TGM ENVIRONMENTAL SERVICES

VOLUME I
DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FOR

UPGRADE OF ROAD D620 & ROAD 621

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Executive Summary

1. Introduction

TGM Environmental Services was appointed by Nyeleti Consulting (Pty) Ltd on behalf of the Gauteng Department of Roads and Transport to submit an application for the upgrade of Road D620 and Road D621 to the Gauteng Department of Agriculture and Rural Development (GDARD) in terms of the National Environmental Management Act (NEMA) (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, published on 4 December 2014 (as amended).

2. Project Description

The project entails the upgrading of Road D620 & Road D621 from gravel to surfaced roads. Road D620 will be upgraded to a dual carriageway, approximately 9.3 km in length, with a proposed road reserve of 62 metres. Road D621 will remain a single carriageway, approximately 4.4 km in length, with a proposed road reserve of 30 metres. Existing stormwater infrastructure will be replaced, and/or upgraded, and/or cleaned and new stormwater infrastructure will be constructed.

3. Site attributes

The project is located in the Winterveld area. Road D620 extends from Jakkalas Village in the south to the intersection with provincial road M39 at the North West Province boundary. Road D621 extends from Jakkalas Village in the west across the M39 to the intersection with the surfaced road to Soshanguve.

The study area is found within the Central Bushveld Bioregion of the Savanna Biome. The study area is situated mainly within the veldtype unit of Central Sandy Bushveld, with a small section of the D621 route within Springbokvlakte Thornveld. The vegetation of the study area is mostly transformed, as most of the study area is existing gravel roads earmarked for upgrade. The vegetation found in the road reserves and adjacent areas varies from transformed to highly modified to moderately modified.

No Red Data species (endangered, threatened or vulnerable) were observed during field investigations for the Terrestrial Ecology Assessment. No Orange Data species were found within the study area corridor. No protected trees were observed in the study area. Marula trees are however present in the area and a final walk down prior to the commencement of the construction phase is recommended.

The general habitats present in the study area are not ideal for most potentially occurring Red Data faunal species. However, it is possible that from time to time species from the surrounding region can and will wander

in and through the Provincial Route R510 corridor. Care should still be taken to avoid impacting on any animals encountered.

There are no High sensitivity areas identified during field investigations within the study site. Most of the site consists of totally transformed existing road areas (gravel or sand roads). The roads are to be upgraded with little to no further impacts along the routes. The areas of road to be widened are situated mostly within the existing road reserve most of which is disturbed. The watercourse crossings are not highly sensitive in reality, but like all watercourses (even degraded ones) they are by default, viewed as sensitive and need to be approached as such.

4. Regulatory Environmental Requirements

The Gauteng Department of Agriculture and Rural Development (GDARD), is the lead authority carrying out the authorisation process in accordance with the National Environmental Management Act (Act No. 107 of 1998, "NEMA") (as amended).

The EIA Regulations under the NEMA consist of two categories of activities namely: Schedules 1 and 3 Activities (GNR. 983 and GNR 985 of 2014) which require a Basic Assessment Process, and Schedule 2 Activities (GNR. 984 of 2014) which require both a Scoping and an EIA Report for authorisation.

The activities associated with the proposed project fall within GNR. 983, 984 and 985. As a result of the activities triggered under GNR. 985, the project has been assessed under the Scoping and EIA process. Approval by GDARD of the Scoping Report and Plan of Study for EIA was received on 28 September 2017.

5. EIA Report

In line with the requirements of the NEMA EIA Regulations, this EIA Report provides a detailed description of the pre-development environment, specifically in terms of the biophysical and socio-economic environment of the study area. Furthermore, the report provides a comprehensive description of the activities as well as specialist studies undertaken for the EIA Phase and Public Participation Process (PPP), as well as the way forward in the form of conclusions, recommendations and a Environmental Management Programme (EMPr).

To ensure the completeness of the EIA and EMPr, specialists surveyed the area to identify the potential impacts of the project on the area. The following specialist studies were conducted for the project and are included within the Appendices of this EIA report:

- Biodiversity Assessment: Terrestrial Ecology Assessment & Wetland Assessment
- Rehabilitation Plan

6. Alternatives

No off-site or other site alternatives have been investigated due to the fact that the project entails the upgrade of existing roads. However design alternatives were assessed. The following designs were evaluated: Alternative 1: Upgrade of roads to a flexible pavement; Alternative 2: Upgrade of roads to a rigid pavement. Pavement in this context refers to the road surface. Alternative 1 is the preferred alternative.

The do-nothing ("no go") option would entail not using the site and maintaining the site as is. The No-go option is considered to be the most undesired alternative as it will not improve future development potential and quality of life of local communities.

7. Public Participation

TGM Environmental Services CC conducted the Public Participation Process (PPP) for the project. During the Scoping Phase there was a more participatory approach to this project. For the PPP, the aim was to ensure that the full range of stakeholders was informed about the development throughout the period in question.

The Draft and Final Scoping Reports as well as the Draft EIA Report were made available for public review.

8. Environmental Impact Assessment

The impacts of the project activities were determined by identifying the environmental aspects and then undertaking an environmental risk assessment to determine the significant environmental aspects.

The environmental impact assessment has considered all phases of the project, namely, construction phase and operational phase. It is not anticipated that the proposed infrastructure will be decommissioned and therefore, the decommissioning impacts have not been considered.

The rating system used is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. During the EIA, the impact of the project on the biophysical and socio-economic environments was assessed. It was this assessment that allowed the EAP to make an informed analysis and provide an opinion of the proposed development.

9. Conclusion

In line with the requirements of the NEMA EIA Regulations (2014), this EIAR has provided, an explanation of the activities undertaken during the EIA Phase. The public participation process has been inclusive, and every effort has been made to include the representations of all stakeholders within the process.

The EIAR provides an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. It further provides a description of the affected environment and alternatives proposed for the upgrade of Roads D620 & Road D621.

Alternative 1 (flexible pavement) is preferred for reasons including cost effectiveness, availability of materials, traffic conditions in the area and the fact that it is preferred by the applicant.

From a socio–economic point of view, the proposed development can create numerous job opportunities on a temporary basis during the construction phase of the development.

Should the proposed mitigation measures be implemented accordingly, the findings conclude that there are no significant environmental fatal flaws that could prevent the development to proceed. Furthermore, the recommendations and management measures are contained in the Environmental Management Programme.

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Definitions

Activity	Means an activity identified in any notice published by the Minister or MEC in terms of section 24D(1)(a) of the Act as a listed activity or specified activity (GN R.982 of NEMA, 1998 (Act No. 107 of 1998));
Alternatives	In relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to the – (a) property on which or location where the activity is proposed to be undertaken; (b) type of activity to be undertaken; (c) design or layout of the activity; (d) technology to be used in the activity; (e) operational aspects of the activity; and includes the option of not implementing the activity (GN R.982 of NEMA, 1998 (Act No. 107 of 1998));
Applicant	See 'Proponent'
Biodiversity	The diversity of animals, plants and other organisms found within and between ecosystems, habitats, and the ecological complexes.
Construction	The building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity but excludes any modification, alteration or expansion of such a facility, structure or infrastructure and excluding the reconstruction of the same facility in the same location, with the same capacity and footprint.
Cumulative Impact	In relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities (GN R.982 of NEMA, 1998 (Act No. 107 of 1998));
Decommissioning	Means to take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned (GN R.983 of NEMA, 1998 (Act No. 107 of 1998));
Development	Means the building, erection, construction or establishment of a facility, structure or infrastructure, including associated earthworks or borrow pits, that is necessary for the undertaking of a listed or specified activity, including any associated post development monitoring but excludes any modification, alteration or expansion of such a facility, structure or infrastructure, including associated earthworks or borrow pits, and excluding the redevelopment of the same facility in the same location, with the same capacity and footprint (GN R.983 of NEMA, 1998 (Act No. 107 of 1998));
Direct Impact	Impacts that are caused directly by the activity and generally occur at the same time and at the same place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally quantifiable.
Ecosystem	A dynamic system of plant, animal (including humans) and micro-organism communities and their non-living physical environment interacting as a functional unit. The basic structural unit of the biosphere, ecosystems are characterised by interdependent interaction between the component species and their physical surroundings. Each ecosystem occupies a space in which macro-scale conditions and interactions are relatively homogenous
Environment	Means the surroundings within which humans exist and that are made up of -

	(i) the land, water and atmosphere of the earth; (ii) micro-organisms, plant and animal life; (iii) any part or combination of (i) of (ii) and the interrelationships among and between them; and (iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing (NEMA, 1998 (Act No. 107 of 1998));
Environmental Assessment Practitioner (EAP)	Means the individual responsible for planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management plans or any other appropriate environmental instrument introduced through regulations (NEMA, 1998 (Act No. 107 of 1998) as amended);
Environmental Authorisation	Means the authorisation by a competent authority of a listed activity in terms of the Act (NEMA, 1998 (Act No. 107 of 1998) as amended);
Environmental Impact	Change to the environment (biophysical, social and/ or economic), whether adverse or beneficial, wholly or partially, resulting from an organisation's activities, products or services.
Environmental Impact Assessment	Means a systematic process of identifying, assessing and reporting environmental impacts associated with an activity and includes basic assessment and S&EIR (GN R.982 of NEMA, 1998 (Act No. 107 of 1998));
Environmental Issue	A concern raised by a stakeholder, interested or affected parties about an existing or perceived environmental impact of an activity.
Environmental Management	Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.
Environmental Management Programme (EMPr)	A detailed plan of action prepared to ensure that recommendations for enhancing or ensuring positive impacts and limiting or preventing negative environmental impacts are implemented during the life cycle of a project. This EMPr focuses on the construction phase, operation (maintenance) phase and decommissioning phase of the proposed project.
Fatal Flaw	Issue or conflict (real or perceived) that could result in developments being rejected or stopped. In the context of an environmental impact assessment a fatal flaw can be termed as an environmental issue that cannot be mitigated by any means
Gauteng Conservation Plan	Means a systematic conservation planning tool delineating biodiversity priority areas representative of biodiversity pattern, process and species of special concern, which areas have been identified in three broad categories; namely, Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) and Protected Areas (GN R.985 of NEMA, 1998 (Act No. 107 of 1998));
General Waste	Means waste that does not pose an immediate hazard or threat to health or to the environmnet, and include – (a) domestic waste; (b) building and demolition waste; (c) business waste; and (d) inert waste (NEM:WA, 2008 (Act No. 59 of 2008));
Groundwater	Water in the ground that is in the zone of saturation from which wells, springs, and groundwater run-off are supplied.
Hazardous Waste	Means any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment (NEM:WA, 2008 (Act No. 59 of 2008));
Hydrology	The science encompassing the behaviour of water as it occurs in the atmosphere, on the surface of the ground, and underground.
Important areas	Sites that are important for the conservation of biodiversity in Gauteng; (Gauteng C-Plan Version 3.3)
Indigenous Vegetation	Refers to vegetation consisting of indigenous plant species occurring

	naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years (GN R.983 of NEMA, 1998 (Act No. 107 of 1998));
Indirect Impacts	Indirect or induced changes that may occur as a result of the activity. These types if impacts include all of the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.
Integrated Environmental Management	A philosophy that prescribes a code of practice for ensuring that environmental considerations are fully integrated into all stages of the development and decision making process. The IEM philosophy (and principles) is interpreted as applying to the planning, assessment, implementation and management of any proposal (project, plan, programme or policy) or activity - at local, national and international level – that has a potentially significant effect on the environment. Implementation of this philosophy relies on the selection and application of appropriate tools for a particular proposal or activity. These may include environmental assessment tools (such as strategic environmental assessment and risk assessment), environmental management tools (such as monitoring, auditing and reporting) and decision-making tools (such as multi-criteria decision support systems or advisory councils).
Interested and Affected Party (I&AP)	Any person, group of persons or organisation interested in or affected by an activity; and any organ of state that may have jurisdiction over any aspect of the activity.
Irreplaceable Areas	Sites, which are essential in meeting targets set for the conservation of biodiversity in Gauteng; (Gauteng C-Plan Version 3.3)
Linear activity	Means an activity that is arranged in or extending along one or more properties and which affects the environment or any aspect of the environment along the course of the activity, and includes railways, roads, canals, channels, funiculars, pipelines, conveyor belts, cableways, power lines, fences, runways, aircraft landing strips, and telecommunication lines (GN R.983 of NEMA, 1998 (Act No. 107 of 1998));
Maintenance	means actions performed to keep a structure or system functioning or in service on the same location, capacity and footprint (GN R.983 of NEMA, 1998 (Act No. 107 of 1998));
Mitigation	Means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible (GN R.982 of NEMA, 1998 (Act No. 107 of 1998));
No-Go Option	In this instance the proposed activity would not take place, and the resulting environmental effects from taking no action are compared with the effects of permitting the proposed activity to go forward.
Pavement	Refers to the road surface
Proponent	Means a person intending to submit an application for environmental authorisation and is referred to as an applicant once such application for environmental authorisation has been submitted (GN R.985 of NEMA, 1998 (Act No. 107 of 1998));
Public Participation Process	A process in which potential interested and affected parties are given an opportunity to comment on, or raise issues relevant to, specific matters.
Rehabilitation	A measure aimed at reinstating an ecosystem to its original function and state (or as close as possible to its original function and state) following activities that have disrupted those functions.
Sensitive Environments	Any environment identified as being sensitive to the impacts of the development.
Significance	Significance can be differentiated into impact magnitude and impact significance. Impact magnitude is the measurable change (i.e. magnitude, intensity, duration and likelihood). Impact significance is the value placed on the change by different affected parties (i.e. level of significance and acceptability). It is an anthropocentric concept, which makes use of value

	judgements and science-based criteria (i.e. biophysical, social and economic).
Significant Impact	Means an impact that may have a notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds or targets and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as duration, magnitude, intensity and probability of occurrence (GN R.982 of NEMA, 1998 (Act No. 107 of 1998));
Specialist	Means a person that is generally recognised within the scientific community as having the capability of undertaking, in conformance with generally recognised scientific principles, specialist studies or preparing specialist reports, including due diligence studies and socio-economic studies (GN R.982 of NEMA, 1998 (Act No. 107 of 1998));
Stakeholder Engagement	The process of engagement between stakeholders (the proponent, authorities and I&APs) during the planning, assessment, implementation and/or management of proposals or activities.
Sustainable Development	Development which meets the needs of current generations without hindering future generations from meeting their own needs.
The Act	Means the National Environmental Management Act, 1998 (Act No. 107 of 1998) (GN R.982 of NEMA, 1998 (Act No. 107 of 1998));
Urban Areas	Means areas situated within the urban edge (as defined or adopted by the competent authority), or in instances where no urban edge or boundary has been defined or adopted, it refers to areas situated within the edge of built-up areas (GN R.982 of NEMA, 1998 (Act No. 107 of 1998));
Waste	Means any substance whether or not that substance can be reduced, re-used, recycled and recovered – (a) that is surplus, unwanted, rejected, discarded, abandoned or disposed of; (b) which the generator has no further use of for the purpose of production; (c) that must be treated or disposed of; or (d) that is identified as a waste by the Minister by notice in the Gazette; and includes waste generated by the mining, medical or other sector, but – (i) a by-product is not considered waste; and (ii) any portion of waste, once re-used, recycled and recovered, ceases to be waste (NEM:WA, 2008 (Act No. 59 of 2008));
Watercourse	Means - (a) a river or spring; (b) a natural depression in which water flows regularly or intermittently; (c) a wetland, lake or dam into which, or from which, water flows; and (d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks (GN R.982 of NEMA, 1998 (Act No. 107 of 1998));
Wetland	Means land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil (GN R.982 of NEMA, 1998 (Act No. 107 of 1998));

Abbreviations

BID	Background Information Document
BSc	Bachelor of Science
CC	Close Corporation
CoT	City of Tshwane Metropolitan Municipality
C-Plan	Gauteng Conservation Plan Version 3.3
CBA	Critical Biodiversity Area
CBD	Central Business District
DFA	Development Facilitation Act
DWS	Department of Water and Sanitation
GDARD	Gauteng Department of Agriculture and Rural Development
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
ESA	Ecological Support Area
Ha	Hectares
I&AP's	Interested and Affected Parties
IBAs	Important Bird Areas
IDP	Integrated Development Plan
LDO's	Land Development Objectives
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEM:WA	National Environmental Management: Waste Act (Act No. 59 of 2008)
OHSA	Occupational Health and Safety Act
OSF	Open space framework
PoSEIA	Plan of Study for Environmental Impact Assessment
PPE	Personal Protective Equipment
PPP	Public Participation Process
(Pty) Ltd	Proprietary Limited
PWV	Pretoria–Witwatersrand–Vereeniging
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
ToR	Terms of Reference

1. Introduction

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The project is located in the Winterveld area. Road D620 extends from Jakkalas Village in the south to the intersection with provincial road M39 at the North West Province boundary. Road D621 extends from Jakkalas Village in the west across the M39 to the intersection with the surfaced road to Soshanguve (Refer to Volume I: Annexure 1 for Locality Map).

The coordinates for the proposed D620 to be upgraded are as follows:
Start of the activity: 25°26'37.13"S; 28° 0'36.40"E
Middle of the activity: 25°24'42.93"S; 27°59'40.60"E
End of the activity: 25°22'28.49"S; 28° 0'59.48"E

The coordinates for the proposed D621 to be upgraded are as follows:
Start of the activity: 25°26'47.15"S; 28° 0'50.57"E
Middle of the activity: 25°25'47.20"S; 28° 2'4.89"E
End of the activity: 25°25'30.08"S; 28° 2'59.70"E

Figure 1: Google Image indicating the project locality

An application form for the project was submitted to GDARD on 3 July 2017.

2. Terms of Reference

The Environmental Scoping Study provided a description of the receiving environment and how the environment may be affected by the development of the proposed project. Desktop studies making use of existing information were used to highlight and assist in the identification of potential significant impacts (both social and biophysical) associated with the proposed project. Additional issues for consideration were obtained from feedback from the public participation process, which commenced at the beginning of the Scoping Phase, and will continue throughout the duration of the project. All issues identified during this phase of the study were documented within the Scoping Report.

The Scoping report was prepared in terms of Appendix 2 of Regulation 982 (Regulations in terms of Chapter 5 of the NEMA) published on 4 December 2014, and aimed to provide all the information necessary for proper

understanding of the nature of issues identified during the scoping process. Acceptance of the Scoping Report was received on 28 September 2017 from GDARD.

The Environmental Impact Assessment Report (EIAR) has been compiled in accordance with the accepted Final Scoping Report and incorporates the findings and recommendations from the Scoping Process as well as specialist studies conducted for the project. In addition, the EIAR was compiled according to the guidelines provided in Appendix 3 of GNR 982 of the EIA Regulations (2014) and contains the following:

Table 1: EIAR requirements according to Appendix 3 of Regulation 982

Scope of assessment and content of Environmental Impact Assessment report according to Appendix 3 of Regulation 982	**Section in Report**
(3)(1)(a) details of – (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	Section 3 Annexure 4
(3)(1)(b) the location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including: (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; and (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Section 4
(3)(1)(c) a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is- (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Section 4
(3)(1)(d) a description of the scope of the proposed activity, including- (i) all listed and specified activities triggered and being applied for; and (ii) a description of the associated structures and infrastructure related to the development;	Section 5
(3)(1)(e)a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;	Section 6
(3)(1)(f) a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 7
(3)(1)(g) a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 7 and Section 8.4
(3)(1)(h) a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including: (i) details of the development footprint alternatives considered; (ii) details of the Public Participation Process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Section 8, 9, 10, 11, 12 and 14

(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks; (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and (x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	
(3)(1)(i) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including- (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Section 12
(3)(1)(j) an assessment of each identified potentially significant impact and risk, including- (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be mitigated;	Section 12
(3)(1)(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	Section 9 and 12 and Volume IV
(3)(1)(l) an environmental impact statement which contains- (i) a summary of the key findings of the environmental impact assessment: (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section 13 Annexure 3

(3)(1)(m) based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Section 9 and 12 and Volume IV
(3)(1)(n) the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Section 12
(3)(1)(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Section 12 and 14
(3)(1)(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 14.1
(3)(1)(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Section 14
(3)(1)(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	N/A
(3)(1)(s) an undertaking under oath or affirmation by the EAP in relation to - (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	Section 15
(3)(1)(t) where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	N/A
(3)(1)(u) an indication of any deviation from the approved scoping report, including the plan of study, including- (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and (ii) a motivation for the deviation;	N/A
(3)(1)(v) any specific information that may be required by the competent authority; and	N/A
(3)(1)(w) any other matters required in terms of section 24(4)(a) and (b) of the Act.	N/A

An Environmental Management Programme (EMPr) has been compiled for the construction and operational phases for the proposed development. The EMPr has been compiled as a stand-alone document from the EIAR and will be submitted to GDARD.

The EMPr was prepared in terms of Appendix 4 of Regulation 982 (Regulations in terms of Chapter 5 of the NEMA) published on 4 December 2014, and provides the actions for the management of identified environmental impacts emanating from the project and a detailed outline of the implementation programme to minimise and/or eliminate the anticipated negative environmental impacts. The EMPr provides strategies to be

used to address the roles and responsibilities of environmental management personnel on site, and a framework for environmental compliance and monitoring.

In the interest of readability, the EIAR is divided into a number of volumes in order to cover the information above without being overly cumbersome. The volumes are divided as follows:

Volume I: *EIR*

Executive Summary

- Chapter 1: Introduction
- Chapter 2: Terms of Reference
- Chapter 3: The EIA Team
- Chapter 4: Description of the site
- Chapter 5: Scope of the proposed activity
- Chapter 6: Relevant environmental legislation and standards
- Chapter 7: Need and desirability
- Chapter 8: Analyses of Alternatives
- Chapter 9: Description of receiving Environment
- Chapter 10: Public Participation Process
- Chapter 11: Summary of issues raised by I&APs and manner in which issues were incorporated
- Chapter 12: Environmental Impact Assessment
- Chapter 13: Environmental Impact Statement
- Chapter 14: Conclusion and Recommendations
- Chapter 15: Declaration
- Chapter 16: References

Volume II: Specialist Studies

Volume III: Comments & Responses trail

Volume IV: Environmental Management Programme (EMPr)

3. The EIA Team

3.1 Information on the Environmental Assessment Practitioner (EAP)

In terms of the NEMA (as amended), an EAP is defined as "…the individual responsible for the planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management plans or any other appropriate environmental management instruments introduced through regulations." The EAP must be independent, objective and have expertise in conducting environmental

impact assessments. Such expertise should include knowledge of all relevant legislation and of any guidelines that have relevance to the proposed activity.

In order to be independent an EAP or person compiling a specialist report or undertaking a specialised process is to perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant. All material information in the possession of the EAP, or person compiling a specialist report /undertaking a specialised process, that reasonably has, or may have, the potential of influencing any decision to be taken with respect to the application by the competent authority in terms of these regulations are to be disclosed to the applicant and competent authority. Furthermore the objectivity of any report, plan or document to be prepared by the EAP or person compiling a specialist report or undertaking a specialised process, in terms of these regulations for submission to the competent authority should furthermore also be disclosed to the applicant and competent authority.

In order to comply with this requirement an Environmental Impact Sheet was provided that provides information on the author of this report being Delia de Lange, an Environmental Consultant with TGM Environmental Services.

TGM Environmental Services is an Environmental Consulting Company based in Pretoria that provides a broad range of environmental consulting services to the private and public sector.

Delia de Lange has been involved in environmental consulting since 2006 and has expertise in a wide range of environmental disciplines including Environmental Impact Assessments, Environmental Management Plans/Programmes, Auditing and Monitoring, Public Participation and Facilitation. She obtained her Honours degree in Geography from the University of Pretoria during 2005 and worked as an Environmental consultant ever since (Refer to Annexure 4 for Curriculum Vitae).

All reports are reviewed and approved by Elaine Minnaar of TGM Environmental Services which is supported by a team of specialists as in the table below.

Table 2: Project Team

Role on the team	Company	Name
Environmental Consultant	TGM Environmental Services	Delia de Lange
Applicant	Gauteng Department of Roads and Transport	Ernest Mashaba
Engineer	Nyeleti Consulting (Pty) Ltd	Sundran Naicker Stefan van Huyssteen
Ecologist Wetland specialist	Flori Scientific Services	Johannes Maree

4. Description of the site

4.1 Location of the activity

The project entails the upgrading of Road D620 & Road D621 from gravel to surfaced roads. Road D620 will be upgraded to a dual carriageway, approximately 9.3 km in length, with a proposed road reserve of 62 metres. Road D621 will remain a single carriageway, approximately 4.4 km in length, with a proposed road reserve of 30 metres. Existing stormwater infrastructure will be replaced, and/or upgraded, and/or cleaned and new stormwater infrastructure will be constructed.

The project is located in the Winterveld area. Road D620 extends from Jakkalas Village in the south to the intersection with provincial road M39 at the North West Province boundary. Road D621 extends from Jakkalas Village in the west across the M39 to the intersection with the surfaced road to Soshanguve (Refer to **Annexure 1** for **Locality Map**).

The coordinates for the proposed D620 to be upgraded are as follows:
Start of the activity: 25°26'37.13"S; 28° 0'36.40"E
Middle of the activity: 25°24'42.93"S; 27°59'40.60"E
End of the activity: 25°22'28.49"S; 28° 0'59.48"E

The coordinates for the proposed D621 to be upgraded are as follows:
Start of the activity: 25°26'47.15"S; 28° 0'50.57"E
Middle of the activity: 25°25'47.20"S; 28° 2'4.89"E
End of the activity: 25°25'30.08"S; 28° 2'59.70"E

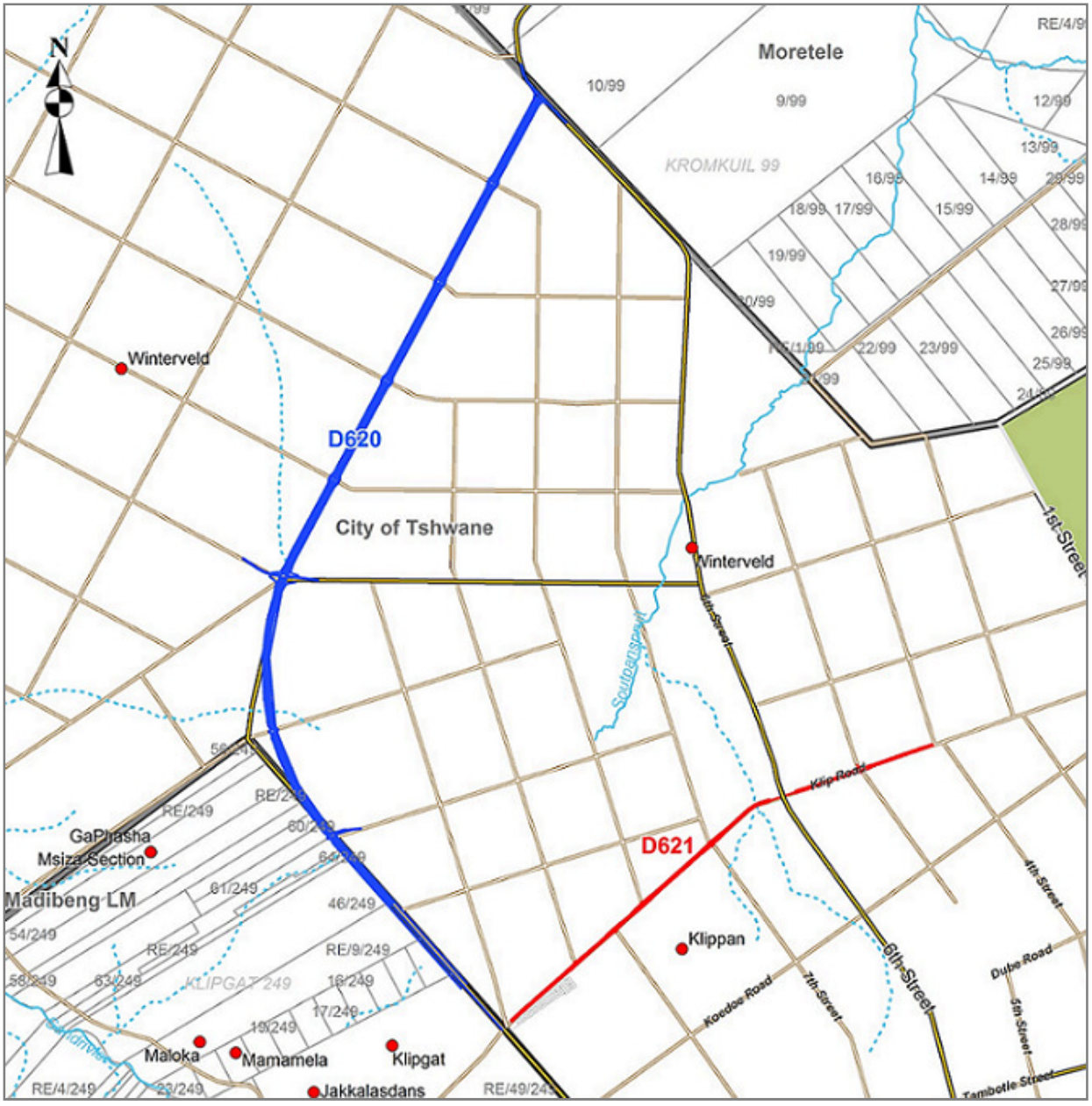

Figure 2: Locality Map

4.2 Surrounding Land uses

The site is located in an area characterised by low density residential uses with minor commercial activities to support the local communities. With the surfacing of the road it is anticipated that residential densification will take place. It is also anticipated that the road will be used as a public transport route.

The table below provides the property descriptions and the 21 digit Surveyor General codes for the properties adjacent to Road D620 and Road D621.

Table 3: Property Descriptions and 21 Digit Surveyor General Codes

Property descriptions	21 Digit surveyor general codes
Road D620	
Holding 1060 Winterveld Agricultural Holdings	T0JR02920000106000000
Holding 493 Winterveld Agricultural Holdings	T0JR02920000049300000
Holding 492 Winterveld Agricultural Holdings	T0JR02920000049200000
Holding 488 Winterveld Agricultural Holdings	T0JR02920000048800000
Holding 487 Winterveld Agricultural Holdings	T0JR02920000048700000
Holding 484 Winterveld Agricultural Holdings	T0JR02920000048400000
Holding 483 Winterveld Agricultural Holdings	T0JR02920000048300000
Holding 480 Winterveld Agricultural Holdings	T0JR02920000048000000
Holding 479 Winterveld Agricultural Holdings	T0JR02920000047900000
Holding 476 Winterveld Agricultural Holdings	T0JR02920000047600000
Holding 475 Winterveld Agricultural Holdings	T0JR02920000047500000
Holding 474 Winterveld Agricultural Holdings	T0JR02920000047400000
Holding 470 Winterveld Agricultural Holdings	T0JR02920000047000000
Holding 469 Winterveld Agricultural Holdings	T0JR02920000046900000
Holding 466 Winterveld Agricultural Holdings	T0JR02920000046600000
Holding 465 Winterveld Agricultural Holdings	T0JR02920000046500000
Holding 462 Winterveld Agricultural Holdings	T0JR02920000046200000
Holding 460 Winterveld Agricultural Holdings	T0JR02920000046000000
Holding 459 Winterveld Agricultural Holdings	T0JR02920000045900000
Holding 458 Winterveld Agricultural Holdings	T0JR02920000045800000
Holding 457 Winterveld Agricultural Holdings	T0JR02920000045700000
Holding 425 Winterveld Agricultural Holdings	T0JR02920000042500000
Holding 169 Winterveld Agricultural Holdings	T0JR02920000016900000
Holding 167 Winterveld Agricultural Holdings	T0JR02920000016700000
Holding 166 Winterveld Agricultural Holdings	T0JR02920000016600000
Holding 162 Winterveld Agricultural Holdings	T0JR02920000016200000
Holding 161 Winterveld Agricultural Holdings	T0JR02920000016100000
Holding 157 Winterveld Agricultural Holdings	T0JR02920000015700000
Holding 156 Winterveld Agricultural Holdings	T0JR02920000015600000
Holding 153 Winterveld Agricultural Holdings	T0JR02920000015300000
Holding 152 Winterveld Agricultural Holdings	T0JR02920000015200000
Holding 150 Winterveld Agricultural Holdings	T0JR02920000015000000
Holding 149 Winterveld Agricultural Holdings	T0JR02920000014900000
Holding 42 Winterveld Agricultural Holdings	T0JR02920000004200000
Holding 39 Winterveld Agricultural Holdings	T0JR02920000003900000
Holding 38 Winterveld Agricultural Holdings	T0JR02920000003800000
Holding 37 Winterveld Agricultural Holdings	T0JR02920000003700000
Holding 36 Winterveld Agricultural Holdings	T0JR02920000003600000
Holding 35 Winterveld Agricultural Holdings	T0JR02920000003500000
Holding 32 Winterveld Agricultural Holdings	T0JR02920000003200000
Holding 31 Winterveld Agricultural Holdings	T0JR02920000003100000
Holding 28 Winterveld Agricultural Holdings	T0JR02920000002800000
Holding 27 Winterveld Agricultural Holdings	T0JR02920000002700000
Holding 3 Winterveld Agricultural Holdings	T0JR02920000000300000
Holding 1 Winterveld Agricultural Holdings	T0JR02920000000100000
Holding 635 Winterveld Agricultural Holdings	T0JR02920000063500000
Holding 636 Winterveld Agricultural Holdings	T0JR02920000063600000
Holding 730 Winterveld Agricultural Holdings	T0JR02920000073000000

Holding 731 Winterveld Agricultural Holdings	T0JR02920000073100000
Holding 732 Winterveld Agricultural Holdings	T0JR02920000073200000
Holding 733 Winterveld Agricultural Holdings	T0JR02920000073300000
Holding 835 Winterveld Agricultural Holdings	T0JR02920000083500000
Holding 834 Winterveld Agricultural Holdings	T0JR02920000083400000
Holding 836 Winterveld Agricultural Holdings	T0JR02920000083600000
Holding 1063 Winterveld Agricultural Holdings	T0JR02920000106300000
Holding 837 Winterveld Agricultural Holdings	T0JR02920000083700000
Holding 935 Winterveld Agricultural Holdings	T0JR02920000093500000
Holding 1021 Winterveld Agricultural Holdings	T0JR02920000102100000
Holding 1022 Winterveld Agricultural Holdings	T0JR02920000102200000
Portion 46 of the Farm Klipgat 249 - JQ	T0JQ00000000024900046
RE Portion 9 of the Farm Klipgat 249 - JQ	T0JQ00000000024900009
Portion 13 of the Farm Klipgat 249 - JQ	T0JQ00000000024900013
Portion 49 of the Farm Klipgat 249 - JQ	T0JQ00000000024900049
Road D621	
Holding 1060 Winterveld Agricultural Holdings	T0JR02920000106000000
Holding 494 Winterveld Agricultural Holdings	T0JR02920000049400000
Holding 539 Winterveld Agricultural Holdings	T0JR02920000053900000
Holding 540 Winterveld Agricultural Holdings	T0JR02920000054000000
Holding 541 Winterveld Agricultural Holdings	T0JR02920000054100000
Holding 542 Winterveld Agricultural Holdings	T0JR02920000054200000
Holding 569 Winterveld Agricultural Holdings	T0JR02920000056900000
Holding 570 Winterveld Agricultural Holdings	T0JR02920000057000000
Holding 571 Winterveld Agricultural Holdings	T0JR02920000057100000
Holding 572 Winterveld Agricultural Holdings	T0JR02920000057200000
Holding 593 Winterveld Agricultural Holdings	T0JR02920000059300000
Holding 594 Winterveld Agricultural Holdings	T0JR02920000059400000
Holding 1147 Winterveld Agricultural Holdings Ext 1	T0JR02920000114700000
Holding 1140 Winterveld Agricultural Holdings Ext 1	T0JR02920000114000000
Holding 1132 Winterveld Agricultural Holdings Ext 1	T0JR02920000113200000
Holding 1123 Winterveld Agricultural Holdings Ext 1	T0JR02920000112300000
Holding 1114 Winterveld Agricultural Holdings Ext 1	T0JR02920000111400000
Holding 1105 Winterveld Agricultural Holdings Ext 1	T0JR02920000110500000
Holding 1098 Winterveld Agricultural Holdings Ext 1	T0JR02920000109800000
Holding 1091 Winterveld Agricultural Holdings Ext 1	T0JR02920000109100000
Holding 1073 Winterveld Agricultural Holdings Ext 1	T0JR02920000107300000
Holding 1066 Winterveld Agricultural Holdings Ext 1	T0JR02920000106600000

5. Scope of the proposed activity

5.1 Nature of Development

The project entails the upgrading of Road D620 & Road D621 from gravel to surfaced roads. Road D620 will be upgraded to a dual carriageway, approximately 9.3 km in length, with a proposed road reserve of 62 metres. Road D621 will remain a single carriageway, approximately 4.4 km in length, with a proposed road reserve of 30 metres. Existing stormwater infrastructure will be replaced, and/or upgraded, and/or cleaned and new stormwater infrastructure will be constructed.

5.2 PWV Planning

Road D621 is a key route in the PWV network linking the proposed K217 in the east and the secondary route NW214 (D603) in the south-west. Road D620 links the afore-mentioned D621 in the south and the NW2 (D604/M39) in the north. Road D620 also intersects with secondary route NWD615, which link PWV6 in the west and PWV9 in the east.

Recent information obtained illustrates that the PWV network for this area has been amended to realign the K2 along Road D620. It is for this reason that the original appointment was amended from "gravel to surfaced upgrade" to full K route standards.

5.3 Accesses and intersections

The current access orientation is informal. The operations currently show that accesses are established and closed as and when required. The establishment of future accesses will have to be in line with provincial standards. Should the land use change, formal access applications should be requested.

The Gautrans guidelines recommend that intersections are spaced 600m apart with a minimum spacing of 500m (approval of the Chief Director is required). The guideline also recommends that provision be made for access to individual properties by means of additional service roads.

The existing intersection spacing and orientation requires additional service roads to provide access to the individual properties.

5.4 Storm Water Infrastructure

5.4.1 Road D620

The tables below provide a description of the proposed storm water infrastructure for Road D620 to include co-ordinates, size and type of culverts/pipes and in the case of replacements the details of the existing infrastructure.

Table 4: Road D620 - Existing storm water infrastructure to be replaced

Chainage:	Coordinates:	Pipe Descriptions:
Ch 0+432	25°26'26.73"S 28° 0'26.19"E	3 x 450mm Ø Pipe Culvert
Ch 1+560	25°25'59.12"S 27°59'59.59"E	1 x 600mm Ø Pipe Culvert
Ch 6+011	25°23'48.83"S 28° 0'13.06"E	1 x 450mm Ø Pipe Culvert
Ch 6+975	25°23'21.04"S 28° 0'28.60"E	1 x 450mm Ø Pipe Culvert
Ch 8+788	25°22'29.29"S 28° 0'59.50"E	1 x 1200x900mm Ø Box Culvert

Table 5: Road D620 - New storm water infrastructure

Chainage:	Coordinates:	Pipe Descriptions:
Ch 1+569	25°25'59.31"S 27°59'58.84"E	2 x 900mm Ø Pipe Culvert
Ch 1+636	25°25'57.70"S 27°59'57.25"E	4 x 900x600mm Ø Box Culverts
Ch 1+712	25°25'55.73"S 27°59'55.49"E	3 x 900x450mm Ø Box Culverts
Ch 1+724	25°25'56.09"S 27°59'54.32"E	1 x 600mm Ø Pipe Culvert
Ch 2+761	25°25'26.41"S 27°59'36.49"E	1 x 600x450mm Ø Box Culvert
Ch 2+766	25°25'25.90"S 27°59'38.81"E	5 x 900x450mm Ø Box Culverts
Ch 2+934	25°25'20.79"S 27°59'36.19"E	4 x 900mm Ø Pipe Culverts
Ch 4+109	25°24'42.76"S 27°59'39.22"E	1 x 600mm Ø Pipe Culvert
Ch 4+140	25°24'43.20"S 27°59'43.26"E	5 x 900x450mm Ø Box Culverts
Ch 4+328	25°24'36.79"S 27°59'43.90"E	3 x 900mm Ø Pipe Culverts
Ch 5+056	25°24'15.93"S 27°59'56.22"E	3 x 600x450mm Ø Box Culverts
Ch 5+253	25°24'10.32"S 27°59'59.50"E	1 x 600mm Ø Pipe Culvert
Ch 6+015	25°23'48.03"S 28° 0'11.43"E	1 x 600mm Ø Pipe Culvert
Ch 6+015	25°23'48.95"S 28° 0'13.37"E	1 x 600mm Ø Pipe Culvert
Ch 6+820	25°23'25.38"S 28° 0'25.90"E	7 x 1500x900mm Ø Box Culverts
Ch 6+985	25°23'20.64"S 28° 0'28.72"E	4 x 750x450mm Ø Box Culverts
Ch 7+942	25°22'52.86"S 28° 0'43.82"E	1 x 600mm Ø Pipe Culvert
Ch 7+957	25°22'52.82"S 28° 0'45.06"E	3 x 600x450mm Ø Box Culverts
Ch 8+170	25°22'46.67"S 28° 0'48.63"E	1 x 600mm Ø Pipe Culvert
Ch 8+799	25°22'29.00"S 28° 0'59.43"E	1 x 600x450mm Ø Box Culvert

5.4.2 Road D621

The tables below provide a description of the proposed storm water infrastructure for Road D621 to include co-ordinates and the size and type of culverts/pipes.

Table 6: Road D621 - Existing storm water infrastructure to be upgraded and/or cleaned

Chainage:	Coordinates:	Pipe Descriptions:
Ch 0+995	25°26'25.87"S 28° 1'17.21"E	2 x 1.2m x 0.9m Box Culverts
Ch 2+800	25°25'47.08"S 28° 2'5.58"E	2 x 1.5m x 0.9m Box Culverts

Table 7: Road D621 - New storm water infrastructure

Chainage:	Coordinates:	Pipe Descriptions:
Ch 4+220	25°25'32.24"S 28° 2'53.62"E	1 x 900mm Ø Pipe Culvert
Ch 4+340	25°25'30.93"S 28° 2'57.74"E	1 x 900mm Ø Pipe Culvert

5.5 Listed activities triggered by the proposed development

The EIA process, applicable to this application, is determined by the Environmental Impact Regulations published in Government Notice R982 in Government Gazette No 38282 of 4 December 2014 promulgated under Chapter 5 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

The EIA regulations inter alia describe the procedure for EIA and provide a description of activities that would require authorisation through Scoping and Environmental Impact Assessment (in terms of Government Notice R984 of 2014).

The following activities are triggered by the proposed development:

Table 8: Listed activities triggered by the proposed development

Number and date of the relevant notice	Activity no (s)	Description of listed activity
GN R983 of 4 December 2014	Listing Notice 1 Activity 19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse. **Construction will take place within a watercourse and will entail excavation, the removal or moving of soil and the infilling or depositing of material of more than 10 cubic metres into a watercourse.**
GN R984 of 4 December 2014	Listing Notice 2 Activity 27	The development of a road - (iii) with a reserve wider than 30 metres; or (iv) catering for more than one lane of traffic in both directions. **The upgraded road will have a proposed road reserve of 62 metres and will cater for more than one lane of traffic in both directions.**
GN R985 of 4 December 2014	Listing Notice 3 Activity 12	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. c. Gauteng i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within Critical Biodiversity Areas or Ecological Support Areas identified in the Gauteng Conservation Plan or bioregional plans; or iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space,

		conservation or had an equivalent zoning. **The activity falls within an Ecological Support Area identified in the City of Tshwane bioregional plan.**
GN R985 of 4 December 2014	Listing Notice 3 Activity 14	The development of – (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs — (a) within a watercourse; c. Gauteng i. A protected area identified in terms of NEMPAA, excluding conservancies; ii. National Protected Area Expansion Strategy Focus Areas; iii. Gauteng Protected Area Expansion Priority Areas; iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act: Biodiversity Act (Act No. 10 of 2004); vi. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority; vii. Sites or areas identified in terms of an international convention; viii. Sites managed as protected areas by provincial authorities, or declared as nature reserves in terms of the Nature Conservation Ordinance (Ordinance 12 of 1983) or the NEMPAA; ix. Sites designated as nature reserves in terms of municipal Spatial Development Frameworks; or x. Sites zoned for conservation use or public open space or equivalent zoning. **Construction will take place within a watercourse and the activity falls within an Ecological Support Area identified in the Gauteng Conservation Plan and City of Tshwane bioregional plan.**

As the proposed development triggers activities that require a full Scoping/ EIA, an application is submitted in terms of Chapter 4 of the EIA Regulations.

6. Relevant environmental legislation and standards

This section provides a description of the policy and legislative context within which the development is proposed. The policy and legislative context discussed are to be considered in the assessment process.

It is particularly of relevance as it illustrates to the relevant adjudicating authority that the EAP and the applicant are both aware of the legal requirements and will comply with the necessary legislation.

6.1 The Constitution of South Africa

The development has to comply with environmental right in the Bill of Rights in the Constitution of the Republic of South Africa (Act 108 of 1996), which reads as follows (Chapter 2, section 24): "Everyone has the right a) to an environment that is not harmful to their health or well-being: and b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:

i) prevent pollution and ecological degradation;
ii) promote conservation; and
iii) secure sustainable development and use of natural resources while promoting justifiable economic and social development."

6.2 National Environmental Management Act (Act 107 of 1998)(NEMA)

NEMA establishes the basis for environmental governance and sets out the principles for decision-making on matters affecting the environment. The principles of the Act are provided in Section 2 and it is the responsibility of all organs of state to take these principles into account when making decisions that could affect the environment.

In terms of the NEMA principles, the following are of particular relevance to the development:

a) Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interest equitably.
b) Development must be socially, environmentally and economically sustainable.
c) Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option (section 2(4)(b)).
d) Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (section 2(4)(c)).
e) Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued and special measures may be taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination (section 2(4)(d)).
f) The participation of all Interested and Affected Parties in environmental governance must be promoted, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured (section 2(4)(f)).
g) Decisions must take into account the interests, needs and values of all Interested and Affected Parties, and this includes recognizing all forms of knowledge, including traditional and ordinary knowledge (section 2 (4) (g)).

h) The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment (section 2(4)(i)).

i) Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure (section 2(4)(r)).

Sustainable development requires the integration of social, economic and environmental practices in the planning, implementation and evaluation of decisions. This integration will ensure that development serves present and future generations. Development has to be done in the manner provided for in the National Environmental Management Act and based on the following environmental management principles:

- Prevention of pollution and ecological degradation,
- Promotion of conservation;
- Secure ecologically sustainable development and use of natural resources;
- Promotion of justifiable economic and social development.

It is obvious from the Act that government is ultimately responsible for environmental impact assessments and for taking action to prevent harm to, or the degradation of, natural, socio-economic and cultural environment.

6.2.1 EIA Regulations (2014)

The NEMA EIA Regulations (2014), which replaced the EIA Regulations (2010), were promulgated and came into effect on 04 December 2014. These Regulations regulate the procedure and criteria as contemplated in Chapter 5 of the Act relating to the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations for the commencement of activities, subjected to environmental impact assessment, in order to avoid or mitigate detrimental impacts on the environment, and to optimise positive environmental impacts, and for matters pertaining thereto.

The nature of the proposed project triggers activities listed in GNR 983, 984 and 985 (Listing Notice 1, 2 and 3) of the EIA Regulations (2014) and is described in Section 5.5 of this report.

6.3 National Water Act (Act No. 36 of 1998)

The purpose of this act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which takes into account amongst other factors:

- Meeting the basic human needs of present and future generations,
- Promoting equitable access to water;
- Redressing the results of past racial and gender discrimination;

- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitating social and economic development;
- Providing for growing demand for water;
- Protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources;
- Meeting international obligations;
- Promoting dam safety;
- Managing floods and drought.

In terms of the act "Pollution" means the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it:

a) less fit for any beneficial purpose for which it may reasonably be expected to be used; or
b) harmful or potentially harmful –
    - to the welfare, health or safety of human beings;
    - to any aquatic or non-aquatic organism;
    - to the resource quality; or
    - to property.

"Water resource" includes a watercourse, surface water, estuary or aquifer.

Section 19 deals with the situations where pollution of water resources occurs or might occur as a result of activities on land. The person who owns, controls, occupies or uses the land in question is responsible for taking measures to prevent pollution of water resources.

"Waste" is defined as "any solid material or material that is suspended, dissolved or transported in water (including sediment) and which is spilled or deposited on land or into a water resource in such volume, composition or manner as to cause, or to be reasonably likely to cause, the water resource to be polluted".

An application for a Water Use Licence for Section 21 (c & i) water uses will be submitted to the Department of Water and Sanitation on receipt of a positive outcome of the EIA application.

6.4 National Road Traffic Act (Act No. 93 of 1996)

The Act provides for all road traffic matters which shall apply uniformly throughout the Republic and for matters connected therewith, and relates to road safety.

6.5 Road Transportation Act (Act No.74 of 1977)

The Act provides for the control of certain forms of road transportation and for matters connected therewith.

6.6 Gauteng Transport Infrastructure Act (Act No. 8 of 2001) as amended

The purpose of the Act is to consolidate the laws relating to roads and other types of transport infrastructure in Gauteng; and to provide for the planning, design, development, construction, financing, management, control, maintenance, protection and rehabilitation of provincial roads, railway lines and other transport infrastructure in Gauteng and to provide for matters connected therewith.

The Act allows for a legal mechanism to protect and amend route alignments and preliminary designs undertaken by the GPDRT.

6.7 National Heritage Resources Act (Act No. 25 of 1999)

Heritage resources have lasting value in their own right and provide evidence of the origins of South African society and, as they are valuable, finite, non-renewable and irreplaceable, they must be carefully managed to ensure their survival.

Every generation has a moral responsibility to act as trustee of the national heritage for succeeding generations and the State has an obligation to manage heritage resources in the interest of all South Africans.

The Act provides for four categories of protected areas:

- National and provincial heritage sites;
- Protected areas;
- Heritage areas; and
- Archaeological and paleontological sites.

The Act stipulates that any person who intends to undertake a development "must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with detail regarding the location, nature and extent of the proposed development".

A Heritage Impact Assessment is currently being conducted for the project site and the results thereof will be included in the Final EIAR.

6.8 Conservation of Agricultural Resources Act (Act No. 43 of 1983)

The purpose of the Act is to provide control over the utilisation of natural resources in South Africa such as soil, water sources and vegetation.

The objective is to maintain the production potential of land, combat and prevent erosion and weakening or destruction of water resources and protect the vegetation and combat weeds and invader plants.

Control measures are specified in terms of Regulation 1048 of 25 May 1984 being:

- Cultivation of virgin soil;
- Cultivation of land with a slope;
- Protection of cultivated land against wind and water erosion;
- Prevention of water logging and salination of land;
- Utilization and protection of wetlands, marshes, water sponges and water courses;
- Regulating the flow pattern of run-off water;
- Utilization and protection of veld;
- Grazing capacity of veld;
- Number of animals that may be kept on veld;
- Prevention and control of veld fires;
- Restoration and reclamation of eroded land;
- Restoration and reclamation of disturbed or denuded land.

6.9 The Gauteng Conservation Plan

Conservation planning was started in Gauteng in the year 2000 and the aim was to revise the C-Plan at least every 5 years. C-Plan Version 1 was produced in 2001 and was followed by version 2 in 2005. Version 2 was refined in 2007. The small size of the province made it feasible to conduct an extensive biodiversity survey, named BGAP, which aimed to provide the information on spatial occurrence of biodiversity necessary for rigorous conservation planning. C-Plan 3 represents priority areas for biodiversity conservation in the Gauteng province.

The C-Plan v3.3 provides a map of priority areas where development and habitat transformation and fragmentation should be discouraged and conservation efforts should be focused.

In terms of the C-Plan v3.3 as per the extract below the site falls within an Ecological Support Area.

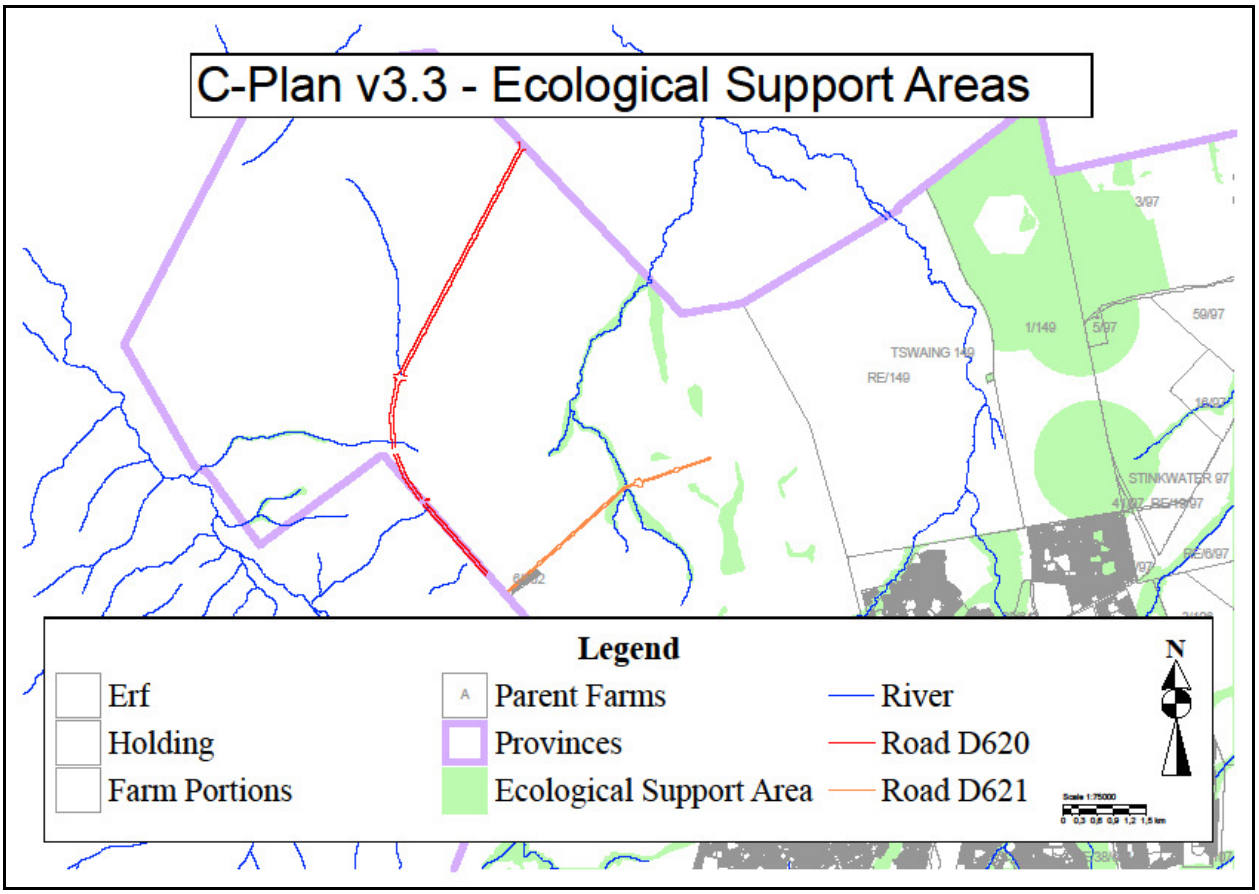

Figure 3: C-Plan 3.3 information of the study site

6.10 The Gauteng Provincial Environmental Management Framework

The objective of the Gauteng Provincial Environmental Management Framework, 2015 (GPEMF, 2015) is to guide sustainable land use management within the Gauteng Province. The GPEMF, inter alia, serve the following purposes:

- To provide a strategic and overall framework for environmental management in Gauteng;
- Align sustainable development initiatives with the environmental resources, developmental pressures, as well as the growth imperatives of Gauteng;
- Determine geographical areas where certain activities can be excluded from an EIA process; and
- Identify appropriate, inappropriate and conditionally compatible activities in various Environmental Management Zones in a manner that promotes proactive decision-making.

According to the GPEMF, the site is identified as Environmental Management Zone 3 and Zone 4. This means that the proposed development is conditionally compatible with the intention of Zone 3 and compatible with the intention of Zone 4. The intentions for zones 3 and 4 are described as follows:

Zone 3: High control zone (outside the urban development zone)

Special control zones are sensitive areas outside the urban development zone. These areas are sensitive to development activities and in several cases also have specific values that need to be protected.

Zone 4: Normal control zone

This zone is dominated by agricultural uses outside the urban development zone as defined in the Gauteng Spatial Development Framework. No listed activities may be excluded from environmental assessment requirements in this zone.

Therefore the GPEMF, 2015, will only support the proposed development if the site falls within zone 4 and will conditionally support the proposed development if it falls within zone 3.

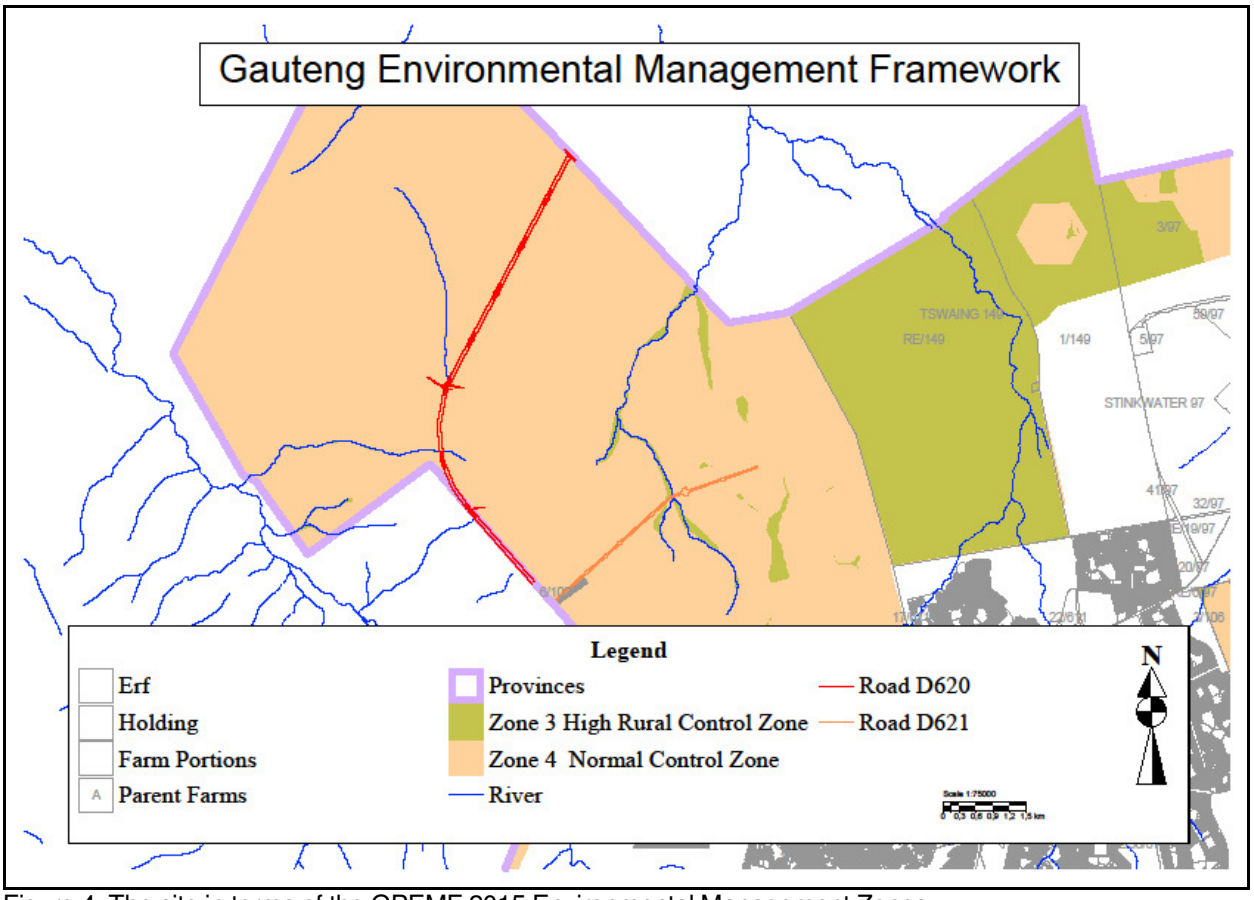

Figure 4: The site in terms of the GPEMF 2015 Environmental Management Zones

6.11 Land Development Objectives / Integrated Development Plan

All local authorities are, in terms of the Development Facilitation Act, 1995 (Act 67 of 1995) DFA and the local Government Transition Act, Second Amendment Act, 1993 (Act 209 of 1993), required to formulate Land Development Objectives (LDO's) and Integrated Development Plans (IDP's) for its area of jurisdiction.

Local municipalities in South Africa have to use "integrated development planning" as a method to plan future development in their areas. Apartheid planning left us with cities and towns that:

- Have racially divided business and residential areas.
- Are badly planned to cater for the poor - with long travelling distances to work and poor access to business and other services.
- Have great differences in level of services between rich and poor areas.
- Have sprawling informal settlements and spread out residential areas that make cheap service delivery difficult.

Rural areas were left underdeveloped and largely un-serviced. The new approach to local government has to be developmental and aims to overcome the poor planning of the past. Integrated Development Planning is an approach to planning that involves the entire municipality and its citizens in finding the best solutions to achieve good long-term development.

An Integrated Development Plan is a super plan for an area that gives an overall framework for development. It aims to co-ordinate the work of local and other spheres of government in a coherent plan to improve the quality of life for all the people living in an area. It should take into account the existing conditions and problems and resources available for development. The plan should look at economic and social development for the area as a whole. It must set a framework for how land should be used, what infrastructure and services are needed and how the environment should be protected.

6.11.1 City of Tshwane Spatial Development Framework (SDF)

The Spatial Development Framework report is a component of the Integrated Development Plan which spells out Tshwane's developmental priorities. It focuses on how space will be developed and is targeted at all residents. However, its main purpose is to inform developers about patterns of future development in the city.

The project site falls in Region 1 within the City of Tshwane Metropolitan Municipality and is discussed in more detail in Section 6.11.3.

6.11.2 City of Tshwane Open Space Framework (OSF)

Open Space as defined by the Tshwane Open Space Framework adds ecological, social, economic and place making value to any development, and the integration and appropriate response of development to open space must at all times be facilitated

6.11.3 Region 1

The project site falls in Region 1 within the City of Tshwane Metropolitan Municipality (CoT). Region 1 is situated in the north-western part of the Metropolitan area, to the north-west of the CBD and to the west of the Wonderboom area.

The region can be reached via the R80-Mabopane Highway (PWV 9), which links the region with the central regions of the metropolitan area. The Bakwena Platinum Highway (PWV 2) that links the region with the N1 freeway to the east and to the west links the area with Rustenburg and the Northwest Province. Generally regional accessibility within this area is poor although the PWV2 has improved the situation considerably since its construction.

An estimated population figure for this area suggests 811 570 people according to 2011 Census. The population generally has low-income levels. 40% of the population reported during the 2001 Census to have no formal income and 16% of the population earned a monthly income of less than R1 600,00 (City of Tshwane, 2017).

7. Need and Desirability

The development in this area is predominantly residential. The upgrading of the D620 link road between the M39 in the north and Jakkalas Village in the south in combination with the D621 link road between the M39 in the east and Jakkalas Village will significantly improve connectivity between these regions. This will promote future development and improve the quality of life for the local people.

Road D621 is a key route in the PWV network linking the proposed K217 in the east and the secondary route NW214 (D603) in the south-west. Road D620 links the afore-mentioned D621 in the south and the NW2 (D604/M39) in the north. Road D620 also intersects with secondary route NWD615, which link PWV6 in the west and PWV9 in the east. Recent information obtained illustrates that the PWV network for this area has been amended to realign the K2 along Road D620. It is for this reason that the road is proposed for upgrade to full K route standards. Roads D620 and D621 are significant roads in the Gauteng road network as it will enhance mobility and promote development in the area.

With the surfacing of the road it is anticipated that residential densification will take place. It is also anticipated that the road will be used as a public transport route.

8. Analysis of Alternatives

In terms of the NEMA Regulations, 2014, the definition of alternatives is given as:

'**Alternatives**' in relation to a proposed activity, means different means of meeting the general purpose and requirement of the activity, which may include alternatives to the –
(a) property on which or location where the activity is proposed to be undertaken;
(b) type of activity to be undertaken;
(c) design or layout of the activity;
(d) technology to be used in the activity; or
(e) operational aspects of the activity;
and includes the option of not implementing the activity;

The following alternatives were investigated during the EIA phase:

8.1 No-go option

The No-go option is considered to be the most undesired alternative.

It is anticipated that residential densification will take place as a result of the surfacing of the road and that it will significantly improve connectivity between these regions, which will promote future development in the area.

Roads D620 and D621 are significant roads in the Gauteng road network as it will enhance mobility and it is also anticipated that the road will be used as a public transport route. This will also improve the quality of life for the local people.

The No-go option will have no impact on the environment, but not implementing the project will fail to provide the community with the benefits as discussed.

This option will also not contribute to providing basic quality infrastructure to the area or provide employment opportunities to members of the community during the construction phase.

8.2 Location alternative

The project entails the upgrading of Road D620 & Road D621 from gravel to surfaced roads, with Road D620 to be upgraded to a dual carriageway. The route alignment for these road is therefore fixed.

No reasonable or feasible alternatives in terms of the property on which or the location where it is proposed to undertake the activity could therefore be investigated.

8.3 Type of activity alternatives

The project entails the upgrading of Road D620 & Road D621 from gravel to surfaced roads, with Road D620 to be upgraded to a dual carriageway.

No reasonable or feasible alternatives in terms of the type of activity to be undertaken could therefore be investigated.

8.4 Design / Layout alternatives

The project entails the upgrading of Road D620 & Road D621 from gravel to surfaced roads, with Road D620 to be upgraded to a dual carriageway. The route alignment for these road is therefore fixed. No reasonable or feasible alternatives in terms of the layout of the activity could therefore be investigated.

The following designs were evaluated: Alternative 1: Upgrade of roads to a flexible pavement; Alternative 2: Upgrade of roads to a rigid pavement. Pavement in this context refers to the road surface.

According to the SANRAL website the primary functions of a pavement area to:

- Provide a reasonably smooth riding surface:
  A smooth riding surface (Low Roughness) is essential for riding comfort, and over the years it has become the measure of how road users perceive a road. Roughness can arise from a number of causes, most often however it is from pavement distress due to structural deformation. Roughness is the distress parameter used by the vehicle operating cost sub-models of a pavement management system, to estimate the timing, type and cost of maintenance needs.
- Provide adequate surface friction (skid resistance):
  In addition to a riding comfort, the other road user requirement is that of safety. Safety, especially during wet conditions can be linked to a loss of surface friction between the tyre and the pavement surface. A pavement must therefore provide sufficient surface friction and texture to ensure road user safety under all conditions.
- Protect the subgrade:

The supporting soil beneath the pavement is commonly referred to as the subgrade, should it be over-stressed by the applied axle loads it will deform and lose its ability to properly support these axle loads. Therefore, the pavement must have sufficient structural capacity (strength and thickness) to adequately reduce the actual stresses so that they do not exceed the strength of the subgrade. The strength and thickness requirements of a pavement can vary greatly depending on the combination of subgrade type and loading condition (magnitude and number of axle loads).

- Provide waterproofing:
  The pavement surfacing acts as a waterproofing surface that prevent the underlaying support layers including the subgrade from becoming saturated through moisture ingress. When saturated, soil loses its ability to adequately support the applied axle loads, which will lead to premature failure of the pavement (SANRAL, 2017).

There are numerous factors influencing the performance of a pavement, the following five are considered the most influential:

- Traffic:
  Traffic is the most important factor influencing pavement performance. The performance of pavements is mostly influenced by the loading magnitude, configuration and the number of load repetitions by heavy vehicles. The damage caused per pass to a pavement by an axle is defined relative to the damage per pass of a standard axle load, which is defined as a 80 kN single axle load (E80). Thus a pavement is designed to withstand a certain number of standard axle load repetitions (E80's), that will result in a certain terminal condition of deterioration.
- Moisture (water):
  Moisture can significantly weaken the support strength of natural gravel materials, especially the subgrade. Moisture can enter the pavement structure through cracks and holes in the surface, laterally through the subgrade, and from the underlying water table through capillary action. The result of moisture ingress is the lubrication of particles, loss of particle interlock and subsequent particle displacement resulting in pavement failure.
- Subgrade:
  The subgrade is the underlying soil that supports the applied wheel loads. If the subgrade is too weak to support the wheel loads, the pavement will flex excessively which ultimately causes the pavement to fail. If natural variations in the composition of the subgrade are not adequately addressed by the pavement design, significant differences in pavement performance will be experienced.
- Construction Quality:
  Failure to obtain proper compaction, improper moisture conditions during construction, quality of materials, and accurate layer thickness (after compaction) all directly affect the performance of a pavement. These conditions stress the need for skilled staff, and the importance of good inspection and quality control procedures during construction.

- Maintenance:

  Pavement performance depends on what, when, and how maintenance is performed. No matter how well the pavement is built, it will deteriorate over time based upon the mentioned factors. The timing of maintenance is very important, if a pavement is permitted to deteriorate to a very poor condition, as illustrated by point B in the figure below, then the added life compared with point A, is typically about 2 to 3 years. This added life would present about 10 percent of the total life. The cost however of repairing the road at point B is minimum four times the cost if the road had been repaired at point A. The postponement of maintenance hold further implications, in that for the cost of repairing one badly deteriorated road (Point B), four roads at point A would have to be deferred, which would mean that in a few years the rehabilitation cost could be 16 times as much. Thus, postponing maintenance because of budget constraints, will result in a significant financial penalty within a few years (SANRAL, 2017).

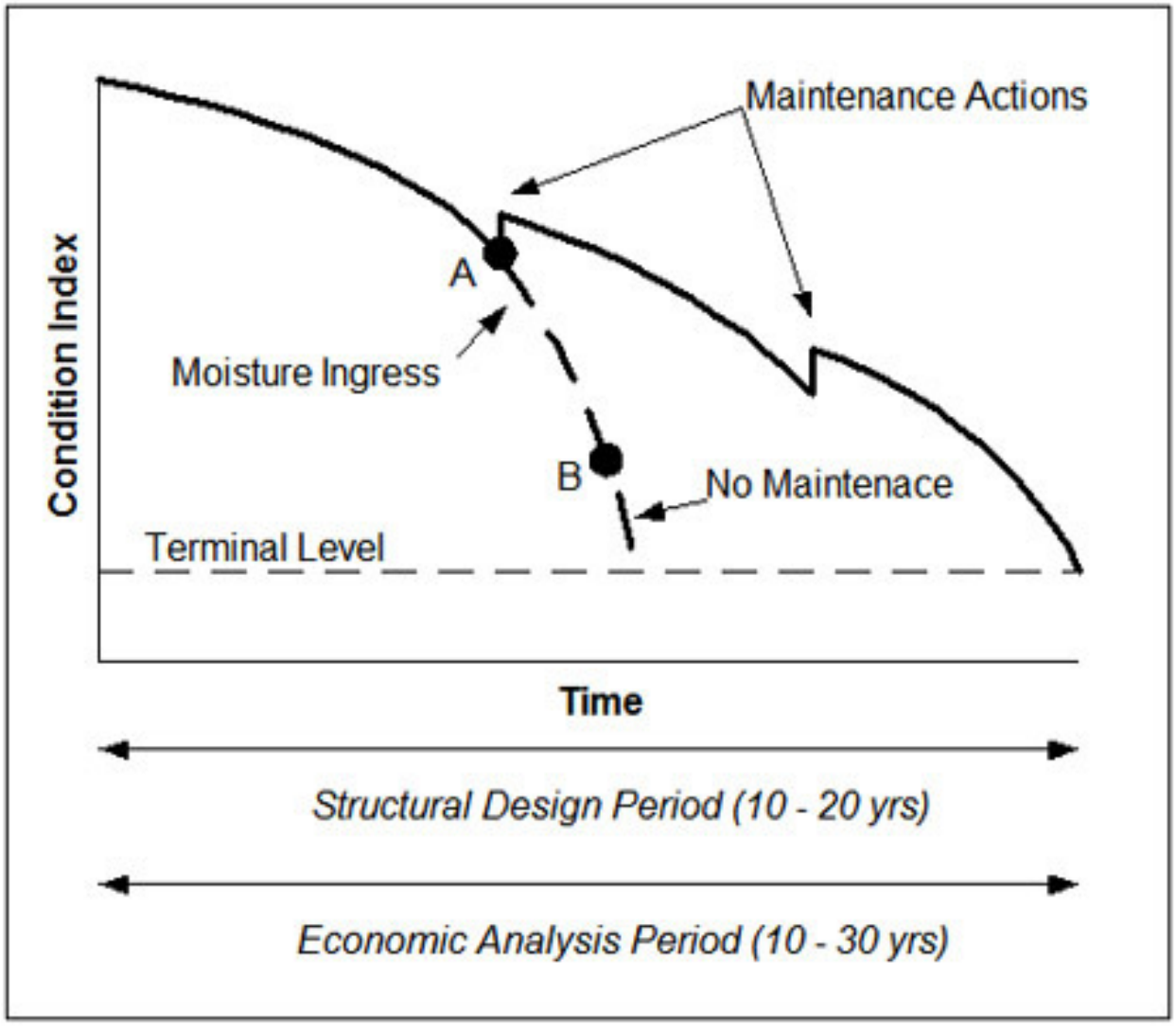

Figure 5: Timing of Pavement Maintenance

8.4.1 Alternative 1

Alternative 1 entails the upgrading of Road D620 (to a dual carriageway) & Road D621 (to remain a single carriageway) from gravel to a flexible pavement.

Flexible pavements are constructed of several layers of natural granular material covered with one or more waterproof bituminous surface layers, and as the name implies, is considered to be flexible. A flexible pavement will flex (bend) under the load of a tyre. The objective with the design of a flexible pavement is to avoid the excessive flexing of any layer, failure to achieve this will result in the over stressing of a layer, which ultimately will cause the pavement to fail. In flexible pavements, the load distribution pattern changes from one layer to another, because the strength of each layer is different. The strongest material (least flexible) is in the top layer and the weakest material (most flexible) is in the lowest layer. The reason for this is that at the surface the wheel load is applied to a small area, the result is high stress levels, deeper down in the pavement, the wheel load is applied to larger area, the result is lower stress levels thus enabling the use of weaker materials (SANRAL, 2017).

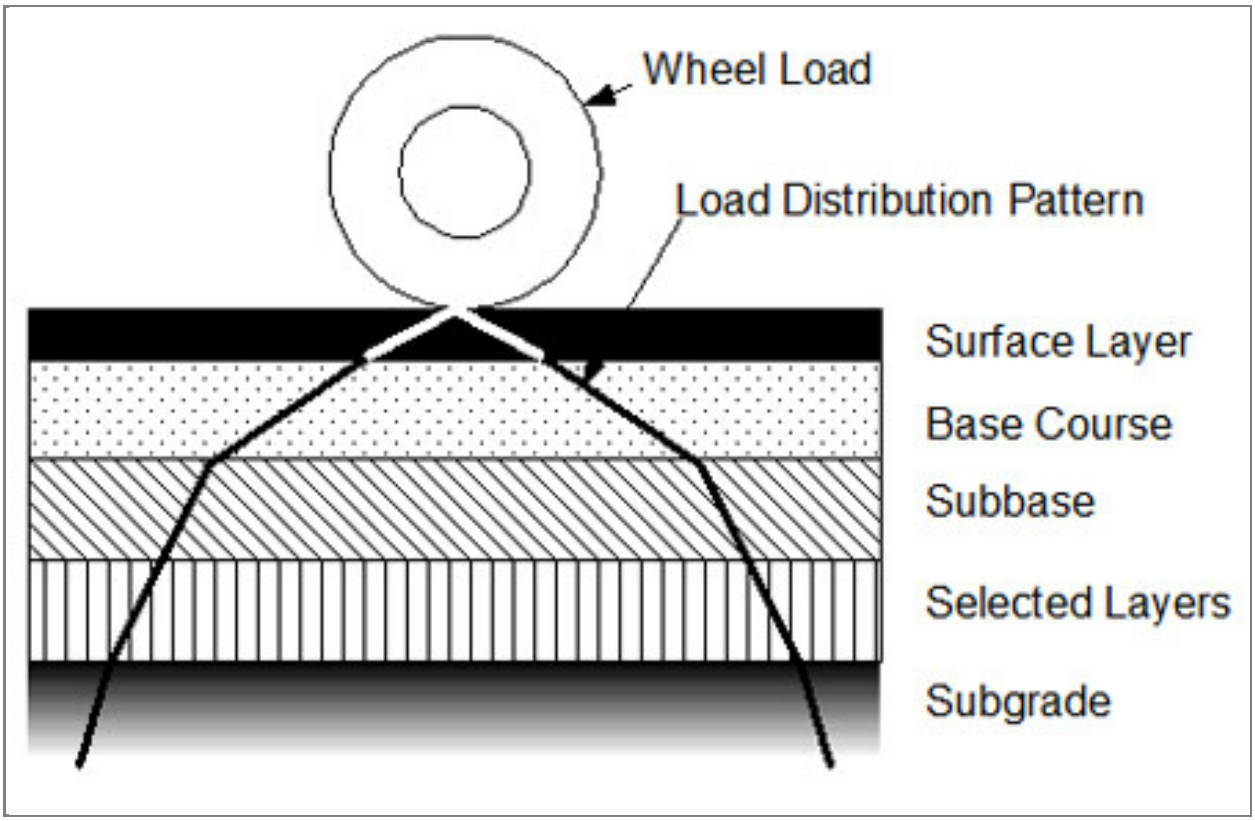

Figure 6: Presentation of the load distribution pattern for a flexible pavement

8.4.2 Alternative 2

Alternative 2 entails the upgrading of Road D620 (to a dual carriageway) & Road D621 (to remain a single carriageway) from gravel to a rigid pavement.

Rigid pavements, as opposed to a flexible pavement that develops its strength from a layer system, rely on the strength of the concrete surface typically ranging from 150 to 300 mm for strength. As the name states, rigid pavements are considered to be rigid, implying that the pavement will not flex (bend). This is not entirely accurate, since even a rigid pavement will flex, the amount is however so small that when compared with a flexible pavement, it is considered rigid.

The increased rigidity of concrete allows the concrete surface layer to bridge small weak areas in the supporting layer through what is known as beam action. This allows the placement of rigid pavements on relatively weak supporting layers, as long as the supporting layer material particles will not be carried away by water forced up by the pumping action of wheel loads.

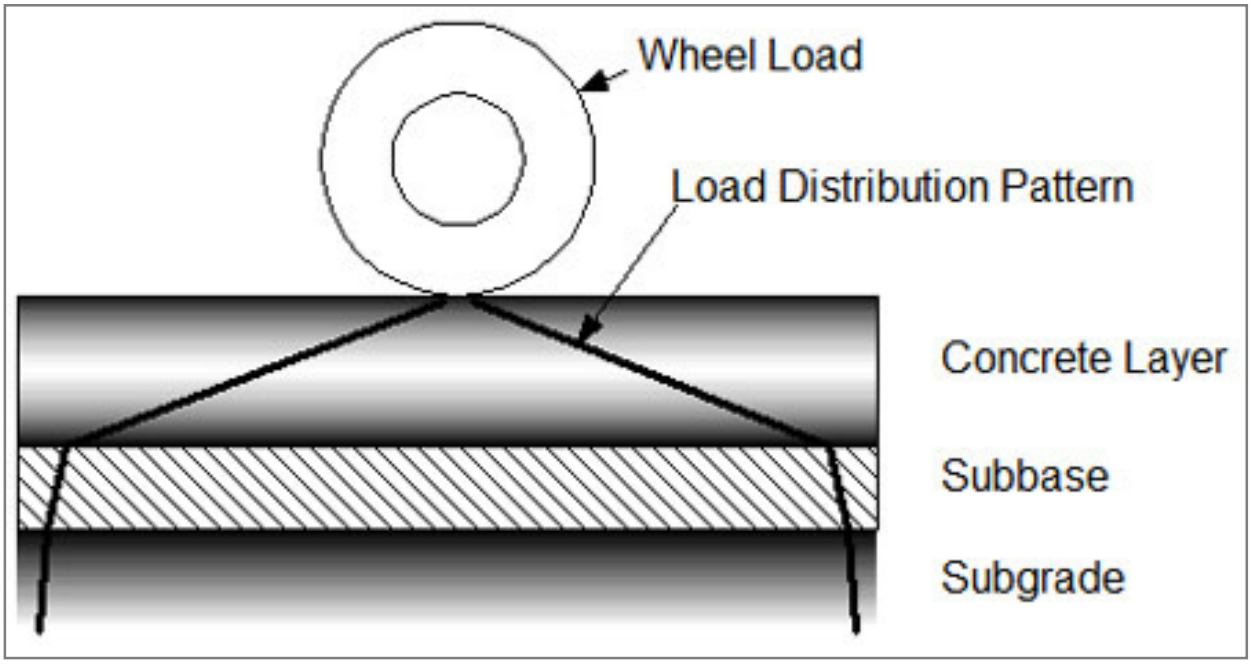

Figure 7: Presentation of the load distribution pattern for a rigid pavement

No further Design Alternatives were investigated.

8.5 Technology alternatives

The project entails the upgrading of Road D620 & Road D621 from gravel to surfaced roads, with Road D620 to be upgraded to a dual carriageway.

No reasonable or feasible alternatives in terms of the technology aspects of the activity were investigated.

8.6 Operational alternatives

The project entails the upgrading of Road D620 & Road D621 from gravel to surfaced roads, with Road D620 to be upgraded to a dual carriageway.

No reasonable or feasible alternatives in terms of the operational aspects of the activity could therefore be investigated.

9. Description of receiving environment

This section provides a description of the natural and socio-economic environment which could be potentially impacted on by the proposed development. It includes a brief overview of the topography, climate, vegetation, fauna and heritage aspects found on site.

9.1 The Physical Environment

9.1.1 Topography

The topography of the study area is that of flat to slightly undulating plains, with little to no steep gradients. There are no rocky outcrops (koppies), rocky ridges, valleys or steep ravines present. The average elevation of the study site is between 1 100m and 1140m with an overall gradient of less than 2%. Even in the region of the small stream there are no sudden or steep gradients (Biodiversity Assessment, Flori Scientific Services, 2017).

9.1.2 Climate

The study area is situated just within the moderate rainfall regions of South Africa (401mm – 600mm per annum) and within the Temperate Interior Climatic Zone of South Africa.

The area normally receives on average about 453mm of rain per year, with most rainfall occurring during the summer. The area receives the lowest rainfall (0mm) in June, the middle of winter and the highest (84mm) in January, during summer. The monthly average for daily maximum temperatures for Winterveld range from

20.6℃ in June, to 29.8℃ in January. The region is the coldest during July when the average night temperate is around 2.4℃ (Biodiversity Assessment, Flori Scientific Services, 2017).

9.1.3 Geology and Soils

9.1.3.1 Geology

The area under investigation is underlain by the Bushveld Complex and the last 4 km of D620 by the Karoo sequence. The Lebowa Granite Suite is the dominant subgroup for both road D620 and D621. Its properties are generally course drained pink or red Granite.

The weathering patterns of the granites are typical of the granites found in southern Africa. The characteristics of weathered to residual soil are generally a course grained quartz sand with the feldspars weathered to a kaolinitic clay. Bushveld Granite underlies the whole of Winterveld and Mabopane. The geotechnical constraints of the Bushveld Granites are:

- Collapsible soils;
- Uneven weathering, which may result in differential settlement; and
- Localized perched water tables could also be present

The Karoo sequence of the Ecca subgroup:
In southern Africa, rocks of the Karoo Supergroup cover almost two thirds of the present land surface, including central Cape Province, almost all of Orange Free State, western Natal and much of north-east Gauteng.

The Ecca Group is a group of sedimentary geological formations found in southern Africa. A component of the Karoo Supergroup, is that it consists mainly of shale's, gritstone, conglomerates and sandstones (Preliminary Design Report, Nyeleti Consulting, 2013).

9.1.3.2 Engineering Geology

The mode of weathering is partly chemical partly physical, resulting in the development of residual soils consisting of angular grains of quarts and feldspar with a small percentage of kaolinitic clay.

The rock and its residual soil is classified under the acid crystalline group. In general these materials are suitable for use in bases, subbases and all other pavement layers if their soil properties allows. Rapid wreathing of the layers are unlikely making these materials very good choices if the other material properties such as grading shape and bearing capacity can be obtained.

The more the disintegration process has taken place, care must be taken and stabilization must be considered, as the main clay mineral is kaolin and acts as a natural soil binder. The addition of cement must be considered if

the secondary minerals exceed 10 percent for mica, muscovite etc. As with all granite type materials the structural layers must be examined with:

- XRD
- Durability tests (Durability Mill, ICL)

Karoo Sequence:
The material encountered during the investigation were a more Anrenaceous than Arigillaceous, which would be expected for a shale underlying area. The laboratory profiled the materials as Ferricrete but the conglomerate type material is more likely to be grid stone.

Engineering consideration must be given to these materials if they are in a weathered state. These need to be treated if used in the road pavement (Preliminary Design Report, Nyeleti Consulting, 2013).

A summary of the Geology and Material Investigation conducted is included as Sections 7 and 8 in the Preliminary Design Report under Volume II: Annexure 1. The report summarises all the test findings and recommendation for the geology, stability, subsurface water etc.

9.1.4 Surface Water and Wetlands

There are no large perennial rivers or even large semi-perennial streams in the study area. The closest large rivers in the region are the Tolwane / Sand (to the west); the Kutswane / Soutpanspruit (to the north and east); and the Tswane (to the east). There are no wetlands in the study area, including pans. There are a few stormwater culverts along both routes that simply channel and allow the free movement of stormwater run-off across (under) the road. These are not watercourses, but need to be inserted, as roads can have a significant impeding impact on the free flow of surface stormwater. The study area is situated within the Primary Drainage Area (PDA) of A and the Quaternary Drainage Areas (QDAs) of A23J and A23K.

All the watercourse crossings were delineated during field investigations. Route D620 only crosses over two small seasonal drainage lines and no streams or rivers. Route D621 crosses over two watercourses, the one being a seasonal drainage line and the other one a larger seasonal drainage line or small seasonal stream. The two watercourses along Route D621 are part of the same, larger drainage system..

The few drainage lines that are present are highly seasonal and erratic with little to no distinctive riparian zones and main channels. The most significant watercourse in the study area is the seasonal drainage line / stream along Route D621, which is approximately 232m east of the M39 junction. The watercourses in this area have been highly modified an impacted on by cultivating, ploughing and planting directly within the main channel and floodplain area. This along with other impacts such as urbanisation, movement of cattle and people, etc.

The figures below show the delineations of the watercourses along Route D620. The watercourses are seasonal, highly erratic drainage lines that have been modified over the years. There are no distinct riparian zones or seasonal floodplains associated with these two watercourses. For this reason 32m buffer zones have been delineated around the main channels. These areas are to be viewed as sensitive.

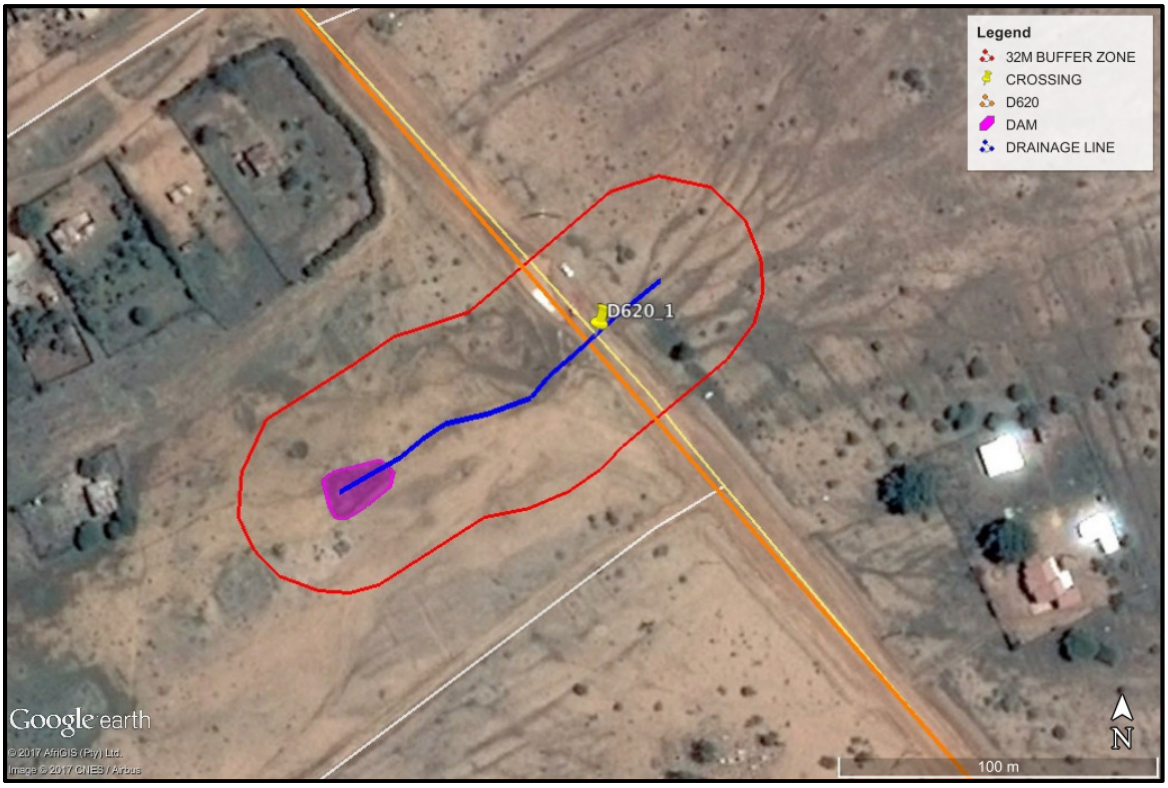

Figure 8: Delineated watercourse at D620_1

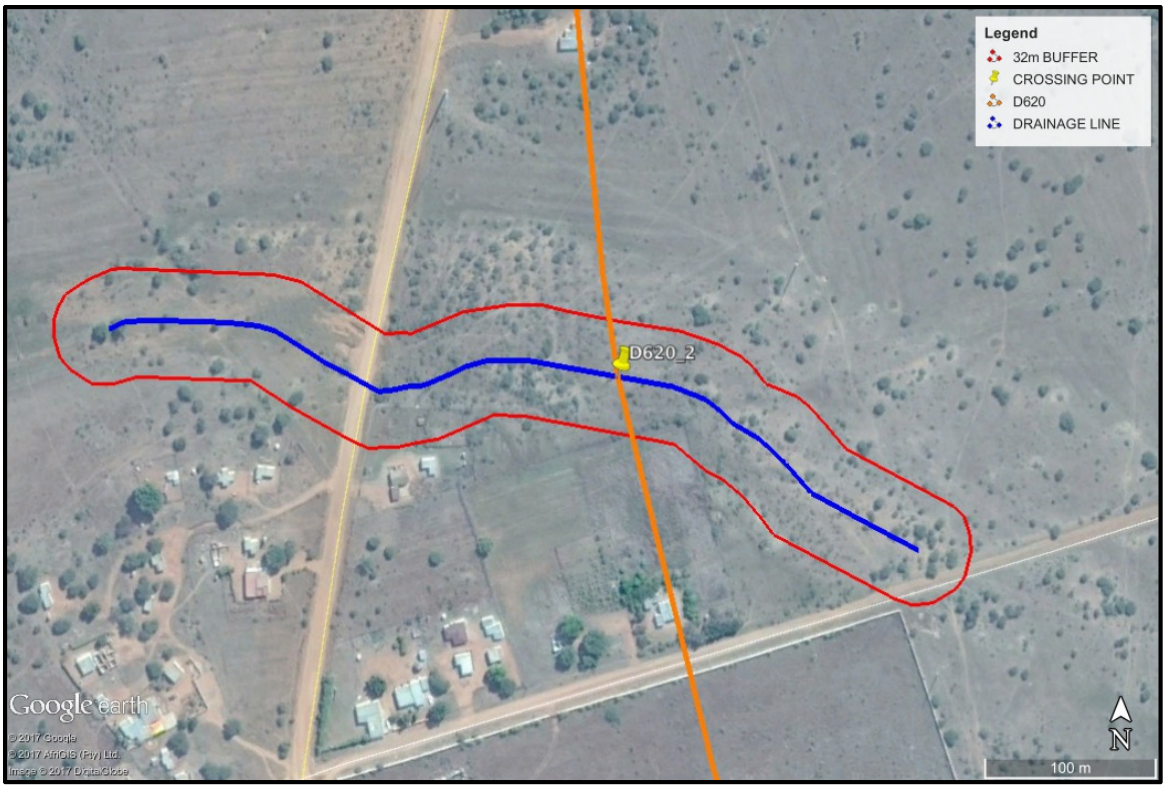

Figure 9: Delineated watercourse at D620_2

The map below shows the delineation of the watercourses along Route D621. D621_1 is highly modified and no clear main channel is present. There is also no distinctive floodplain area or riparian zone. For this reason a 32m bufferzone has been delineated around the basic main channel in the area of the road, which can be determined as sensitive (Biodiversity Assessment, Flori Scientific Services, 2017).

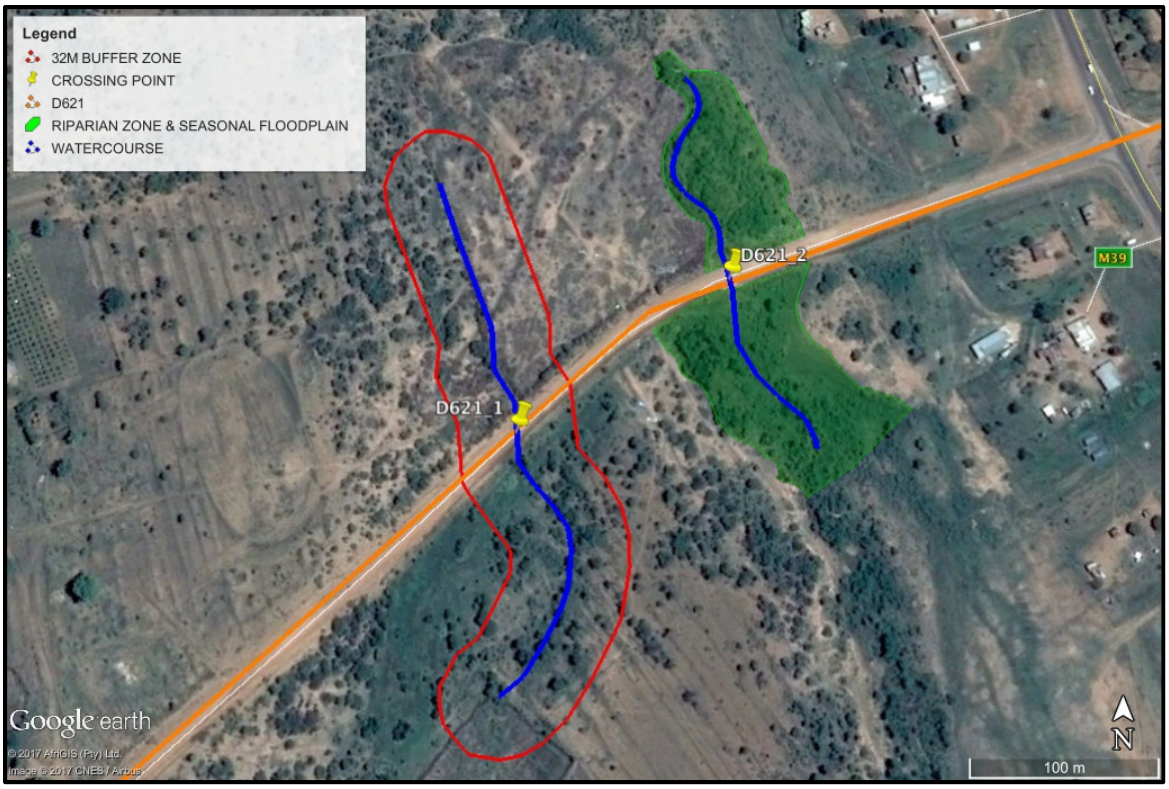

Figure 10: Delineated watercourses for Route D621

9.2 The Biological Environment

9.2.1 Vegetation

The study area is found within the Central Bushveld Bioregion of the Savanna Biome. The study area is situated mainly within the veldtype unit of Central Sandy Bushveld, with a small section of the D621 route within Springbokvlakte Thornveld.

The vegetation of the study area is mostly transformed, as most of the study area is existing gravel roads earmarked for upgrade. The vegetation found in the road reserves and adjacent areas varies from transformed to highly modified to moderately modified. Actual open veld areas are more characteristic of dense to open thornveld than of mixed bushveld. The vegetation is characteristic of Central Sandy Bushveld in areas and Springbokvlakte Thornveld in other areas. The study area is that of flat to low undulating plains, supporting deciduous *Terminalia sericea* and *Burkea africana* woodland on deep sandy soils (with the former often dominant on the lower slopes of sandy catenas) and low, broad- leaved *Combretum* woodland on shallow rocky or gravelly soils. Species of *Acacia*, *Ziziphus* and *Euclea* are found on flats and lower slopes on eutrophic sands and some less sandy soils (Mucina & Rutherford, 2006). The open bushveld areas are dominated by Acacia thorn trees.

No Red Data species (endangered, threatened or vulnerable) were observed during field investigations for the Terrestrial Ecology Assessment. No Orange Data species were found within the study area corridor. However, it is possible that in the wetter, grassy areas and watercourse areas *Boophone disticha* might be present and species such as *Haemanthus humilis*, *Hypoxis hemerocallidea* and *Hypoxis rigidula* present in the drier areas. If any bulb species such as mentioned above are found during the construction phase they can easily be lifted and replanted in a similar habitat nearby, as these bulbs are very easy to lift and transplant well.

According to the SANBI database, no Red Data species have been recorded in the area of the QDS quadrants in which the study site is situated, with the exception of *Brachystelma discoideum* in QDS 2528AC. It is fairly unlikely that any Red Data species occur in the study area, but it is not impossible. According to the Red List of South African Plants (Raimondo, *et. al*., 2009) *Brachystelma discoideum* is a Critically Endangered (CR) (Possibly extinct) succulent that prefers gravelly, sandy soils in a bushveld ecosystem.

There are a number of alien plants in the study area. The herbaceous plants are especially prevalent in disturbed areas and rehabilitated mining areas. Tree species present tend to be mainly blackwattle (*Acacia mearnsii*) and gum trees (*Eucalyptus* spp.), with indigenous trees been rare to absent. Alien plant species, some of which are invasive, occur scattered throughout the area, especially in disturbed areas, rehabilitated mine areas and along road curbs.

No protected trees were observed in the study area. Marula trees are however present in the area and a final walk down prior to the commencement of the construction phase is recommended. Other trees of interest, which also occur in the area, although not protected trees, include *Burkea Africana* (Biodiversity Assessment, Flori Scientific Services, 2017).

9.2.2 Fauna

Field observations were limited to a few days, which always limits the observation and identification of fauna in the field. Due to the transformed nature of the study area the species richness will be low. Ideal habitats for most large or priority faunal species are rare. However, there are large, open thornveld and farming areas in the region so it is highly likely that numerous mobile species will venture through the study area.

The general habitats present in the study area are not ideal for most potentially occurring Red Data faunal species. However, it is possible that from time to time species from the surrounding region can and will wander in and through the Provincial Route R510 corridor. Care should still be taken to avoid impacting on any animals encountered.

The table below highlights the faunal species of conservation concern (which includes Red Data species) that potentially might occur in the study area and surrounding areas from time to time (Biodiversity Assessment, Flori Scientific Services, 2017).

Table 9: Red Data Faunal Species likely to occur in the area

Species	Common Name	Red Data Status	Preferred Habitat	Habitat Restrictions	Present in Study area
Frogs					
Pyxicephalus adspersus	Giant bullfrog	Threatened / removed from list	Grassland; savanna	Temporary floodplains, pans	Possible
Mammals					
Atelerix frontalis	SA hedgehog	Near threatened	Most, broad	Broad	Occasionally
Manis temmincki	Pangolin (Scaly anteater)	Vulnerable	Grassland, savanna	Woody savanna, ants, termites	Not likely
Mellivora capensis	Honey badger (Ratel)	Near threatened	Most, broad	Broad	Possibly
Cloeotis percivali	Short-eared trident bat	Critically endangered	Savanna	Caves and subterranean habitat	Not likely
Pipistrellus rusticus	Rusty bat	Near threatened	Most, broad	Woody savanna, large trees	Not likely
Snakes					
Python natalensis	Southern African python	Vulnerable	Ridges, wetlands	Rocky areas; open water	Possible, but only near watercourses

9.2.2.1 Mammals

No large- or medium-sized mammals were observed during field investigations for the Terrestrial Ecology Assessment. Due to the amount of urbanisation taking place in the region this is not surprising. It is however, more than likely that medium-sized mammals do move through the area from time to time. It is important to instruct contractors not to interact deliberately with any wild animals (Biodiversity Assessment, Flori Scientific Services, 2017).

9.2.2.2 Avifauna

The study area is not situated within or adjacent to any Important Bird Areas (IBAs). However, IBAs such as the Magaliesberg and the Waterberg are situated 20km south and 60km north of the study site, respectively. It is therefore reasonable to believe that priority species will visit the area, especially during the rainy, summer season when migratory birds have also returned (Biodiversity Assessment, Flori Scientific Services, 2017).

9.2.2.3 Reptiles

No reptiles were observed during field investigations for the Terrestrial Ecology Assessment.. The study area is not within a snake hotspot, although it is possible that rock python (*Python natalensis*) could occur although rarely. The likelihood is rare that any priority lizard species will be present in the study area (Biodiversity Assessment, Flori Scientific Services, 2017).

9.2.2.4 Invertebrates

Invertebrates such as spiders, scorpions and butterflies are important faunal groups, but are difficult to fully assess in a short time period. During field investigations specific attention was given to priority species such as *Mygalomorphae arachnids* (Trapdoor and Baboon spiders) and red data butterflies. Fortunately, the nature and scope of the project is such that it will have very little negative impact, if any, on these species. No priority species were observed.

The most likely red data butterfly to potentially occur in the region is the Marsh sylph (*Metisella meninx*), which is vulnerable (VU). The Marsh Sylph is endemic to the wet vleis of highland grasslands in northern KwaZulu-Natal, Mpumalanga, Gauteng and the northern part of the Orange Free State.

9.2.3 Ecological Sensitivity of the Study Area

The ecological sensitivity of the study area is determined by combining the sensitivity analyses of both the floral and faunal components. The highest calculated sensitivity unit of the two categories is taken to represent the sensitivity of that ecological unit, whether it is floristic or faunal in nature (Refer to Table below).

Table 10:Ecological sensitivity analysis

Ecological community	Floristic sensitivity	Faunal sensitivity	Ecological sensitivity	Development Go-ahead
Thornveld	Medium/Low	Medium/Low	Medium/Low	Go-Slow
Road area	Low	Low	Low	Go
Cultivated lands	Low	Medium/Low	Medium/Low	Go-Slow
Watercourses	Medium	Medium	Medium	Go-But

There are no High sensitivity areas identified during field investigations within the study site. Most of the site consists of totally transformed existing road areas (gravel or sand roads). The roads are to be upgraded with little to no further impacts along the routes. The areas of road to be widened are situated mostly within the existing road reserve most of which is disturbed. The watercourse crossings are not highly sensitive in reality, but like all watercourses (even degraded ones) they are by default, viewed as sensitive and need to be approached as such.

The only sensitive areas in the study area are therefore the watercourse crossings. The sensitivity map is shown below (Biodiversity Assessment, Flori Scientific Services, 2017).

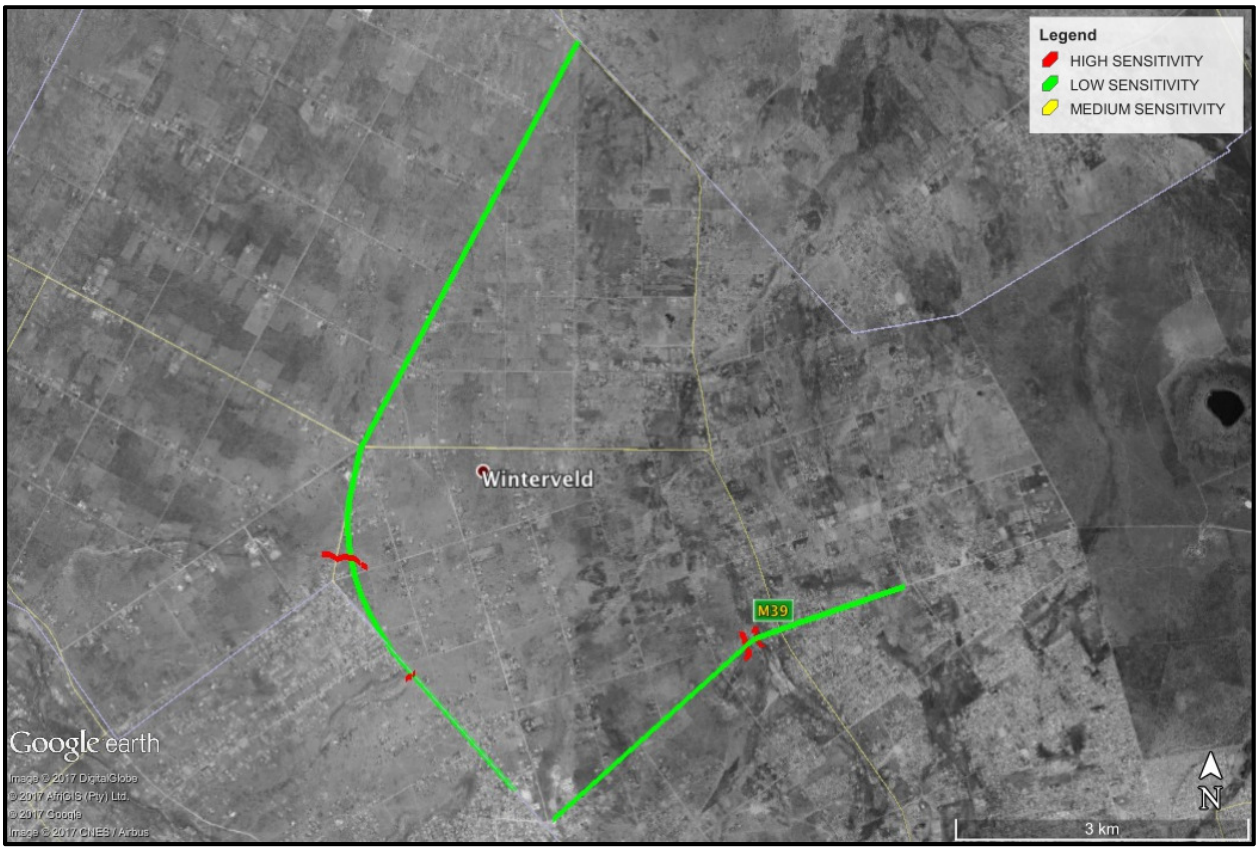

Figure 11: Sensitivity Map

9.3 Cultural and social features

9.3.1 Historic, pre-historic features and archaeological

The project entails the upgrading of an existing road and it is therefore not envisaged that any sites of archaeological importance will be disturbed. A chance find procedure should however be implemented and/or adhered to:

- If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or services provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.
- It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area.

- The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA.

A Heritage impact Assessment is currently being conducted and the results thereof will be included and discussed in the Final EIAR.

9.3.2 Visual Quality

One of the potential impacts of a development is its aesthetic impact. The aesthetic quality of an area is important for several reasons and could be an important contributor to the well-being and quality of life for people (Barnard, 1999).

A new development should therefore aim to be attractive and visually pleasing. It should preferably improve the visual quality of the area and at the very least should avoid visual degradation of the area (Barnard, 1999).

The proposed upgrading of Road D620 & Road D621 is not expected to visually degrade the area.

9.3.3 Air Quality

Air pollution sources are typically dust from gravel road networks and smoke emissions from fires. Vegetation clearing (exposure of soil) as well as prevailing winds may lead to conditions that are favourable for the creation of excessive dust. However this will only be applicable for the construction period, until the roads have been tarred. For the no-go option, dust will still be experienced.

9.3.4 Noise Quality

Noise during the construction phase of the project will be short term and mitigation is possible. The contractor must ensure that noise levels are kept within acceptable limits and the construction hours must be restricted to working hours and permitted hours in terms of local noise regulations. The road will cause noise during the operational phase.

9.3.5 Safety and Security

It is a general concern that crime increases during the construction phase due to the transient nature of the labourers. Safety and security issues are addressed in Section 12 of this report as well as in the EMPr included under Volume IV.

9.3.6 Socio-Economic Environment

The project site falls in Region 1 within the City of Tshwane Metropolitan Municipality (CoT). Region 1 is situated in the north-western part of the Metropolitan area, to the north-west of the CBD and to the west of the Wonderboom area.

The region can be reached via the R80-Mabopane Highway (PWV 9), which links the region with the central regions of the metropolitan area. The Bakwena Platinum Highway (PWV 2) that links the region with the N1 freeway to the east and to the west links the area with Rustenburg and the Northwest Province. Generally regional accessibility within this area is poor although the PWV2 has improved the situation considerably since its construction.

An estimated population figure for this area suggests 811 570 people according to 2011 Census. The population generally has low-income levels. 40% of the population reported during the 2001 Census to have no formal income and 16% of the population earned a monthly income of less than R1 600,00 (City of Tshwane, 2017).

10. Public Participation

The broad objectives of the public involvement programme were to:

- inform I&APs and key stakeholders of the proposed application and environmental studies;
- initiate meaningful and timeous participation of I&APs;
- identify issues and concerns of key stakeholders and I&APs with regards to the application for the development (i.e. focus on important issues);
- promote transparency and an understanding of the project and its potential environmental (social and biophysical) impacts (both positive and negative);
- provide information used for decision-making;
- provide a structure for liaison and communication with I&APs and key stakeholders;
- ensure inclusivity (the needs, interests and values of I&APs must be considered in the decision-making process);
- focus on issues relevant to the project, and issues considered important by I&APs and key stakeholders; and
- provide responses to I&AP queries.

10.1 Identification of Interested and Affected Parties

TGM Environmental Services CC developed a database of I&AP's based on the Public Participation undertaken for the project, past projects and experience in the area. Additional I&AP's were identified during the process via various discussions with authorities and key I&AP's during the Scoping process.

10.2 Procedure by which I&APs were afforded the opportunity to participate

All identified I&AP's were notified of the proposed project by fax/ e-mail and registered letters were sent out to property owners who's details were available on 3 July 2015 containing the Background Information Document (BID). The BID provided basic information on the proposed project, the EIA process and the details on how to register as an I&AP.

Notices were hand delivered to properties where registered addresses were not available. The intended activity was furthermore advertised in the "Daily Sun Newspaper" on 3 July 2015. Notices were also placed on and around the site on 3 July 2015.

10.3 Comments from I&APs

Comments were received from I&AP's (Refer to Volume III) and a register was opened to register any and all interested and affected parties that provided comments or issues in writing.

All the various issues and comments have been noted and various studies have been conducted in order to address the issues.

The Draft and Final Scoping Reports were made available for public review. The reports included a comment and response report which summarised all the comments received during the Public Participation process as well as a Biodiversity Assessment which addresses the requirements as indicated by GDARD. Design Drawings were also included in the Reports.

10.4 Public Participation Issues & Responses

This section provides a synthesis of all issues and concerns identified through the EIA process and its associated PPP. Issues have been listed and a brief description is given. A response is given in an attempt to explain the comment, or how the issue was resolved during the EIA process and is contained in Volume III: Comments & Response Trail.

10.5 Environmental Authorisation

On receipt of environmental authorisation (positive or negative) for the project, stakeholders and I&APs registered on the project database will be informed of this authorisation and its associated terms and conditions by letters, e-mails and fax.

11. Summary of issues raised by I&APs

Comments received as part of the Public Participation Process as well as the responses thereto are included in detail in the Comments and Responses Report under Volume III: Annexure 6. A summary of these issues follows in the Sections below.

11.1 Support for the project

Support for the project was received, as the dust created by the gravel road and damage to cars is a concern. Employment opportunities and improved travelling conditions were also mentioned.

Request received for storm water pipes, Apollo light and the following traffic signs:

1. T-junction chevron
2. Stop sign
3. T-junction > 100m from the stop sign
4. Tourism sign symbol (brown colour board) New St Johannes Apostolic Church
5. Traffic control stop ahead

Response:

No response is required. The input from surrounding landowners and other interested parties is appreciated.

The project entails the upgrading of Road D620 & Road D621 from gravel to surfaced roads. Existing stormwater infrastructure will be replaced, and/or upgraded, and/or cleaned and new stormwater infrastructure will be constructed. Appropriate traffic signs will form part of the project.

11.2 Request for employment opportunities

Requests for employment opportunities were received.

Response:

Gautrans has a tendering process which is outside the range of influence of the EIA team. Comments about the tendering process must be directed to Gautrans directly. The tender will be advertised according to the Gautrans procurement procedures.

11.3 Heritage

SAHRA must be consulted during the EIA process and their comments and responses must be included on the draft and final Environmental Impact Assessment Report.

SAHRA commented that should graves older than 60 years be discovered, National Heritage Resources Act Legislation must be adhered to. SAHRA needs to be informed if such a discovery is made.

Response:
SAHRA will be informed should graves older than 60 years be discovered. A Heritage impact Assessment is currently being conducted and the results thereof will be included and discussed in the Final EIAR. The proposed project will also be registered on the SAHRIS website.

11.4 Storm Water Management Plan

A Storm Water Management plan should be compiled and submitted to City of Tshwane Roads and Storm Water Division for review, comment and approval. The comments and response from City of Tshwane Roads and Storm Water Division should be included within the final BAR. The plan should aim for: the management of storm water on site during and after construction; storm water drainage must not damage properties or infrastructure of any storm water discharge and after construction the site must be contoured to ensure free flow of runoff and to prevent ponding of water.

Existing storm water infrastructure will be upgraded as part of the proposed activities; the plan must indicate all points of inlet and outlet as well as connections with the existing municipal systems (if there are any) and must comply with the standard and requirements of the City of Tshwane Roads and Stormwater Division.

Response
A summary of the storm water design and stormwater management is included as Section 15 in the Preliminary Design Report included under Volume II: Annexure 1. The Storm Water Management Plan as requested will be included in the Final EIAR.

11.5 Rehabilitation Plan

A detailed landscape and rehabilitation plan should be developed by the landscape architect and submitted to the City of Tshwane: Environment and Agriculture Management Services Department for perusal. The plan should aim to prevent erosion and aid the return of natural, endemic and indigenous vegetation cover to at least 80% of the rehabilitated area. The proposed rehabilitation plan should be included within the EMP.

Response

The Rehabilitation plan is included under Volume II: Annexure 3 as well as in the EMPr included under Volume IV.

11.6 Geotechnical Investigation

The geotechnical investigation study should be conducted and submitted to the City of Tshwane: Environment and Agriculture Management Services Department for perusal. The proposed activity should be guided by the findings of the report.

Geotechnical study must be forwarded to council for geosciences for comments and correspondence must also be attached on the EIA Report.

Response

A summary of the Geology and Material Investigation conducted is included as Sections 7 and 8 in the Preliminary Design Report prepared for the project under Volume II: Annexure 1. The report summarises all the test findings and recommendations for the geology, stability, subsurface water etc. A detailed Stability & Geotechnical Report will be conducted for the Detail Design phase to include proper mitigation measures once the project has been commissioned in the future. Test results are available on request.

11.7 Noise

Noise mitigation measures must be established where roads passes through residential areas. This must be designed to a standard that the road surface limit road noise within the build-up areas to acceptable levels and must be described in the EMP.

Response

Noise during the construction phase of the project will be short term and mitigation is possible. The contractor must ensure that noise levels are kept within acceptable limits and the construction hours must be restricted to working hours and permitted hours in terms of local noise regulations. The road will cause noise during the operational phase. Noise is addressed inn the EMPr.

11.8 Water Use Licence Application

No activities which require a water use authorisation must be allowed to encroach into a wetland, riparian and river boundaries without a water use authorisation being in place from the Department of Water and Sanitation (DWS) according to the National Water Act where necessary.

Response

An application for a Water Use Licence will be submitted to the Department of Water and Sanitation. It is the opinion of the specialist and the conclusion of the study that at most a GA process is required for the upgrade of the existing water crossings.

11.9 Mitigation Measures

GDARD requested an Ecological Sensitivity Study covering both fauna and flora and meeting the Department's Directorate of Biodiversity Management requirements for Biodiversity assessments must be undertaken during EIA and the findings and mitigation measures must be attached on the Draft and Final Environmental Impacts Assessment Report.

The City of Tshwane: Environment and Agriculture Management Services Department requested that all the recommendations and mitigation measures in the Ecological Assessment & Wetland Assessment Report must be adhered to and implemented as part of the design, planning, construction and operational phases of the proposed development.

Response

The Biodiversity Assessment is included under Volume II: Annexure 2.

All the recommendations and mitigation measures in the Ecological Assessment & Wetland Assessment Report will be adhered to and implemented as part of the design, planning, construction and operational phases of the proposed development.

11.10 Environmental Management Programme (EMPr)

The Environmental Management Programme (EMP) should be compiled and submitted within the EIA Report. The EMP should identify all activities that may have an adverse impact on the environmental or the potential to cause environmental harm, and detail the mechanisms employed to prevent or minimize the impact of these activities. If require, the ways in which the conduct of the activity will enable altered to minimise or reduce the adverse environment impact of the activity is detailed including a time table for implementation.

The EMPr must incorporate the findings and mitigation measures of the specialized studies to be undertaken and must be included in the EIAR.

Response
The EMPr is included under Volume IV.

11.11 Alternatives Investigated

Feasible and reasonable alternatives must be provided and comparative assessment of such alternatives must be included on the EIAR phase of the project.

Response
Alternatives investigated are included under Section 8 of this report.

11.12 Stakeholder Consultation

All relevant stakeholders including (DWA, SAHRA and Local Authority – CTMM etc.) must be consulted during the EIA process and their comments and responses must be included on the draft and final Environmental Impact Assessment Report.

Response
SAHRA has been notified of the project. A Heritage impact Assessment is currently being conducted and the results thereof will be included and discussed in the Final EIAR. The proposed project will also be registered on the SAHRIS website. The Draft and Final Scoping Reports as well as the Draft EIAR was submitted to DWS. No response from DWS has been received. The Draft and Final Scoping Reports as well as the Draft EIAR was submitted to DWS. Their comments are included in the Comments and Reponses Report under Volume III: Annexure 6.

12. Environmental Impact Assessment

12.1 Introduction

The Impact of the project activities is determined by identifying the environmental aspects and then undertaking an environmental risk assessment to determine the significant environmental aspects. The environmental impact assessment will include all phases of the project namely:

- Construction Phase; and
- Operational Phase.

Due to the nature of the development it is anticipated that the infrastructure would be permanent, thus not requiring decommissioning or rehabilitation. Maintenance of infrastructure will be addressed under the operational phase.

12.2 Methodology

The potential environmental impacts associated with the project will be evaluated according to the nature, extent, duration, intensity, probability and significance of the impacts, whereby:

- **Nature**: A brief written statement of the environmental aspect being impacted upon by a particular action or activity.
- **Extent**: The area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact. For example, high at a local scale, but low at a regional scale;
- **Duration**: Indicates what the lifetime of the impact will be;
- **Intensity**: Describes whether an impact is destructive or benign;
- **Probability**: Describes the likelihood of an impact actually occurring; and
- **Cumulative**: In relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Significance is determined through a synthesis of impact characteristics. Significance is also an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact. The criteria to determine the Consequence of an Impact is described in the tables below.

Table 11: Methodology

Rating	Definition of Rating	Score
A. Extent – *the area in which the impact will be expected*		
None	None	0
Local	Confined to project or study area or part thereof (e.g. site)	1
Regional	The region, which may be defined in various ways, e.g. Cadastral, catchment, topographic	2
(Inter) national	Nationally or beyond	3
B. Intensity – *the magnitude or size of the impact*		
None	None	0
Low	Natural and/or social functions and processes are	1

	negligibly altered	
Medium	Natural and/or social functions and processes continue albeit in a modified way	2
High	Natural and/or social functions or processes are severely altered	3
C. Duration – *the time frame for which the impact will be experienced*		
None	None	0
Short term	Up to 2 years	1
Medium term	2 – 15 years	2
Long term	More than 15 years	3

The combined score of these three criteria corresponds to a Consequence Rating, as set out in Table below.

Table 12: Method used to determine the consequence score

Combined score (A+B+C)	**0 - 2**	**3 - 4**	**5**	**6**	**7**	**8-9**
Consequence Rating	Not Significant	Very Low	Low	Medium	High	Very High

Once the consequence is derived, the probability of the impact occurring is considered, using the probability classifications indicated in table below:

Table 13: Method used to determine the probability

Probability of impact – the likelihood of the impact occurring	
Improbable (Im)	< 40% chance of occurring
Possible (Po)	40% - 70% chance of occurring
Probable (Pr)	> 70% - 90% chance of occurring
Definite (De)	> 90% chance of occurring

The overall significance of impacts is determined by considering consequence and probability using the rating system indicated in table below.

Table 14: Impact significance rating

Significance Rating	**Consequence**		**Probability**
Insignificant	Very Low	&	Improbable
	Very Low	&	Possible
Very Low	Very Low	&	Probable
	Very Low	&	Definite
	Low	&	Improbable
	Low	&	Possible
Low	Low	&	Probable
	Low	&	Definite
	Medium	&	Improbable

	Medium	&	Possible
Medium	Medium	&	Probable
	Medium	&	Definite
	High	&	Improbable
	High	&	Possible
High	High	&	Probable
	High	&	Definite
	Very High	&	Improbable
	Very High	&	Possible
Very High	Very High	&	Probable
	Very High	&	Definite

In conclusion the impacts are also considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The prescribed system for considering impacts status and confidence (in assessment) is indicated in the table below.

Table 15: Impact status and confidence classification

Status of Impact	
Indication of where the impact is adverse (negative) or beneficial (positive)	+ ve (positive – a 'benefit')
	- ve (negative – a 'cost')
	Neutral
Confidence of assessment	
The degree of confidence in predictions based on available information, EAP's judgement and/or specialist knowledge	Low
	Medium
	High

The impact significance rating will be considered in the Impact Assessment process based on the implications of ratings ascribed below:

- Insignificant: the potential impact is negligible and will not have an influence on the decision regarding the proposed activity / development;
- Very low: the potential impact should not have any meaningful influence on the decision regarding the proposed activity / development;
- Low: the potential impact may not have any meaningful influence on the decision regarding the proposed activity / development;
- Medium: the potential impact should influence the decision regarding the proposed activity / development;
- High: the potential impact will affect the decision regarding the proposed activity / development;
- Very high: The proposed activity should only be approved under special circumstances.

The table below describe and compare the potential impacts, significance rating of impacts, proposed mitigation and significance rating of impacts after mitigation that are likely to occur as a result of the construction phase for

the various alternatives of the proposed development. This also includes an assessment of the significance of all impacts.

12.3 Potential Impacts and Significance Rating

The suitability and feasibility of all proposed mitigation measures is included in the assessment of significant impacts. This was achieved through the comparison of the significance of the impact before and after the proposed mitigation measure is implemented. Mitigation measures identified as necessary have been included in the EMPr. Impacts are mostly associated with the Construction phase, however, impacts associated with the Operational phase are also included in the assessment.

The table below contain the assessment of significant impacts for Alternative 1 and Alternative 2.

12.3.1 Significance Rating for Alternatives 1 & 2

Table 16: Significance rating for the construction and operational phases

Potential Impact	Extent (A)	Intensity (B)	Duration (C)	Consequence A+B+C	Probability (P)	Impact Significance	Status	Confidence	Mitigation	(A)	(B)	(C)	(P)	Impact Significance after mitigation
CONSTRUCTION PHASE														
BIOPHYSICAL ENVIRONMENT														
1. ISSUE: TOPOGRAPHY														
1.1 Visual Impacts due to clearance of site and cut and fill	Local (1)	Medium (2)	Short term (1)	Very Low (4)	Definite	Very Low & Definite = Very Low	-ve	High	• Dust generation should be kept to a minimum. • Dust must be suppressed on construction areas during dry periods by the regular application of water or a biodegradable soil stabilisation agent. • Speed limits must be implemented in all areas, including public roads and private property to limit the levels of dust pollution. • It is recommended that the clearing of vegetation from the site should be selective and done just before construction so as to minimise erosion and dust. • Excavating, handling or transporting erodible materials in high wind or when dust plumes are visible shall be avoided.	1	2	1	De	Very Low

Potential Impact	Extent (A)	Intensity (B)	Duration (C)	Consequence A+B+C	Probability (P)	Impact Significance	Status	Confidence	Mitigation	(A)	(B)	(C)	(P)	Impact Significance after mitigation
									• All materials transported to site must be transported in such a manner that they do not fly or fall off the vehicle. This may necessitate covering or wetting friable materials. • Development of the site to take place in phases. • Only phase subject to construction to be cleared. • No burning of waste or vegetation is permitted. • Domestic waste generated on site should be separated at source and recycled. • The site must be managed appropriately and all waste and rubble that can't be recycled must be removed to a permitted Landfill site. • Spoil should be disposed of at a permitted Landfill site. • No excess imported soils or stone (if used during the construction phase) may be left behind. These materials to be removed immediately on completion of the project or activity. • Excess concrete must be disposed of correctly at a permitted Landfill site. • Disturbed surface areas in the construction phase to be rehabilitated. No open trenches to be left. No mounds of soils created during construction to be left. Soils to be leveled and sculptured to the original contours of the surrounding soils. • Waste disposal certificates must be obtained for any waste that is disposed of. • Waste must not remain on site for more than 2 weeks. • All construction material, equipment and any foreign objects brought into the area by contractors and staff to be removed immediately after completion of construction. • Construction / management activities must be limited to the daylight hours between 7:00am and 5:30pm weekdays; 7:00am and 1:30pm on Saturdays. No work is allowed on Sundays and public holidays.					
1.2 Bulk earthworks: Deep cuttings, high embankments, disposal of spoil and excavations cause local changes to	Local (1)	Medium (2)	Short term (1)	Very Low (4)	Definite	Very Low & Definite = Very Low	-ve	High	• All stockpiles must be restricted to designated areas and are not to exceed a height of 2 metres. • Stockpiles created during the construction phase are not to remain during the operational phase. • The contractor must be limited to clearly defined access routes to ensure that sensitive and undisturbed areas are not disturbed. • The site must be managed appropriately and all waste	1	2	1	De	Very Low

Potential Impact	Extent (A)	Intensity (B)	Duration (C)	Consequence A+B+C	Probability (P)	Impact Significance	Status	Confidence	Mitigation	(A)	(B)	(C)	(P)	Impact Significance after mitigation
topography									and rubble that can't be recycled must be removed to a permitted Landfill site. • Excess soil and bedrock should be disposed of at a permitted Landfill site.. • Excess concrete must be disposed of correctly and at a permitted Landfill site. • Waste disposal certificates must be obtained for any waste that is disposed of. • Waste must not remain on site for more than 2 weeks. • Waste bins must be provided by the Contractor for waste to be used by staff. • The construction camp must be located as far from other properties as possible. • The construction foot print must be minimised. • Construction / management activities must be limited to the daylight hours between 7:00am and 5:30pm weekdays; 7:00am and 1:30pm on Saturdays. No work is allowed on Sundays and public holidays • Lighting on site is to be sufficient for safety and security purposes, but shall not be intrusive to neighbouring residents or interfere with road traffic. • Avoid development on excessively steep slopes. • Avoid cutting steep embankments • Provide the necessary erosion protection measures. • Ensure that all erosion control measures are in good repair and working condition.					
2. ISSUE: GEOMORPHOLOGY, GEOLOGY AND SOILS														
2.1 Potential Erosion & Siltation	Region (2)	Medium (2)	Short term (1)	Low (5)	Definite	Low & Definite = Low	-ve	High	• Erosion along gravel roads and access roads to be continually monitored and repaired during construction phase, not only after construction. • Erosion around bridges and stormwater culverts to be monitored during the construction phase and rectified on and on-going basis (if occurring directly as a result of the construction activities). Erosion control not to be left until after construction only. • Upgrade activities close to watercourses to be carefully monitored in terms of erosion and possible resulting siltation of watercourses. Weekly inspection of work areas around watercourses to be conducted. Any signs of new erosion and siltation to be rectified immediately.	2	2	1	De	Low
2.2 Loss of topsoil,	Local	Medium	Medium	Low (5)	Definite	Low &	-ve	High	• Strip topsoil prior to any construction activities.	1	2	2	Pr	Low

Potential Impact	Extent (A)	Intensity (B)	Duration (C)	Consequence A+B+C	Probability (P)	Impact Significance	Status	Confidence	Mitigation	(A)	(B)	(C)	(P)	Impact Significance after mitigation
deterioration of soil quality	(1)	(2)	term (2)			Definite = Low			• Reuse topsoil to rehabilitate disturbed areas. • Topsoil must be kept separate from overburden and must not be used for building purposes or maintenance or access roads.					
2.3 Soil pollution	Local (1)	Medium (2)	Medium term (2)	Low (5)	Definite	Low & Definite = Low	-ve	High	• Ensure correct position of construction caps, equipment yards, refueling depots, concrete batching plant etc. to avoid areas susceptible to soil and water pollution. • Ensure appropriate handling of substances. • Remove polluted soil from site to be remediated. • All construction vehicles, plant, machinery and equipment must be properly maintained to prevent leaks. • Vehicles are to be repaired immediately upon developing leaks. Drip trays shall be supplied for all repair work undertaken on machinery on site or campsite area. • Drip trays are to be utilised during daily greasing and re-fuelling of machinery and to catch incidental spills and pollutants. • Drip trays are to be inspected daily for leaks and effectiveness, and emptied when necessary. This is to be closely monitored during rain events to prevent overflow. • Vehicles to be used during the construction phase are to be kept in good working condition and should not be the source of excessive fumes. • Fuels and chemicals must be stored in adequate storage facilities that are secure, enclosed and bunded. • No cement or concrete is allowed to mixed directly on the bare soil in the veld.	1	2	2	Pr	Low
3. ISSUE: HYDROLOGY														
3.1 Stormwater flow and drainage	Region (2)	Medium (2)	Medium term (2)	Medium (6)	Definite	Medium & Definite = Medium	-ve	High	• Wherever relevant, the terms, conditions and recommendations contained in the specialist reports must be implemented. • Drainage systems – all works on the site must be aimed at preventing contamination of the drainage lines within the project site. • When working in low lying areas during periods of high rainfall (summer months) weather reports and rainfall events must be closely monitored. If there is a high potential for rain no work must be carried out in the drainage lines • The most favourable period to do upgrade work in the	2	1	2	Pr	Low

Potential Impact	Extent (A)	Intensity (B)	Duration (C)	Consequence A+B+C	Probability (P)	Impact Significance	Status	Confidence	Mitigation	(A)	(B)	(C)	(P)	Impact Significance after mitigation
									delineated watercourse areas would be during the winter months (low rainfall) or drought periods, if possible. • Construction areas must be graded to existing contours; Corrective use of mounds, culverts and drains to prevent excessively channelled stormwater runoff, which can speed up water flow and cause erosion. Continual corrective actions to erosion during construction phase, especially during the summer rainfall season. Corrective action to erosion not to be left to only end of construction phase. Proper use of culverts, gabions, mats, ridges to slow water flow and rehabilitated areas to prevent medium- to long-term erosion of land, watercourses and stream banks.					
3.2 Impact on water quality, spillage of fuels, lubricants and other chemicals	Region (2)	Medium (2)	Medium term (2)	Medium (6)	Definite	Medium & Definite = Medium	-ve	High	• No temporary accommodation or temporary storage sites to be erected within 100m of any river, stream, drainage line, wetland or farm dam. • Locate construction camp, refueling depots, sanitation facilities and concrete batching plant 100m away from drainage area. • Utilise proper waste management practices. • Ensure handling, transport and disposal of hazardous substances are adequately controlled and managed. • Provide containment areas for potential pollutants at construction camps, refueling depot and concrete batching plant. • Specialised adsorption material and equipment will be kept on site to contain and remove oil spills, etc. • Clean-up of spills as soon as they occur. • Adequate provision of ablutions for construction employees. • Wastewater must not be allowed to come into direct contact with exposed soils or run across the site. • Vehicles and machinery may not be washed on site. • All wastewater must be collected in a sealed container and disposed of by an approved waste contractor.	2	1	2	Pr	Low
3.3 Impact on functioning of watercourses	Region (2)	Medium (2)	Medium term (2)	Medium (6)	Definite	Medium & Definite = Medium	-ve	High	• All temporary facilities (i.e. storage, accommodation, portable toilets, etc.) to be setup in existing built-up areas or disturbed areas only. • No temporary facilities to be setup within 100m of any watercourses, including wetlands. • No temporary facilities (including portable toilets) to be positioned within a 50m bufferzone of the edge of	2	1	2	Pr	Low

Potential Impact	Extent (A)	Intensity (B)	Duration (C)	Consequence A+B+C	Probability (P)	Impact Significance	Status	Confidence	Mitigation	(A)	(B)	(C)	(P)	Impact Significance after mitigation
									any watercourses. • Only existing roads to be used by vehicles during construction as far as possible. Especially in terms of crossing over watercourses. • No vehicles may drive through wetland areas and no new service road may be made through wetland areas. • Ensure small footprint during construction phase. • Erosion around bridges and stormwater culverts to be monitored during the construction phase and rectified on and on-going basis (if occurring directly as a result of the construction activities). Erosion control not to be left until after construction only. • Avoid and minimise the unnecessary removal of any indigenous vegetation, especially trees.					
3.4 Cumulative Impact – Quality of regional surface water	Region (2)	Low (1)	Medium term (2)	Low (5)	Probable	Low & Probable = Low	-ve	High	• Remain out of watercourse areas with vehicles and materials. • Use existing roads. • Ensure small footprint during construction phase.	2	1	2	Pr	Low
4. ISSUE: Fauna & Flora														
4.1 Impacts on fauna & flora	Local (1)	Medium (2)	Medium term (2)	Low (5)	Probable	Low & Probable = Low	-ve	High	• Marula trees are present in the area and a final walk down prior to the commencement of the construction phase is recommended. • The contractor must ensure that no fauna species are disturbed, trapped, hunted or killed during the construction phase. • The illegal hunting or capture of wildlife will not be tolerated. Such matters will be handed over to the relevant authorities for prosecution. • Disturbance to birds, animals and reptiles and their habitats should be prevented at all times. • Construction activities in areas with high floristic sensitivity should be kept strictly within the road reserve. • All temporary facilities (i.e. storage, accommodation, portable toilets, etc.) to be setup in existing built-up areas or disturbed areas only. • No temporary facilities to be setup within 100m of any watercourses. • Ensure small footprint during construction phase. • Use existing roads and road reserve for haul vehicles, contract vehicles, etc. If possible no new access roads to be constructed.	1	2	2	Pr	Low

Potential Impact	Extent (A)	Intensity (B)	Duration (C)	Consequence A+B+C	Probability (P)	Impact Significance	Status	Confidence	Mitigation	(A)	(B)	(C)	(P)	Impact Significance after mitigation
									• Erosion to be continually monitored and rectified during construction phase, not only after construction. • All excess materials brought onto site for construction to be removed after construction. • No open trenches or mounds of soils to be left. • Rehabilitation plan for disturbed areas to be compiled and implemented. • Re-seeding of bare areas with local indigenous grasses to be part of the rehabilitation plan. No exotic species to be used for rehabilitation. • No open fires allowed at all during the construction phase by contractors. • Proper control and management of litter is important.					
4.2 Degradation and destruction of habitats/ ecosystems	Local (1)	Low (1)	Medium term (2)	Very Low (4)	Probable	Very Low & Probable = Very Low	-ve	High	• Site clearing is to be limited to the construction footprint, and the destruction of vegetation in no-go areas should be prevented. • No indigenous trees, shrubs or reeds outside of the road reserve to be removed. • Existing roads should be utilized wherever possible to provide access to construction area. • Clearly demarcate areas to be cleared and ensure that vegetation clearing only occurs within the demarcated areas • Ensure that erosion management and sediment controls are strictly implemented from the beginning of the site clearing activities • Cleared indigenous vegetation can be stockpiled for possible reuse in later rehabilitation or landscaping, or as a brush pack for erosion prevention. • Stockpiles of vegetation are only to be located in areas approved by the ECO, and may not exceed 2m in height. Methods of stacking must take cognisance of the possible creation of a fire hazard. • No burning of stockpiled vegetation is permitted. • Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material).	1	1	2	Pr	Very Low
4.3 Eradication and control of alien invasive plant species	Region (2)	Medium (2)	Short term (1)	Low (5)	Probable	Low & Probable = Low	-ve	High	• Clearing of vegetation to be minimised to reduce footprint and bare, disturbed areas. • Care must be taken to avoid the introduction of alien invasive plant species onto the site. Particular attention must be paid to imported material such as building sand or dirty earth□moving equipment. Stockpiles should be	2	2	1	Pr	Low

Potential Impact	Extent (A)	Intensity (B)	Duration (C)	Consequence A+B+C	Probability (P)	Impact Significance	Status	Confidence	Mitigation	(A)	(B)	(C)	(P)	Impact Significance after mitigation
									checked regularly and any weeds emerging from material stockpiles should be removed, or slashed. • ECO to specifically survey site once a month to detect aliens and have them removed. • Alien vegetation regrowth must be controlled throughout the entire site during the construction period. • The alien plant removal and control method guidelines should adhere to 'best practice' for the species concerned. Such information can be obtained from the Working for Water website as well as herbicide guidelines. • No chemical control (herbicides) of alien plants near watercourses to be used. Herbicides could get into the water system and will have a detrimental effect on the environment. • Clearing activities must be contained within the affected zones and may not spill over into adjacent no□go areas. No-go areas should be clearly demarcated prior to construction. These would include watercourse floodplains. • Initially simply slash (mechanically control) young emerging weeds. • As construction is completed in certain areas, start rehabilitation in those disturbed areas (if possible). It is not always necessary to wait until the completion of the entire project. • Re-seed rehabilitated, disturbed areas with indigenous grasses. It should not be necessary to have to plant any trees or shrubs. • Monitor rehabilitated areas for patches that have not regressed very well, or where erosion has possibly occurred. Rehabilitate eroded areas and reseed. In this way, the potential for invasive alien plant species to establish as spread vigorously is reduced drastically. • Only use chemical control as a last resort and very localised and controlled.					
SOCIO-ECONOMIC AND CULTURAL HISTORICAL ENVIRONMENT														
5. ISSUE: AIR QUALITY														
5.1 Dust/Air pollution - The generation of fugitive dust associated with	Local (1)	Low (1)	Short term (1)	Very low (3)	Definite	Very Low & Definite = Very	-ve	High	• Dust generation should be kept to a minimum. • Dust must be suppressed on construction areas during dry periods by the regular application of water or a biodegradable soil stabilisation agent. • Speed limits must be implemented in all areas, including	1	1	1	De	Very Low

Potential Impact	Extent (A)	Intensity (B)	Duration (C)	Consequence A+B+C	Probability (P)	Impact Significance	Status	Confidence	Mitigation	(A)	(B)	(C)	(P)	Impact Significance after mitigation
construction activities & earthworks						Low			public roads and private property to limit the levels of dust pollution. • It is recommended that the clearing of vegetation from the site should be selective and done just before construction so as to minimise erosion and dust. • Excavating, handling or transporting erodible materials in high wind or when dust plumes are visible shall be avoided. • All materials transported to site must be transported in such a manner that they do not fly or fall off the vehicle. This may necessitate covering or wetting friable materials. • No burning of waste or vegetation is permitted.					
6. ISSUE: AESTHETICS, LANDSCAPE CHARACTER AND SENSE OF PLACE														
6.1 Noise/Vibration	Local (1)	Medium (2)	Short term (1)	Very Low (4)	Definite	Very Low & Definite = Very Low	-ve	High	• Noise levels shall be kept within acceptable limits, and construction crew must abide by National Noise Laws and local by-laws regarding noise. • No sound amplification equipment such as sirens, loud hailers or hooters are to be used on site except in emergencies and no amplified music is permitted on site. • Construction / management activities involving use of the service vehicle, machinery, hammering etc, must be limited to the hours between 7:00am and 5:30pm weekdays; 7:00am and 1:30pm on Saturdays; no noisy activities may take place on Sundays or Public Holidays. • Activities that may disrupt neighbours (e.g. delivery trucks, excessively noisy activities etc.) must be preceded by notice being given to the affected neighbours at least 24 hours in advance. • Equipment that is fitted with noise reduction facilities (e.g. side flaps, silencers etc.) must be used as per operating instructions and maintained properly during site operations.	1	1	1	Pr	Very Low
6.2 Visual Impact • Site clearing and removal of vegetation could partially alter the landscape as viewed from the surrounds of the site, with the	Region (2)	Medium (2)	Short term (1)	Low (5)	Definite	Low & Definite = Low	-ve	High	• Phased, rather than indiscriminate clearing of the site to be undertaken. • Provide the necessary erosion protection measures. • Ensure that all erosion control measures are in good repair and working condition. • Construction / management activities involving use of the service vehicle, machinery, hammering etc, must be limited to the hours between 7:00am and 5:30pm weekdays; 7:00am and 1:30pm on Saturdays; no noisy	2	1	1	Pr	Very Low

Potential Impact	Extent (A)	Intensity (B)	Duration (C)	Consequence A+B+C	Probability (P)	Impact Significance	Status	Confidence	Mitigation	(A)	(B)	(C)	(P)	Impact Significance after mitigation
emergence of exposed areas of bare soil • Construction equipment could be visually intrusive, albeit for a short time period									activities may take place on Sundays or Public Holidays. • Disturbed surface areas in the construction phase to be rehabilitated. No open trenches to be left. No mounds of soils created during construction to be left.					
7. ISSUE: SOCIAL WELL-BEING AND QUALITY OF THE ENVIRONMENT														
7.1 Safety and Security	Local (1)	Medium (2)	Short term (1)	Very Low (4)	Probable	Very Low & Probable = Very Low	-ve	High	• Signs should be erected on all entrance gates to the site camp indicating that no temporary jobs are available, thereby limiting opportunistic labourers and crime. • The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act (Act No. 85 of 1993) and the National Building Regulations. • All structures that are vulnerable to high winds must be secured (including toilets). • Potentially hazardous areas such as trenches are to be cordoned off and clearly marked at all times. • The Contractor is to ensure traffic safety at all times, and shall implement road safety precautions for this purpose when works are undertaken on or near public roads. • Necessary Personal Protective Equipment (PPE) and safety gear appropriate to the task being undertaken is to be provided to all site personnel (e.g. hard hats, safety boots, masks etc.). • All vehicles and equipment used on site must be operated by appropriately trained and / or licensed individuals in compliance with all safety measures as laid out in the Occupational Health and Safety Act (Act No. 85 of 1993) (OHSA). • An environmental awareness training programme for all staff members shall be put in place by the Contractor. Before commencing with any work, all staff members shall be appropriately briefed about the EMPr and relevant occupational health and safety issues. • All construction workers shall be issued with ID badges and clearly identifiable uniforms. • Access to fuel and other equipment stores is to be strictly controlled. • Emergency procedures must be produced and	1	2	1	Pr	Very Low

Potential Impact	Extent (A)	Intensity (B)	Duration (C)	Consequence A+B+C	Probability (P)	Impact Significance	Status	Confidence	Mitigation	(A)	(B)	(C)	(P)	Impact Significance after mitigation
									communicated to all the employees on site. This will ensure that accidents are responded to appropriately and the impacts thereof are minimised. This will also ensure that potential liabilities and damage to life and the environment are avoided. • Adequate emergency facilities must be provided for the treatment of any emergency on the site. • The nearest emergency service provider must be identified during all phases of the project as well as its capacity and the magnitude of accidents it will be able to handle. Emergency contact numbers are to be displayed conspicuously at prominent locations around the construction site and the construction crew camps at all times. • The Contractor must have a basic spill control kit available at each construction crew camp and around the construction site. The spill control kits must include absorptive material that can handle all forms of hydrocarbon as well as floating blankets / pillows that can be placed on water courses. • The Contractor shall make available safe drinking water fit for human consumption at the site offices and all other working areas. • Washing and toilet facilities shall be provided on site and in the construction camp. • Adequate numbers of chemical toilets must be maintained in the construction camp to service the personnel using this area. At least 1 toilet must be available per 20 workers using the camp. Toilet paper must be provided. • The chemical toilets servicing the camp must be maintained in a good state, and any spills or overflows must be attended to immediately. • The chemical toilets must be emptied on a regular basis. • HIV/AIDS awareness and education should be undertaken by all Contractor staff.					
7.2 Employment opportunities	Region (2)	High (3)	Short term (1)	Medium (6)	Probable	Medium & Probable = Medium	+ve	Medium	• Make use of local labour • Provide clear and realistic information regarding employment opportunities and other benefits for local communities in order to prevent unrealistic expectations. • Provide skills training for construction workers.	2	3	1	Pr	Medium (Positive)
8. ISSUE: SURROUNDING LAND USES														
8.1 Loss of	Local	Medium	Medium	Low (5)	Probabl	Low &	-ve	Medium	• No movement of heavy vehicles through farmlands	1	2	2	Pr	Low

Potential Impact	Extent (A)	Intensity (B)	Duration (C)	Consequence A+B+C	Probability (P)	Impact Significance	Status	Confidence	Mitigation	(A)	(B)	(C)	(P)	Impact Significance after mitigation
agriculture, cultivation and grazing potential	(1)	(2)	term (2)		e	Probable = Low			directly after rains to limit damage to lands and farm roads (although this should not be necessary). • Any farm roads or gravel roads used by contractors during construction to be rehabilitated. • Erosion along gravel roads and access roads to be continually monitored and repaired. • Ensure small footprint during construction phase. • Dust suppression along gravel roads to be implemented. • Any farm roads / private roads / gravel roads used during construction to be rehabilitated after construction.					
9. ISSUE: EXPROPRIATION														
9.1 Possible future expropriation	Region (2)	Low (1)	Medium term (2)	Low (5)	Possible	Low & Possible = Very Low	-ve	Medium	• Expropriation, if and when required, will be dealt with by the applicant, GAUTRANS.	2	1	2	Po	Very Low
10. ISSUE: HISTORICAL ENVIRONMENT														
10.1 Destruction of cultural/ heritage sites	Region (2)	Low (1)	Medium term (2)	Low (5)	Possible	Low & Possible = Very Low	-ve	Medium	• A Heritage Impact Assessment is currently being undertaken. • Ensure that construction staff members are aware that heritage resources could be unearthed and the scientific importance of such finds. • A paleontological protocol for finds should be implemented. • If any graves are located in future, they should ideally be preserved *in-situ* or alternatively relocated according to existing legislation. • The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMPr. A short summary of chance find procedures is discussed below. ➢ If during the construction, operations or closure phases of the project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or rock engraving, this person must cease work at the site of the	2	1	2	Po	Very Low

Potential Impact	Extent (A)	Intensity (B)	Duration (C)	Consequence A+B+C	Probability (P)	Impact Significance	Status	Confidence	Mitigation	(A)	(B)	(C)	(P)	Impact Significance after mitigation
									find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager. ➢ It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find, and confirm the extent of the work stoppage in that area.					
INFRASTRUCTURE, SERVICES/ AND WASTE														
11. ISSUE: INFRASTRUCTURE, SERVICES/ AND WASTE														
11.1 Pressure on existing infrastructure and services	Region (2)	Medium (2)	Short term (1)	Low (5)	Probable	Low & Probable = Low	-ve	High	• Integrity of existing services to be ensured. • Phased, rather than indiscriminate clearing of the site to be undertaken. • Services Agreements to be in place.	2	1	1	Pr	Very Low
11.2 Waste	Local (1)	Medium (2)	Short term (1)	Very Low (4)	Definite	Very Low & Definite = Very Low	-ve	High	• Proper rubbish/waste bins to be provided. These to be emptied weekly and the waste to be removed to an official waste disposal site. • Domestic waste generated on site should be separated at source and recycled. • The site must be managed appropriately and all waste and rubble that can't be recycled must be removed to a permitted Landfill site. • Spoil should be disposed of at a permitted Landfill site. • Excess concrete must be disposed of correctly at a permitted Landfill site. • All construction material, equipment and any foreign objects brought into the area by contractors to be removed immediately after completion of the construction phase. • Waste disposal certificates must be obtained for any waste that is disposed of. • Waste must not remain on site for more than 2 weeks. • No burning of waste.	1	2	1	De	Very Low
OPERATIONAL PHASE														
BIOPHYSICAL ENVIRONMENT														
1. ISSUE: GEOMORPHOLOGY, GEOLOGY AND SOILS														
1.1 Potential Erosion & Siltation	Local (1)	Medium (2)	Long term (3)	Medium (6)	Definite	Medium & Definite = Medium	-ve	High	• Areas around foundations, culverts, gabions, etc. need to be check before and after the summer rainy season for signs of soil erosion due to stormwater run-off. Such sites need to be modified and rehabilitated to prevent ongoing erosion. These sites need to be monitored more closely than other sites which show no or minimal signs of erosion.	1	2	3	De	Medium

Potential Impact	Extent (A)	Intensity (B)	Duration (C)	Consequence A+B+C	Probability (P)	Impact Significance	Status	Confidence	Mitigation	(A)	(B)	(C)	(P)	Impact Significance after mitigation
									• Inspection of road shoulders in areas of steep topography to be inspected after the summer rainy season for signs of erosion and rehabilitated and rectified as required.					
2. ISSUE: HYDROLOGY														
2.1 Impact on functioning of watercourses	Local (1)	Medium (2)	Long term (3)	Medium (6)	Definite	Medium & Definite = Medium	-ve	High	• Existing river crossings must be used during maintenance.	2	1	3	Po	Low
3. ISSUE: Fauna & Flora														
3.1 Impacts on fauna & flora	Local (1)	Medium (2)	Medium term (2)	Low (5)	Probable	Low & Probable = Low	-ve	High	• Only use existing roads and vehicle paths during routine maintenance. • Do not drive through watercourses unless over an existing bridge or road. • Avoid areas where birds are nesting, especially long grassy areas, moist grasslands and wetlands. • Ensure that all signage are maintained.	1	2	2	Po	Very Low
3.2 Eradication and control of alien invasive plant species	Region (2)	Medium (2)	Medium term (2)	Medium (6)	Definite	Medium & Definite = Medium	-ve	High	• Conduct surveys for weeds and remove those identified on site. • Revegetation with indigenous, locally occurring species should take place in areas where natural vegetation is slow to recover or where repeated invasion has taken place. • No alien species are to be planted on site. If vegetation is required for rehabilitation and aesthetic purposes, then non-invasive locally indigenous species must be used. This includes grasses. A botanist or ecologist must verify the species to be used. • During routine maintenance eroded sites along the project should be rehabilitated. This will also assist in reducing the potential establishment of alien, invasive species	2	1	2	Pr	Low
3.3 Cumulative Impact - Wildlife Road Conflict	Local (1)	Medium (2)	Long term (3)	Medium (6)	Probable	Medium & Probable = Medium	-ve	High	• Roads are known to create dangerous intersections for animals travelling along familiar routes, especially at night when fast moving vehicles with bright lights cause problems for them. • Preventing animal access – existing roadside fences to be maintained. • Speed limits to be implemented.	1	2	3	Po	Low
SOCIO-ECONOMIC AND CULTURAL HISTORICAL ENVIRONMENT														
4. ISSUE: SOCIAL WELL-BEING AND QUALITY OF THE ENVIRONMENT														

Potential Impact	Extent (A)	Intensity (B)	Duration (C)	Consequence A+B+C	Probability (P)	Impact Significance	Status	Confidence	Mitigation	(A)	(B)	(C)	(P)	Impact Significance after mitigation
4.1 Safety and Security	Local (1)	Medium (2)	Long term (3)	Medium (6)	Probable	Medium & Probable = Medium	-ve	High	• Ensure that road surface, signage and speed bumps (if implemented) are maintained.	1	2	3	Po	Low
MAINTENANCE														
5. ISSUE: MAINTENANCE PHASE TO BE IMPLEMENTED														
5.1 Maintenance phase to be implemented in defect liability period for 1 year	Region (2)	Medium (2)	Short term (1)	Low (5)	Definite	Low & Definite = Low	-ve	High	• Mechanical control of alien plants around disturbed areas caused by construction need to be implemented within three months of completion of construction. Thereafter every six months. Mechanical control to be of such a nature as to allow local, indigenous grasses and other pioneers to colonise the previously disturbed areas, thereby assisting in keeping out invasive weed species. • No chemical control (herbicides) of alien plants to be used within 100m of any watercourses. • Areas around foundations, culverts, gabions, etc. need to be check before and after the summer rainy season for signs of soil erosion due to stormwater run-off. Such sites need to be modified and rehabilitated to prevent ongoing erosion. These sites need to be monitored more closely than other sites which show no or minimal signs of erosion. • Inspection of road shoulders in areas of steep topography to be inspected after the summer rainy season for signs of erosion and rehabilitated and rectified as required.	1	2	1	De	Very Low

12.4 Comparative Discussion of Alternatives

This section provides a comparative discussion of the alternatives as described in Section 8. The section does not take into account the assessment of significant impacts provided in Section 12.3 as the impacts on the environment for the two alternatives are similar. A description of the two alternatives as well as the reasons why Alternative 1 is preferred, is discussed.

Alternative 1 entails the upgrading of Road D620 (to a dual carriageway) & Road D621 (to remain a single carriageway) from gravel to a flexible pavement. Flexible pavements are constructed of several layers of natural granular material covered with one or more waterproof bituminous surface layers, and as the name implies, is considered to be flexible. A flexible pavement will flex (bend) under the load of a tyre. The objective with the design of a flexible pavement is to avoid the excessive flexing of any layer, failure to achieve this will result in the over stressing of a layer, which ultimately will cause the pavement to fail. In flexible pavements, the load distribution pattern changes from one layer to another, because the strength of each layer is different. The strongest material (least flexible) is in the top layer and the weakest material (most flexible) is in the lowest layer. The reason for this is that at the surface the wheel load is applied to a small area, the result is high stress levels, deeper down in the pavement, the wheel load is applied to larger area, the result is lower stress levels thus enabling the use of weaker materials (SANRAL, 2017).

Alternative 2 entails the upgrading of Road D620 (to a dual carriageway) & Road D621 (to remain a single carriageway) from gravel to a rigid pavement. Rigid pavements, as opposed to a flexible pavement that develops its strength from a layer system, rely on the strength of the concrete surface typically ranging from 150 to 300 mm for strength. As the name states, rigid pavements are considered to be rigid, implying that the pavement will not flex (bend). This is not entirely accurate, since even a rigid pavement will flex, the amount is however so small that when compared with a flexible pavement, it is considered rigid. The increased rigidity of concrete allows the concrete surface layer to bridge small weak areas in the supporting layer through what is known as beam action. This allows the placement of rigid pavements on relatively weak supporting layers, as long as the supporting layer material particles will not be carried away by water forced up by the pumping action of wheel loads.

Alternative 1 (flexible pavement) is preferred for this project for the following reasons:

- A rigid pavement would be more expensive than a flexible pavement for purposes of this project.
- The original traffic counts do not govern a rigid pavement design as traffic loading on the pavements are relatively light.
- The availability of the bituminous materials is in close proximity of the proposed road alignments.
- The rideability on the flexible pavement performs better than on a rigid pavement and would provide a better-quality product (SANRAL, 2017).

13. Environmental Impact Statement

13.1 Summary of key findings

The upgrading of Road D620 and Road D621 will have a short to medium term impact ranging from very low to medium during the construction phase and a long term impact, ranging from low to medium during the operational phase for Alternatives 1 and 2. With the implementation of the mitigation measures as per the specialist reports and discussed in Section 12, the impacts during the construction and operational phase will range from very low to medium with the exception of employment opportunities during the construction phase which will have a medium positive impact.

The study area is found within the Central Bushveld Bioregion of the Savanna Biome. The study area is situated mainly within the veldtype unit of Central Sandy Bushveld, with a small section of the D621 route within Springbokvlakte Thornveld. The study area is not within any Critical Biodiversity Areas (CBAs). Route D621 crosses through an Ecological Support Area (ESA) in terms of the GDARD's C-Plan V3.3.

No Red Data species (endangered, threatened or vulnerable) were observed during field investigations for the Terrestrial Ecology Assessment. No Orange Data species were found within the study area corridor. No protected trees were observed in the study area. Marula trees are however present in the area and a final walk down prior to the commencement of the construction phase is recommended.

The general habitats present in the study area are not ideal for most potentially occurring Red Data faunal species. However, it is possible that from time to time species from the surrounding region can and will wander in and through the Provincial Route R510 corridor. Care should still be taken to avoid impacting on any animals encountered.

There are no High sensitivity areas identified during field investigations within the study site. Most of the site consists of totally transformed existing road areas (gravel or sand roads). The roads are to be upgraded with little to no further impacts along the routes. The areas of road to be widened are situated mostly within the existing road reserve most of which is disturbed. The watercourse crossings are not highly sensitive in reality, but like all watercourses (even degraded ones) they are by default, viewed as sensitive and need to be approached as such.

There are no large perennial rivers or even large semi-perennial streams in the study area. There are no wetlands in the study area, including pans. Route D620 only crosses over two small seasonal drainage lines and no streams or rivers. Route D621 crosses over two watercourses, the one being a seasonal drainage line

and the other one a larger seasonal drainage line or small seasonal stream. The two watercourses along Route D621 are part of the same, larger drainage system.

Overall the proposed activities for Alternatives 1 and 2 have a very low to medium impact score. These impacts can be managed through the implementation of the proposed mitigation measures.

Please see below a summary of the identified impacts and their pre-mitigation and post-mitigation impact significance rating scores for Alternatives 1 and 2.

Table 17: Summary of impacts and significance rating

Potential Impact	Impact Significance	Impact Significance after mitigation
CONSTRUCTION PHASE		
1.1 Visual Impacts due to clearance of site and cut and fill	Very Low	Very Low
1.2 Bulk earthworks: Deep cuttings, high embankments, disposal of spoil and excavations cause local changes to topography	Very Low	Very Low
2.1 Potential Erosion & Siltation	Low	Low
2.2 Loss of topsoil, deterioration of soil quality	Low	Low
2.3 Soil pollution	Low	Low
3.1 Stormwater flow and drainage	Medium	Low
3.2 Impact on water quality, spillage of fuels, lubricants and other chemicals	Medium	Low
3.3 Impact on functioning of watercourses	Medium	Low
3.4 Cumulative Impact – Quality of regional surface water	Low	Low
4.1 Impacts on fauna & flora	Low	Low
4.2 Degradation and destruction of habitats/ ecosystems	Very Low	Very Low
4.3 Eradication and control of alien invasive plant species	Low	Low
5.1 Dust/Air pollution - The generation of fugitive dust associated with construction activities & earthworks	Very Low	Very Low
6.1 Noise/Vibration	Very Low	Very Low
6.2 Visual Impact	Low	Very Low
7.1 Safety and Security	Very Low	Very Low
7.2 Employment opportunities	Medium	Medium (Positive)
8.1 Loss of agriculture, cultivation and grazing potential	Low	Low
9.1 Possible future expropriation	Very Low	Very Low
10.1 Destruction of cultural/ heritage sites	Very Low	Very Low
11.1 Pressure on existing infrastructure and services	Low	Very Low
11.2 Waste	Very Low	Very Low
OPERATIONAL PHASE		
1.1 Potential Erosion & Siltation	Medium	Medium
2.1 Impact on functioning of watercourses	Medium	Low

Potential Impact	Impact Significance	Impact Significance after mitigation
3.1 Impacts on fauna & flora	Low	Very Low
3.2 Eradication and control of alien invasive plant species	Medium	Low
3.3 Cumulative Impact - Wildlife Road Conflict	Medium	Low
4.1 Safety and Security	Medium	Low
5.1 Maintenance phase to be implemented in defect liability period for 1 year	Low	Very Low

14. Conclusion and Recommendations

The Environmental Impact Assessment (EIA) process for the proposed upgrade of Road D620 and Road D621 has been undertaken in accordance with the Regulations published in Government Notice R982, R983, R984 and R985 of 2014 (as amended) in terms of Section 24(5) of the National Environmental Management Act (Act No 107 of 1998) (as amended).

In order to protect the environment and to ensure that the proposed road is constructed and operated in an environmentally sensitive manner, a number of environmental legislation have been taken into account during the study.

The relevant legislation has informed the identification and development of appropriate management mitigation measures that are to be implemented in order to minimise potential significant impacts associated with the project.

The conclusion of the EIAR, including comments and concerns from Interested and Affected Parties (I&AP's), is as a result of a comprehensive EIA study. The study is based on issues identified in the Environmental Scoping Study and the public participation process.

The public participation process has been inclusive, and every effort has been made to include the representations of all stakeholders within the process.

14.1 Gaps in Knowledge, Uncertainty, Assumptions and Limitations

No impact assessment can be completely certain of the exact nature and extent of the various impacts that could result from a given development activity. However, this assessment strives to limit any uncertainties by optimising the collection of base data, and by following a rigorous impact assessment methodology. Consequently, it can be stated that the uncertainty in this study would be limited to changes in the development

circumstances at a scale that is beyond the locally focused impact assessment exercise such a drastic change to the economic climate that alters the viability of the proposal.

14.1 Concluding Remarks and EAP Opinion

This EIAR provides an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. It further provides a description of the affected environment and alternatives proposed for the upgrade of Road D620 and Road D621.

Based on the comparative discussion of the two alternatives it is evident that there is very little difference with regard impacts from Alternative 1 in comparison to Alternatives 2. Alternative 1 (flexible pavement) is preferred for reasons including cost effectiveness, availability of materials, traffic conditions in the area and the fact that it is preferred by the applicant.

From a socio–economic point of view, the proposed development can create numerous job opportunities on a temporary basis during the construction phase of the development.

Should the proposed mitigation measures be implemented accordingly, the findings conclude that there are no significant environmental fatal flaws that could prevent the development to proceed. Furthermore, the recommendations and management measures are contained in the Environmental Management Programme.

From the outcome of the assessment, the EAP is of the view that the project be authorised subject to the following conditions:

a. The applicant is not absolved from complying with any other statutory requirements that is applicable to the undertaking of the activity.
b. The applicant must appoint a suitably experienced Environmental Control Officer for the construction phase of the development that will have the responsibility to ensure that the mitigation / rehabilitation measures and recommendations are implemented and to ensure compliance with the provisions of the EMPr.
c. Mitigation measures contained in the specialist reports and EMPr to be implemented.
d. Rehabilitation to be implemented as per the Rehabilitation Plan.
e. A detailed Stability & Geotechnical Report to be conducted for the Detail Design phase to include proper mitigation measures once the project has been commissioned in the future.

15. Declaration

I, Delia de Lange, declare that I -

Will ensure that the information provided in this report is correct at the time of compilation,

Will ensure that information containing all relevant facts in respect of the application is made available to interested and affected parties and the public, and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application,

Will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the competent authority in respect of the application,

Will ensure that the inputs and recommendations from the specialist reports are included in the EIAR where relevant, and

Will ensure that all specific information required by the competent authority is included and addressed in the reports.

16. References

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