustic Soda and 5 000 L of Hydrochloric Acid will also be stored on site.

The proposed development is also scheduled as a Macadam preparation process that also needs an AEL in terms of the NEM:AQA. However, according to the Atmospheric Impact Report, the impact of modelled concentrations of emissions associated with the Emulsion Plant are well below the national health-based ambient air quality standards and guidelines (uMoya-Nilu Consulting 2019).

The site falls within the Eastern Free State Sandy Grassland (Gm 4) vegetation type, which is classified as Least Concern according to the National List of Threatened Ecosystems (Notice 1477 of 2009) (National Environmental Management Biodiversity Act, 2004). The site also falls within an Ecological Support Area 1 as per the Free State Biodiversity Management Plan (2015). However, it should be noted that the site is situated within an industrial area of the town and thus the site is degraded. The area that will be cleared is also smaller than 1 ha (0.74ha). According to the Ecological Assessment, the natural vegetation present on site has been degraded by surrounding activities and on-site disturbance and the conservation value of the site is considered to be low. Furthermore, due to the transformed nature of the vegetation, no rare or threatened species were observed on site and it is unlikely that such species would occur on site. However, two protected geophytic species, *Asclepias gibba* and *A. multicaulis* were observed on site (Van Rensburg 2020). There are no watercourses or wetlands present on the proposed site. The nearest watercourse is the Wilge River, which is located approximately 1.3 km away from the site.

Furthermore, a Phase 1 HIA and PIA was conducted. The survey found no evidence of archaeological material or historic buildings (Philip 2020). The geology underlying the site is also not considered to be paleontologically significant (Butler 2020).

By implementing the proposed development, numerous job opportunities will be created, which will have a positive impact on the local economy. It is estimated that the project will have an approximate capital value of R10 245 000 upon completion. Approximately 10 new employment opportunities will be created by the establishment of the Emulsion Plant. Also, society will be directly benefited by improving access and connectivity for communities and businesses. The site is located in a favourable position, as Harrismith is located at a major junction of the N5 National Road and the N3 National Road, which ensures mobility in all directions. It is also located relatively close to the export harbour at Durban (SANEC 2012), from which the applicant receives their raw bitumen which is used in the emulsion production process.

9.1 Summary of Significance Rating after mitigation

Impact	Preferred Alternative (Erf 1559)	
	Construction phase	Operational phase
Geology and Soil	3.10 (Low)	4.9 (Low)
Land Use	5 (Low-Moderate)	10.485 (Moderate)
Plant & Animal Life	4.431 (Low)	6.995 (Low-Moderate)
Surface Water	3.325 (Low)	5.81 (Low-Moderate)
Groundwater	3.495 (Low)	5.828 (Low-Moderate)
Air Quality	3.99 (Low)	4 (Low)
Noise	5.81 (Low – Moderate)	3.5 (low)
Archaeological, Palaeontological and Cultural Resources	2.49 (Low)	No Impact

Aesthetics	6 (Low-Moderate)	9.31 (Low-Moderate)
Socio-economics	Positive Impact	Positive Impact

9.2 Motivation for proposed site alternative

All possible alternatives were identified and assessed. The preferred site was decided on based on certain factors:

- The proposed site is situated within an industrial area and is already degraded due to surrounding activities and on-site disturbance. There are not watercourses or wetlands present on the proposed site. This was confirmed in the Ecological Assessment.
- All impacts related to the preferred site will be Low or Low-Moderate. Only the impact on Land Use during the operational phase will have a Moderate impact, due to the development being permanent.
- The proposed development will create numerous job opportunities and contribute positively towards the economy of the area.

It should be noted that the alternative 1 site (erf 1560) is situated directly next to the preferred site and is expected to have the same environmental features and impacts. However, the applicant already has a Lease Agreement with the landowner for the preferred site. Therefore, the preferred site, erf 1559, was considered as the best suited site for the establishment of an Emulsion Plant.

10 Proposed Conditions of Approval

The following measures will have to be implemented and maintained throughout the lifetime of the proposed project:

- No vegetation may be cleared outside the site boundaries.
- Alien vegetation should be removed regularly. This must adhere to the Alien and Invasive Species Regulations.
- Any soil that is removed should be stockpiled and may not be used for any other activities. Soil stockpiles may not exceed a height of 1.5 m.
- All efforts should be made to limit aesthetic impact on passing motorists and adjacent landowners, by always keeping the site clean and neat and disposing of waste in the correct manner.

- An air emission monitoring programme and dust fallout monitoring programme should be implemented to reduce the potential impact and to monitor compliance with NEM:AQA. Dust control measures must adhere to Dust Control Regulations.
- All potentially hazardous substances should be stored in a bunded area which can contain 110% of the volume of the substance.
- Any spillages should be cleaned immediately by removing the contaminated soil and disposing of it as hazardous waste.
- Stormwater management should be implemented to reduce runoff which may cause contamination and siltation of watercourses, by establishing trenches and/or berms around the site.
- Should any items of archaeological or palaeontological significance be unearthed or found on the site during the lifetime of the project, a specialist will be appointed to investigate the finds and SAHRA will also be notified thereof.
- No animals may be killed on site.
- The necessary permits should be obtained to remove the two protected plant species on site prior to construction.

An Environmental Management Programme ("**EMPr**") has been compiled and is attached in **Annexure 4**. The EMPr aims to limit potential impacts through mitigation measures, especially during the construction phase.

11 EAP Declaration

The EAP declares that the EIA Phase was conducted objectively, and the information provided in this report is correct. All inputs from I&AP's received to date have been included.

NAME OF EAP

SIGNATURE OF EAP

DATE

SIGNATURE OF COMMISSIONER OF OATHS

DATE

12 References

- Department: Water Affairs. 2012. Aquifer Classification of South Africa. <http://www.dwa.gov.za/Groundwater/documents/Aquifer%20Classification.pdf>. [Date of access: 18/10/2019].
- Department: Water Affairs. 2012. Aquifer Classification of South Africa. <http://www.dwa.gov.za/Groundwater/documents/Groundwater%20Quality.pdf>. [Date of access: 18/10/2019].
- Department: Water Affairs. 2012. Aquifer Classification of South Africa. http://www.dwa.gov.za/Groundwater/documents/Aquifer%20Vulnerability_1.pdf [Date of access: 18/10/2019].
- DEA. National List of Threatened Ecosystems (Notice 1477 of 2009). National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004).
- DEAT (2001). ENPAT, Department of Environmental Affairs and Tourism, Pretoria.
- Meteoblue. 2019. Harrismith. https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/harrismith_south-africa_997751 [Date of access: 18/10/2019].
- Mucina *et al.* 2006. Grassland Biome. In: Mucina, L. & Rutherford, M.C. (eds) 2006. *The vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria.
- SANEC. 2012. Gauteng & Harrismith. FACTFINDING: Transport, Energy & Water. <http://portandcorridor.org/wp-content/uploads/2013/02/Factfindings-Gauteng-Province-and-Harrismith-2g@there-2012-final.pdf> [Date of access: 29/10/2019].
- Statistics South Africa (STATS SA). 2011. Harrismith. Available at: http://www.statssa.gov.za/?page_id=4286&id=7190 [Date of access: 18/10/2019].
- Water Resource Council. 2005.